

Teaching and learning in higher education: The role of emotion and cognition

Edited by

Jian-Hong Ye, Mei Yen Chen and Yung-Wei Hao

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Teaching and learning in higher education: The role of emotion and cognition

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Editorial: Teaching and learning in higher education: the role of emotion and cognition

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cognition, competencies, core literacy, emotion, higher education, learning, teaching

Editorial on the Research Topic

Teaching and learning in higher education: the role of emotion and cognition

With the global boom in higher education and the wave of educational reforms, the promotion of “meaningful teaching and learning” has become an important topic of discussion and has attracted the attention of many international scholars. This is because the provision of quality education is one of the United Nations’ sustainable development goals. Therefore, for the purpose of quality education development, research from a psychological perspective has become a mainstream research direction in the field of teaching and learning. This is because a psychological perspective can help teachers in higher education better understand their teaching performance from a micro perspective, and can enhance or promote higher quality learning performance and effectiveness, thereby equipping students with the core literacy and competencies required for the 21st century.

There are many worthwhile references to emotion and cognition Research Topics within the topic of teaching and learning in higher education, including: academic achievement (e.g., Liu et al.), academic persistence (e.g., Ma et al.), academic success (e.g., Pishghadam et al.), anger (e.g., Deng et al.), anxiety (e.g., Ma; Qiu and Luo), autonomy support (e.g., Zhang et al.), beliefs (e.g., Huang et al.; Qian et al.), career adaptability (e.g., Lu and Jia), career exploration (e.g., Lu and Jia), conscientiousness (e.g., Huang et al.), continuance intention (e.g., Li X. et al.), critical thinking (e.g., Cheng; Li M. et al.), emotion (e.g., Bachler et al.; Maier et al.; Qin et al.; Schlosser and Paetsch), emotion regulation (e.g., Cheng; Deng et al.; Li M. et al.; Zheng et al.; Weidi and JeeChing), emotional intelligence (e.g., Jiang et al.), engagement (e.g., Al-Obaydi et al.; Deng et al.; Ma et al.; Wang et al.; Zhao and Ling), enjoyment (e.g., Zhang et al.), evaluation of teaching (e.g., Keerthigha and Singh; Zhao et al.), grit (e.g., Zheng et al.), intelligence (e.g., Pishghadam et al.), interests (e.g., Bi and Liu), learning strategies (e.g., Alshaharni), life satisfaction (e.g., Weidi and JeeChing), motivation (e.g., Bi and Liu; Keerthigha and Singh; Zhao and Ling), occupational intention (e.g., Zhang), performance (e.g., Cheng; Qiu and Luo), professional success (e.g., Yang), psychological needs (e.g., De Vocht et al.), reflection (e.g., Schlosser and Paetsch), resilience (e.g., Wu), self-efficacy (e.g., Deng et al.; Liu et al.; Ma; Schlosser and Paetsch; Zheng et al.), self-management (e.g., Zhao and Ling), self-monitoring (e.g., Zhao and Ling), self-regulated learning (e.g., Bellhäuser et al.), stress (e.g., Drüge et al.; Zhang), teacher aggression

(e.g., Yang), teacher burnout (e.g., Yang; Zhang), teacher support (e.g., Ma et al.), teaching preparedness (e.g., Huang et al.), teaching styles (e.g., Keerthigha and Singh), values (e.g., Bi and Liu), and wellbeing (e.g., Zhao and Ling). It can be seen from the above studies that the variables of research on teaching and learning are quite diverse.

Although there have been many studies that have confirmed the importance of emotion and cognition in higher education, with the passage of time, rapid technological developments, literacy-oriented philosophies, and changes in teaching philosophies during the COVID-19 pandemic, many of the originally known results may have changed due to different circumstances. For example, although research on online learning in higher education has been available for decades, there has been a very large amount of research on online learning or online teaching in the past few years due to the COVID-19 pandemic, which led to the temporary closure of classrooms. However, these findings seem to differ in many ways from previous studies. Prior to the pandemic, many studies found that online learning worked well for learners.

The implementation of teaching and learning in emergency situations seems to have difficulty achieving the same good results as deliberately created teaching and learning situations, and can even lead to poor learning for learners. This is because many previous studies excluded disruptive factors, but these disruptive factors are actually present in the classroom. While empirical studies have been successful in proving the validity of the new approach, the scenarios are not realistic. It is important that these excluded distractors are also evaluated after the validity of the method has been confirmed, in order to gain a more complete understanding of the effectiveness of the new method in real educational settings. Although COVID-19 regulations are gradually being relaxed around the world, and teaching is returning to offline classrooms, the impact of the COVID-19 epidemic on education remains, as the experience of teaching during the epidemic has given us insight into the practical effects of current online learning and the potential problems that may exist. This will also help to improve educational technology and digital learning methods in the post-epidemic era, and to explore how to enhance learning to compensate for the loss of learning during the epidemic, as well as how to better design blended learning, collaborative learning, online learning, self-directed Learning, self-regulated Learning, personalized learning, flipped classrooms, and so on.

Meanwhile, under the digital transformation generation of education, metaverse technologies such as 5G, cloud computing, artificial intelligence, artificial intelligence generated content (e.g., ChatGPT), augmented reality (AR), virtual reality (VR), mixed reality (MR), extended reality (XR), substitutional reality (SR), holographic displays, blockchain, IoT, and human-computer interaction are considered to help facilitate quality (meaningful) teaching and learning. Moreover, due to the increasing maturity of AI technology, its role in the field of education has become more important. AI may be used to assist teachers and students in academic assessment, consultation, and guidance through AI-based educational technologies, enabling personalized learning. It can even be used for chat and psychological counseling through its conversational capabilities. However, research on these topics still needs to continue, as most of the metaverse technologies are not

yet widespread in the classroom or are not yet well-adapted for use in the classroom. There is a need for more research that combines educational experience with user experience, so that educators can understand how to use these technologies more effectively and avoid poor use, and so that teaching and learning can be more diverse, personalized and contextualized. The basis of this type of research is not just about effectiveness, but also about the user's sense of experience (adaptability).

It is important to understand how learning takes place. People always want to replicate successful experiences, but how to avoid failure also needs to be taken into account. Success is difficult to replicate in its entirety because of individual differences, but the same mistakes should be avoided as much as possible. Moreover, even students of the same level of learning may encounter different problems when studying the same content, let alone learners from different subjects and systems. We therefore urge educators and researchers to understand the difficulties and needs of learners, and to collect more complete information on problems in different contexts and situations, so that they can provide appropriate help to students. At the same time, the framework, standards and objectives of curriculum and teaching may vary according to the educational policies of different countries and regions. For example, China advocates the inclusion of moral concepts in the curriculum to nurture talents (known as curriculum ideology and politics), which has a Chinese effect on students' cognition, emotions, skills and knowledge. Such a curriculum model and its effects will have national, ethnic and regional characteristics and should therefore be of interest to academics as well, depending on the educational policy context.

In addition, although education experts, the government and educational organizations advocate literacy-oriented education and student-centered teaching methods, traditional didactic teaching is still the mainstream teaching method. Therefore, how to create a truly effective educational environment (learning context) is still an important issue. It is also important that students become self-directed learners, and that teachers become facilitators, guides and companions. Of course, not all teaching and curriculum designs are effective. In particular, design approaches that are not grounded in theory are less likely to deliver effective results. Moreover, it is not only theoretical foundations that are needed for the design of teaching and curricula. The evaluation of learning outcomes also requires a theoretical basis. In addition to identifying the effectiveness of teaching and learning implementation, it is important to identify the pre- and post-teaching relationships that influence teaching and learning. This is because these factors are thought to influence learners' beliefs, intentions, wishes, behaviors (actions) and outcomes. This is why it is important to understand the emotional and cognitive factors of the students (the learners). Therefore, teaching and learning should not only focus on changes in knowledge and skills, but also on cognitive and emotional responses. In addition, among the issues of teaching and learning in higher education, there is still much to explore in the areas of education policy-based practices, sustainable development, localization of international education goals, curriculum development, instructional design, STEAM education (C-STEAM, iSTEAM, IP-STEAM, etc.), educational technology applications, online learning, innovative learning

strategies, learner-centered learning/teaching (mixed methods, personalisation, inquiry-oriented, work-oriented, competition-oriented, context-oriented, collaboration-oriented, topic-oriented, game-oriented, problem-oriented, literacy-oriented), beliefs about teaching and learning, teacher professional capacity development, and teaching adaptability.

Moreover, the models proposed by learning theories are not static. Teachers need to adapt the theoretical models more effectively according to student characteristics, subject matter, curriculum content, course context and lesson time. Therefore, the flexibility and variability of teaching methods need to be taken into account, and the validity of new models needs to be tested. In addition, future research on teaching and learning will need to emphasize the implementation of experiments in real-world learning contexts. At the same time, the ethics of research will increasingly focus on the protection of students' rights when participating in experiments. A single-group experimental design would be an appropriate approach to research design for the benefit of all students, given the constraints of insufficient numbers of participants and the difficulty of re-grouping experiments. After all, we have already recognized the limitations or shortcomings of traditional lecture-based teaching and learning, which is why we want to try out new teaching (learning) methods.

It is also important that innovative (learning and teaching) methods are applied in a sustainable manner. If an effective educational technique, teaching method or learning method was developed but was then not applied after the completion of the teaching experiment, the end of the research project or the publication of a journal paper, it would be a shame and a waste of educational resources. In addition, although the indicators can be converted into numerical values for assessment and comparison, this does not cover all of the assessment content. There is much that

needs to be understood through qualitative content. By combining the results of these two areas, a more comprehensive picture of the truth can be obtained. We therefore call for a more holistic approach to the study of teaching and learning.

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Comparing stress, areas of stress and coping-strategies between distance-learning and on-campus students – A mixed-methods approach

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In recent years, the increase in stress experienced by students, and the related health problems have become a key challenge for health psychologists. The aim of this cross-sectional survey study was to compare stress, areas of stress and coping-strategies of 246 distance-learning (81.7% female; 33.62 years, SD = 9.30) and 254 on-campus students (82.3% female; 24.23 years, SD = 3.99). One-way analyses of variance showed no significant differences in perceived stress and stress symptoms between the student groups. Stress-inducing areas were revealed by qualitative content analysis. Chi-square tests showed that on-campus students significantly more often reported study- and performance-related areas, whereas conflicts between work and private life were more present among distance-learning students. Results also indicated that on-campus students significantly more often cope with stress by means of social support. These findings may help tailoring stress-management interventions for different student groups.

KEYWORDS

coping strategies, distance-learning students, on-campus students, stress, areas of stress, mixed-methods

Introduction

One focus of stress research is the subjective experience of stress and ways of coping in different target groups. In line with this, research activities on stress among students have increased since the Bologna declaration has substantially reformed and structured European academic qualification programs and more

learning support and mental health strategies were called for Rückert (2015). With respect to college or university students, there is a growing body of research scoped on stress and stress-management interventions (e.g., Hintz et al., 2015; Harrer et al., 2018). Also, recently the effects of the COVID-19 pandemic on stress through online-communication and -education are evaluated and discussed (Lazarevic and Bentz, 2020; Mheidly et al., 2020) and have shown a negative psychological effect on college students around the world (Wang et al., 2021).

Different forms of studying

During the last decades, studying has become more diverse. Most post-secondary students are so-called “traditional” students, starting university after graduating from school, while “non-traditional” students usually start their studies later in life (Jones et al., 2016)—in full- or part-time. One central distinction is made between on-campus students and distance-learning students (Furlonger and Gencic, 2014), with a growing number of distance-learning students. Students choose this form of studying mainly because of its compatibility with both work and private life (e.g., parenting). Also, the COVID-19 pandemic has led to a major shift to distance learning. However, also national differences (e.g., tuition fees) could have a large impact on differences in studying experience. It is possible that different forms of studying may result in different stressors, for example, on-campus students may experience stress due to inflexible time schedule or social interactions, whereas distance-learning students may experience stress rather due to distraction by online learning or social isolation.

Stress, areas of stress, and coping among students

With regard to the two forms of studying, it is very likely that they are associated with different types of stressors and that the level of stress, areas of stress and coping-strategies differ between on-campus and distance-learning students, although there are only a few studies that compare the two forms of studying directly. For instance, Furlonger and Gencic (2014) reported higher levels of satisfaction in 295 on-campus students from an Australian university compared to two distance-education modes. Beccaria et al. (2015) found comparable health-promoting behaviors and coping strategies in 242 on-campus students and 399 distance students. They found a significant, though not very strong negative relationship between health-promoting behaviors and intention to leave for on-campus students.

Whereas the majority of studies on students’ stress focus on on-campus students, there are only some studies that focus on distance-learning students: Kwon et al. (2010) reported that distance-learning students were likely to experience increased feelings of social isolation. Kwaah and Essilfie (2017) found in a sample of 332 distance-learning students at a University in Ghana that the major areas of stress, in addition to academic workload and high frequency of examinations, were financial problems and family/marriage problems. These students used multiple coping-strategies, mainly meditating, self-distracting activities like watching TV and listening to music. Furthermore, in a sample of 5,721 distance-learning students of Germany’s largest distance-learning university, Apolinário-Hagen et al. (2018) confirmed a work-life-study-imbalance.

Summarizing the current state of research, there is a substantial lack of studies comparing stress, areas of stress and coping directly between on-campus and distance-learning students. Regarding the situation in Germany, there are no corresponding studies so far, but some studies aiming at stress and coping of on-campus and distance-learning students separately. Moreover, none of the studies considers both quantitative and qualitative approaches, although these prove to be helpful especially in the case of a very private experience like stress. Still, due to COVID-19, it is now more important than ever to learn more about differences in the perceived stress and areas of stress between distance-learning students and on-campus students. Although a general increase in stress caused by distance-learning was observed during the COVID-19 pandemic (Wang et al., 2021), this result needs to be interpreted within the specific context of the COVID-19 situation. For an analysis of stress-related differences between distance-learning and on-campus students that is not blurred by the exceptional situation created by the COVID-19 pandemic, we therefore present data from the time before the onset of the pandemic (i.e., 2018).

Aims of the present study

The present study aims at comparing distance-learning students with traditional on-campus students from German universities with regard to perceived stress, areas of stress and coping-strategies.

Research Question 1: Are there differences in perceived stress and stress symptoms between distance-learning students and on-campus students?

Research Question 2: Are there differences in areas of stress among distance-learning students and on-campus students?

Research Question 3: Are there differences in the type and extent of coping-strategies between distance-learning students and on-campus students?

Materials and methods

Study design and procedure

We conducted a cross-sectional online survey using program (Unipark, Enterprise Feedback Suite survey, version summer 2017, Questback) in summer 2018. We used a combination of qualitative and quantitative methods (mixed-method-design), referring to a study on German on-campus students conducted by [Ortenburger \(2013\)](#). The overall completion time was 15–20 min. Students could take part in a raffle and win one out of ten 50€ gift vouchers.

Sample and recruitment

A total of 500 participants were recruited by email and social media in 2018 (410 females, 89 males, 1 diverse), consisting of 254 on-campus students and 246 distance-learning students over the age of 18 years, who were matriculated at several German universities. The overall average age was 29 (SD = 8.52) years. [Table 1](#) shows further demographic characteristics of this sample. As expected, groups differed with regard to employment status, working hours and caring for children. Ethical approval was not required for this kind of non-clinical pilot survey; the study was conducted in accordance with the Helsinki Declaration. Data was saved on a secure server of the university following German and European data security regulations.

Measures

[Table 2](#) shows the measures that were used for quantitative data collection. To measure perceived stress and coping

strategies, scales were used that are freely available in German (see [Table 2](#) for further information).

For qualitative data collection the following open question was used: “Which three areas associated with your studies have been the most stressful since you started your studies? State at least two out of three areas.”

Data analyses

Quantitative analyses

Data analysis was performed using the SPSS software package by IBM (version 25) and Microsoft Excel. Out of 717 students who gave consent, 508 respondents completed the survey (response rate: 70%). Eight outliers were deleted from the data set; non-realistic values were imputed by the mean. The Kolmogorov-Smirnov test of normality indicated violation of the assumption of normality for the stress and the stress symptoms, but not for the coping scale. Therefore, we used non-parametric tests (chi-square tests) and a one-way ANOVA to test research questions 1 and 3. Effect sizes were calculated using Cohens' *d*.

Qualitative analysis

To test research question 2, the answers to the open question were analyzed using a qualitative content analysis with inductive category development ([Mayring, 2015](#)). Two raters independently coded all open-ended questions and derived ten subordinate categories and subcategories (see [Table 3](#)), with the resulting good interrater-reliability ($\kappa = 0.79$). For statistical comparison between the frequencies of areas of stress between both student groups a chi-square test was used ($\alpha < 0.05$).

Results

Differences in perceived stress and stress symptoms

Analysis of Variance results showed no differences among stress [$F_{(1,498)} = 2.79$, $p = 0.095$, $\eta_p^2 = 0.006$] and stress symptoms [$F_{(1,498)} = 1.96$, $p = 0.162$, $\eta_p^2 = 0.004$] due to different forms of studying.

Differences in areas of stress

[Table 3](#) gives an overview of the reported areas of stress. For results, only superordinate categories with $n \geq 30$ were considered. Most of the subcategories are associated with university (557) as well as emotions, thoughts, personal characteristics, conditions (155), and time, leisure (185). Areas like pressure, performance (91) and social contacts (59), were

TABLE 1 Sociodemographic characteristics of the study sample ($N = 500$).

	Distance-learning students	On-campus students
Sample	246	254
Age: M (SD)	33.62 (9.30)	24.23 (3.99)
Gender		
Male	44 (17.9%)	45 (17.7%)
Female	201 (81.7%)	209 (82.3%)
Other	1 (0.4%)	
Employment	193 (78.5%)*	146 (57.5%)*
Working hours/week: M (SD)	30.96* (12.14)	15.80* (9.38)
Caring for children		
Yes	83 (33.7%)*	7 (2.8%)*

*Significant differences ($p < 0.001$) using chi square tests and Analysis of Variance (ANOVA).

TABLE 2 Measures used for data collection.

Construct	Scale	Author(s)	Description of scale	Response format	Consistency
Perceived stress	Perceived stress scale (PSS)	Original version: Cohen et al., 1983 ; German version: Herbst et al., 2016	10 items, e.g., In the last 4 weeks, how often did you feel nervous and stressed?	5-point Likert scale ranging from 0 (= disagree) to 5 (= strongly agree)	Sum-score: ≥ 20 high level of perceived stress, Cronbach's $\alpha = 0.89$
Stress symptoms	Subscale of the German stress and coping inventory (SCI)	Satow, 2012 ¹	13 items, e.g., "Stress and pressure can cause physical symptoms. Which symptoms did you notice on yourself the last 6 months?"	5-point Likert scale ranging from 0 (= disagree) to 5 (= strongly agree)	Cronbach's $\alpha = 0.85$
Areas of stress			The students were asked to name three main study-related areas, which stress them since the beginning of their studies	Open question	
Coping-strategies	Subscale of the SCI	Satow, 2012 ¹	20 items, assesses five different coping-strategies (positive thinking, active coping, social support, religion, and alcohol and cigarette consumption)	5-point Likert scale ranging from 0 (= disagree) to 5 (= strongly agree)	Cronbach's $\alpha = 0.73$

¹Freely accessible: <https://www.drsatow.de/tests/stress-und-coping-inventar/SCI-Testdokumentation.pdf>.

TABLE 3 Superordinate categories and subcategories of areas of stress.

Subordinate category	Subcategory (numbers of mentions)			
University	• Exams, tests	(153)	Quantity of study matter, high workload, effort of learning	(104)
	• Content of study	(82)	• Final thesis	(43)
	• Grades	(42)	• Deadlines, dates	(28)
	• Term paper	(26)	• Attendance time	(22)
	University (organization, bureaucracy)	(18)	• Duration, standard period of study	(15)
	• Group work	(13)	• Presentations	(11)
	• Future anxiety	(31)	• Personal characteristics, emotions	(27)
Emotions, thoughts, personal characteristics, conditions	• Stress	(22)	• Motivation	(20)
	• Fear of failure	(18)	• Requirements, expectations, claims	(17)
	• Health	(10)	Doubts	(10)
Time and leisure time	• Time, time pressure	(140)	• Leisure time	(45)
Social contacts	• Private life	(59)		
Pressure and performance	Performance (pressure), pressure to succeed	(74)	• Burden/overload/no relaxation	(17)
Occupation	• Work	(48)		
Finances	• Financial problems	(46)		
Household, everyday life, housing situation	• Housing situation	(11)	• Commuting/drive	(11)
Lack of contact, lack of aid	• Anonymity, studying alone	(15)		
Other	• other	(16)		

Only subcategories with 10 mentions or more are listed.

also mentioned frequently. Less people named categories like occupation (48), finances (46), household, everyday life, housing situation (22), and lack of contact, lack of aid (15). All statements which could not be aggregated to one category are listed in other (16).

According to the results of the chi-square test (see [Table 4](#)), distance-learning students reported significantly more stress regarding the subcategories *time pressure*, *private life* ($p < 0.001$), and *leisure time* ($p = 0.002$); on-campus students reported significantly more stress regarding categories like *exams*, *tests* ($p < 0.001$), *final thesis* ($p < 0.001$), and *future anxiety* ($p = 0.007$), but also in *performance (pressure)*, *pressure to succeed* ($p = 0.034$).

Differences in coping-strategies

ANOVA results in [Table 5](#) indicate that on-campus students use social support significantly more often as a coping-strategy than distance-learning students ($p < 0.001$), albeit with a small effect size ($d = 0.35$).

Discussion

To our knowledge, the present study is the first directly comparing stress, areas of stress and coping between on-campus students and distance-learning students in Germany. The study helps to compare on-campus and distance-learning students without taking up the current discussion about the influence of the online situation due to COVID-19. The COVID-19 background provides a strong bias for an actual comparison.

Research question 1 focused on perceived stress and stress symptoms. Though on-campus students rated their perceived stress levels and stress symptoms higher than distance-learning students, no significant differences were found. This finding is in line with international research by [Ramos \(2011\)](#), [Furlonger and Gencic \(2014\)](#) and [Beccaria et al. \(2015\)](#). Still, it is also possible that the absence of any differences occurred due to the survey method (e.g., scales used) or the sample (perhaps particularly stressed or less stressed students participated). Although no significant differences were found between the perceived levels of stress, the areas of stress could still be different.

Research question 2 aimed at differences in reported areas of stress. Several differences were found between the student groups: On-campus students mention study- and performance-related areas (e.g., exams, future anxiety) more often, whereas distance-learning students report more pronounced work-privacy-conflicts (e.g., time, private life). It is important to note that distance-learning students are significantly older, more often employed, and care more often for children ([Jones et al., 2016](#)), which might moderate these results. These differences in age and life circumstances indicate different areas of stress,

which underlines the need for tailored interventions based on different needs due to the form of studying ([Apolinário-Hagen et al., 2018](#)). Interestingly, some categories that could have been expected to differ between the groups were not mentioned as often (e.g., higher level of procrastination in the case of distance-learning students, lack of support).

Research question 3 focused on the type and extent of coping-strategies. In contrast to prior research indicating no differences ([Ramos, 2011](#); [Furlonger and Gencic, 2014](#); [Beccaria et al., 2015](#)), our data showed that on-campus students used the coping-strategy social support more often, despite a small effect size. An explanation could be that distance-learning students typically study by themselves and are less involved in the social life of universities in general. However, according to the results of research question 2, the distance-learning students did not perceive lack of support as a main area of stress. Again, age and other study-specific life circumstances might moderate these results as age and life-circumstances differ between on-campus students and distance-learning students naturalistically. Nevertheless, this result points to practical implications, like implementing platforms for knowledge sharing and support.

Limitations

The study has a self-selective sample, which might lead to an overestimation of effect sizes due to a selection bias. In addition, the group of distance-learning students differed in sociodemographic variables. On the one hand, this limits the comparability of the two study groups; on the other hand, this represents the characteristics of the group of distance-learning students very well. Furthermore, it is important to note that the study took place pre-Corona. In addition, we do not know how many different universities the students in our sample attend, which further limits the generalizability of the data, as universities may vary in methods and technologies used. Another approach would be to look at specific technologies and their relationship to stress.

The level of stress and wellbeing of students is likely to vary over time (e.g., due to exams). Accordingly, future research should consider a longitudinal approach. Also, these data are only representative for the specific time, and do not allow wide-reaching conclusions to be drawn, for example, about post-COVID-19 differences between distance-learning and on-campus students.

In the open-question format the students had to name three areas of stress, which might have led to forced answers or leaving out important areas of stress. In addition, no assumptions about the extent of stress experienced due to the different areas can be made, which should be addressed in future studies.

The Stress and Coping Inventory (SCI) allows differentiation between six coping-strategies. Still, they cannot be categorized to problem- and emotion-focused

TABLE 4 Absolute (n) and relative (%) frequencies of areas of stress differentiated by on-campus students (n = 254) and distance-learning students (n = 246).

Areas of stress	On-campus students		Distance-learning students		$\chi^2 (1)$	p
	n	%	n	%		
Exams, test	99	39	54	22	17.06	<0.001
Time, time pressure	42	17	98	40	33.66	<0.001
Study matter ^a	48	19	56	23	1.13	0.287
Content of study	36	14	46	19	1.87	0.172
Pressure ^b	46	18	28	11	4.49	0.034
Private life	18	7	41	17	11.02	<0.001
Occupation	21	8	27	11	1.06	0.304
Financial problems	23	9	23	9	0.01	0.909
Leisure time	13	5	32	13	9.50	0.002
Final thesis	37	15	6	2	23.38	<0.001
Grades	26	10	16	7	2.26	0.133
Future anxiety	23	9	8	3	7.24	0.007

^aHigh workload, effort of learning.^bPerformance (pressure), pressure to succeed.

TABLE 5 Means and standard deviations of each SCI-coping subscale as well as results of the ANOVA for on-campus students and distance-learning students (N = 500).

Coping-strategies	On-campus students		Distance-learning students		F ^a	p
	M	SD	M	SD		
Coping	58.2	9.40	57.20	9.16	1.44	0.230
Positive thinking	13.07	3.20	13.37	3.32	1.05	0.306
Active coping	12.74	3.23	13.25	3.37	2.97	0.086
Social support	16.44	3.38	15.13	4.03	15.45	0.001
Religion	8.70	4.34	8.49	3.99	0.33	0.569
Substance consumption ^b	7.24	3.79	6.96	3.64	0.73	0.392

^adf = 1, 498.^bAlcohol and cigarette consumption.

coping, which would be interesting to analyze among students to tailor interventions.

Practical implications

First, the findings reveal a need for stress-management interventions for students (e.g., Hintz et al., 2015) by taking different forms of studying into account. Interventions for distance-learning students should focus on time-management and methods for reducing the work-privacy conflict. Furthermore, for distance-learning students the coping-strategy social support could be an overlooked resource: Distance-universities could focus on creating more (virtual) space for social bonding and peer-to-peer-support programs (e.g., social events) or professional assistance (e.g., mentoring programs). Apparently, on-campus students seem to worry more about the future and experience more pressure to succeed.

Therefore, interventions could include cognitive techniques and relaxation. Last, as distance-learning students are used to the benefit of flexibility; further research should take digital delivery formats into particular consideration (Harrer et al., 2018).

Conclusion

Our study found comparable levels of stress among distance-learning students and on-campus students, but qualitative analysis revealed differences in the areas of stress (e.g., work vs. private life) and in the use of social support as a coping-strategy. It compares on-campus and distance-learning students without taking up the background of COVID-19. It proved to be very helpful to enrich the quantitative data with qualitative data, as this opened the opportunity to reveal differences in the areas of stress that would not have become apparent in a purely quantitative approach. Specific needs

for tailored interventions taking the form of studying into account can be derived.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The study was conducted in accordance with the Helsinki Declaration. Data was saved on a secure server of the university following German and European data security regulations. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

MD, CS, and CB: conceptualization. MD, LF, and CB: methodology and writing—original draft preparation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Intelligence, emotional intelligence, and emo-sensory intelligence: Which one is a better predictor of university students' academic success?

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The primary aim of this study was to determine the role of psychometric intelligence (IQ), emotional intelligence (EQ), and emo-sensory intelligence (ESQ) in university students' academic achievement. To this end, 212 university students at different academic levels, composed of 154 females and 58 males, were asked to complete the Raven's Progressive Matrices, the Bar-On Emotional Quotient Inventory, and the Emo-Sensory Intelligence Scale. Data were then matched with students' Grade Point Averages as a measure of their academic achievement. The results revealed that students' level of IQ and EQ could positively predict their academic achievement. In the case of their ESQ level, its auditory sub-component was found to be a positive predictor of academic success. Results were discussed, and possible implications and applications for increasing students' chances for success were presented.

KEYWORDS

psychometric intelligence, emotional intelligence, emo-sensory intelligence, academic achievement, university students

Introduction

Achievement, in general, can be defined as how well individuals can perform quantitatively and qualitatively based on pre-set of facts and knowledge (Maramag-Manalastas and Batang, 2018; Lavrijsen et al., 2022). In the academic domain, this ability to perform is operationalized in terms of the outcomes that students achieve at the end of educational programs, which is called Academic Achievement (AA) and is associated with the active performance of academic skills (Ennser-Kananen et al., 2017; Peng and Kievit, 2020). More broadly speaking, AA can also refer to the acquisition of knowledge and skills through cognitive abilities (Mayer, 2011), which help students dwell well in educational tests and tasks; skills related to communication, literacy, science, thinking,

social life, and mathematics (Lindholm-Leary and Borsato, 2006). Given the importance of AA in future success, there have been numerous attempts to find out which factors contribute to greater achievements in academic settings.

Earlier attempts focused mostly on cognitive factors, and since intelligence was recognized as a representation of cognitive abilities (Binet, 1905), it was considered the main predictor of AA (Kaya et al., 2015). Therefore, individuals with higher levels of IQ were considered educationally more successful (Pishghadam et al., 2020). Following the introduction of the emotional quotient (EQ) by Bar-On in 1997 and the sensory quotient (SQ) by Lombard (2007), the importance of emotional factors in AA gained momentum in research. Despite the lack of unanimity among early attempts, more recent views found that the level of EQ can strongly associate with and predict how much students can achieve in academic settings (Partido and Stafford, 2018; Denny et al., 2019; Suleman et al., 2019; MacCann et al., 2020; Sánchez-Álvarez et al., 2020). To further challenge the role of IQ in AA, researchers also found that SQ can outvalue IQ and EQ in predicting desirable performance in academia (Lombard, 2007), and more recently, ESQ (Pishghadam et al., 2020) has been recognized as a broader aspect of intelligence that integrates EQ with SQ. ESQ's power was even more recognized when it was found as a significant predictor of English students' Grade Point Average (GPA), with those possessing higher levels of ESQ maintaining higher GPAs (Pishghadam et al., 2020).

Cognition, emotions, and senses have all contributed to different theories of intelligence and consolidated their role in educational success. However, each theory has only proposed a fragmented view of intelligence and, thus, a one-sided view of factors affecting success in the educational domain. Academic achievement, however, is a multi-faceted combination of skills and abilities, and analyzing its association with each type of intelligence (IQ, EQ, or SQ) can unravel only one of its aspects. ESQ, on the other hand, can elaborate on AA more efficiently due to its broader perspective of intelligence; yet, more important than that is investigating how different types of intelligence associate with AA and predict it compared with one another. For university students, the significance of AA is undeniable since it plays a central role not only in university settings but in their prospective careers as well. Yet, it is still unclear how students can succeed academically. In other words, whether IQ, as an indicator of cognitive abilities, is essential in developing an academically-successful student or EQ and ESQ, as indicators of sensory/emotional abilities, is still a matter of debate. Drawing upon the triune theory of the brain (MacLean, 1990), we took the three major parts of the brain (i.e., rational, emotional, and sensory) into consideration and adopted a comparative approach to determine which type of intelligence among the three (i.e., IQ, EQ, and ESQ) plays a more significant role in academic gain and whether or not the combinatory nature of ESQ can be a more powerful predictor of AA. Therefore, this study postulates the following questions:

1. Is there any significant relationship between university students' level of IQ, EQ, ESQ, and their AA?
2. Which type of intelligence can better predict university students' AA?

Review of literature

Intelligence defined

Intelligence was first linked to cognitive abilities of logic and language, and the first psychometric test of intelligence (Binet, 1905) was designed to distinguish children with potential educationally-related mental deficits. Despite a lack of consensus among scholars in conceptualizing intelligence, most of them consider the following as the key components of intelligence: abstract thinking or reasoning, knowledge acquisition capacity, and problem-solving ability.

After the introduction of social intelligence by Thorndike, however, emotional and social aspects became integral components of intelligence. This recognition led to the introduction of EQ as a better predictor of success (Bar-On, 1988), encompassing skills to meet the demands of the surrounding social environment and rise above issues in life. To measure emotional intelligence, Bar-On (1997) developed an inventory of EQ, including both social and emotional competencies, called the Emotional Quotient Inventory (EQi). This inventory included five components: intrapersonal as emotional self-awareness and self-expression, interpersonal as awareness toward social relationships, adaptability as the ability to manage changes, stress management as emotional regulation competence, and general mood as an ability to keep oneself motivated (Bar-On, 1997). At the beginning of the 21st century, the importance of the body and senses in individuals' cognition was once again recognized. Lombard (2007), therefore, extended the concept of intelligence to cover the additional ability of spotting, decoding, and monitoring sensory codes as sensory intelligence (SI) and SQ.

More recently, Pishghadam et al. (2020), drawing upon the concept of emotioncy (emotion + frequency; Pishghadam et al., 2013), adopted a combinatory approach to explaining more aspects of intelligence and proposed ESQ as a conciliation between EQ and SQ. The idea of emotioncy is defined as emotions created by sensory experiences which relativize cognition. Therefore, it combines sense, emotion, and cognition to shape a unified concept and build a bridge between felt experience and physical reality to clarify their relationship. Pishghadam et al. (2013, 2019, 2021, 2022) and Akbari and Pishghadam (2022) claimed that emotions are the byproducts of sensory experiences; therefore, what we perceive triggers emotional responses and creates reality. Accordingly, ESQ posits that intelligence is the ability to recognize, express,

label, monitor, and manage sense-induced emotions; that is to say, cognition and perception are not solely constructed by the intellect; rather, it emerges from the blend of emotion and senses (Pishghadam et al., 2020). Based on this model, intelligence in separation (s factor) or in general (g factor) (Spearman, 1923) cannot cover all aspects of intelligence. EQ focuses on how well individuals can understand and manage their emotions regardless of what ignited these emotions. SQ describes individuals' ability to connect with their senses and understand them, ignoring the mediation between senses and cognition. ESQ, on the other hand, draws a relationship between the two by considering emotions the mediator between senses and cognition, thereby emphasizing the role of senses in creating emotions, the centrality of emotions induced by senses, and that senses affect cognition through emotions they ignite. Individuals experience the world through their senses, which create in them certain emotions, and if they have a high level of ESQ, they can recognize these emotions and behave accordingly.

Academic achievement and intelligence

Intelligence has always been the key cognitive factor explaining variations in AA (Kaya et al., 2015) and the subject of numerous studies examining how intelligence is related to educational success. The majority of these studies confirmed the association between general intelligence and AA (Jensen, 1998). However, the degree of this association has been inconsistent throughout research since different studies have found a range of moderate to strong correlations (0.40–0.63) existing between the two (Jencks, 1979; Macintosh, 1998). Very recently, IQ has been associated with more academic gains and found to be a powerful predictor of academic achievement (Guez et al., 2018; He et al., 2021). Therefore, IQ tests are still widely used to predict who can achieve more in academic contexts. More precisely, it was found that IQ can well predict how individuals perform in tests of reading, social sciences, natural sciences, and mathematics (Lohman, 2005; McCrocklin, 2020). However, evidence suggests that the verbal aspect of intelligence, which is related to the readiness to learn, has a stronger association with AA, compared to the non-verbal aspect of intelligence, which concerns the potential to learn (Kaya et al., 2015). Despite the rather unanimous findings of research regarding the role of IQ in AA, some recent attempts have shown contradictory findings. For example, in a study to investigate whether the academic performance of medical students is influenced by their IQ levels, Iqbal et al. (2021) found that since medical students are extremely hardworking, their level of IQ is not significantly associated with their AA in that no difference was noticed between the performances of more- and less-intelligent students. Therefore, the role of IQ in AA has recently been questioned.

To compensate for the lack of consistency in the relationship between IQ and AA, and following the recognition that IQ is not the sole predictor of academic success, researchers started to examine the association between EQ and AA. The majority of research in this regard has also found it a core competency that is positively correlated with and can predict individuals' AA (Partido and Stafford, 2018; Denny et al., 2019; Suleman et al., 2019; MacCann et al., 2020; Pozo-Rico and Sandoval, 2020; Rajendran et al., 2020; Sánchez-Álvarez et al., 2020). Higher levels of EQ can improve students' self-confidence and their ability to overcome challenges leading them toward better academic performance (Jan and Anwar, 2019). More precisely, EQ was found to act as a mediating variable between cognitive abilities and AA; therefore, a higher level of EQ was revealed to even facilitate the role that IQ plays in academic success (Petrides et al., 2004). Besides, it is worth mentioning that this association has been found to exist in all stages of life, such as primary education (Billings et al., 2014), secondary education (Sánchez-Álvarez et al., 2020), and primarily the university settings (Suleman et al., 2019). More recently, Pozo-Rico and Sandoval (2020) revealed that teachers who implemented EQ into their teaching plans could make a significant difference in their students' AA, in that those with higher levels of EQ demonstrated higher GPAs compared with their less emotionally intelligent counterparts. They also found that the potential reason behind this difference in academic performance is that lower levels of EQ can be a hindrance to students' motivation and can lead them to frequently procrastinate, which both negatively affect their results.

As suggested by Roy et al. (2013), since EQ is composed of different dimensions, each can, in turn, create competencies in students to make them more academically equipped. To further explain this association, studies began to investigate which specific dimensions of EQ are more strongly associated with and can better predict AA. In a longitudinal study, Parker et al. (2004) correlated first-year university students' GPA with their EQ score to find which dimensions of EQ have a stronger role in AA. Their findings revealed that those with higher intrapersonal EQ, adaptability, and stress management abilities could cope with the demands of academic settings more successfully, thereby achieving higher GPAs. However, Fahim and Pishghadam (2007) focused only on English major students, and though confirming the association between intrapersonal, stress management, and AA, presented the third associative dimension as general mood competencies rather than adaptability. In another study, Fillipova and Bilyalov (2020) found that although self-management and intrapersonal components positively correlate with and predict AA, the interpersonal component poses a negative correlation, revealing that not all aspects of EQ can be a predictor of students' success.

Reviewing previous research clearly shows that there is a lack of consistent findings about how different types of intelligence can be associated with AA. More importantly,

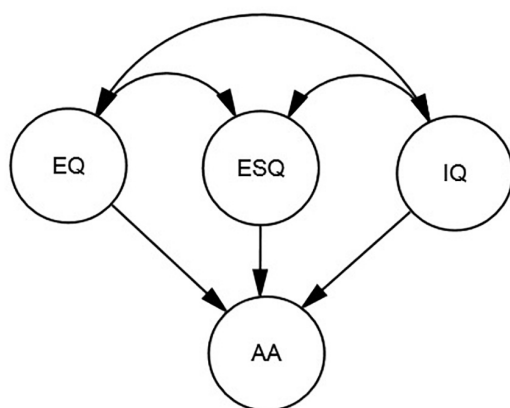


FIGURE 1
A hypothesized model for the possible relationships among IQ, EQ, ESQ, and AA.

previous research has mostly focused on the two more widely-known aspects of intelligence (i.e., IQ and EQ), overlooking more recently-recognized types of intelligence such as ESQ. Therefore, the present study can fill this gap by clarifying which type of intelligence is more strongly associated with and can more powerfully predict university students' level of success in academic settings. **Figure 1** illustrates the possible relationships vividly.

Methodology

Participants

A total number of 212 university students, composed of 154 females and 58 males aging from 18 to 25 ($M = 20.98$, $SD = 2.46$) participated voluntarily in this study. The number of females exceeded that of the males owing to the fact that above 60% of university students in Iran are females. The participants were selected based on convenient sampling, and they all spoke Persian as their mother tongue. The participants were also asked to provide information related to their GPA from their university reports ($M = 17.49$, $SD = 1.69$) and degree (AA/S, $N = 48$); (BA/S, $N = 129$); (MA/S, $N = 27$); (Ph.D., $N = 7$).¹ They provided written informed consent, and the study was approved by the Ferdowsi University of Mashhad Ethics Committee, Mashhad, Iran.

Instrumentation

The Raven's progressive matrices

Raven Matrices (Raven and Court, 1938) includes three versions, namely Standard Progressive Matrices (SPM), Colored Progressive Matrices (CPM), and Advanced Progressive

Matrices (APM). The CPM is designed for children and less able adults, and APM targets 20% of the population (Raven, 2003). Thus, for the purpose of this study, the SPM version, comprising 60 items, which applies to the general population, was utilized. As a "well-validated measure of basic cognitive functioning" (Raven, 2000, p. 1), this test has been widely employed to determine an individual's "capacity at the time of the test to apprehend meaningless figures presented for his observation, see the relations between them, conceive the nature of the figure completing each system of relations presented" (Raven et al., 1983, p. 2). The reason we used this test and not the more comprehensive ones measuring both fluid and crystalized intelligence was its feasibility to apply online during the COVID-19 pandemic.

The Persian version of Bar-On emotional quotient inventory

The Bar-On Emotional Quotient Inventory (EQ-i; Bar-On, 1997), as a self-report scale, aims to assess five areas of skills/competencies as follows: Intrapersonal, Interpersonal, Stress management, Adaptability, and General mood; and a 5-point Likert scale ranging from 1 (very seldom or not true of me) to 5 (very often or true of me) was used in this inventory for measuring participants' EQ.

However, the Persian version of this inventory which includes 15 components and 90 items, was employed for the purpose of this study to ensure that our participants fully comprehended the questions since a possibility of misunderstanding was likely to be caused for some participants. In Samouei's (2002) study, Cronbach's alpha reliability for the translated version of this inventory was reported as 0.80.

The emo-sensory intelligence scale

The responsiveness to the emotions aroused by sensory inputs is considered the definition of Emo-Sensory Intelligence, which is of significance in modifying one's behaviors and, as a result, can lead to success in life (Pishghadam et al., 2020). The emo-sensory intelligence scale, developed and validated by Pishghadam et al. (2020), is a 144-item scale for measuring emo-sensory intelligence consisting of 6 senses (auditory, visual, tactile, kinesthetic, smell, and taste) and 4 components (recognition, labeling, monitoring, and management). This scale (see Appendix 1 for sample items) uses a 5-point Likert scale ranging from 1 (very little) to 5 (very much) and was "validated through structural equation modeling, multitrait-multimethod design along with the Rasch measurement model" (Pishghadam et al., 2020, p. 173).

Procedures

The three aforementioned tests were distributed online (using Google Forms) among the participants simultaneously.

Each test took around 20–30 min for the participants to complete. The process of compiling the data lasted approximately 1 month (April to May 2021). A number of 240 forms were distributed among the participants, from which 220 were returned. Eight more forms were discarded due to invalid data. After the data were collected, the Pearson Product-Moment Correlation was run using the SPSS Software to determine the significance of the relationship among the intended variables. Then, the AMOS software was employed to run Structural Equation Modeling (SEM) and verify the relationship between the three types of intelligence (IQ, EQ, and ESQ) and AA.

Results

This study sought to investigate whether there are any significant relationships between university students' level of IQ, EQ, ESQ, and their AA, and which type of intelligence can better predict AA. The following sections represent the findings.

Descriptive statistics

Descriptive statistics for AA and the IQ, EQ (intrapersonal, interpersonal, stress management, adaptability, and general mood), and ESQ (visual, olfactory, auditory, gustatory, tactile, and kinesthetic) measures can be seen in [Table 1](#). Since the Skewness and Kurtosis estimates were within the range of -2 and $+2$, the normal distribution of the data was confirmed. Reliability coefficients were further calculated, which were all in an acceptable range.

Correlational analysis

In order to find possible relationships between the variables of the study, Pearson Product-Moment Correlation was used. Based on [Table 2](#), AA had a significant relationship with IQ ($r = 0.18, p < 0.01$), the overall EQ ($r = 0.12, p < 0.05$), and its general mood subconstruct ($r = 0.12, p < 0.05$), and the auditory subconstruct of ESQ ($r = 0.14, p < 0.05$). EQ and four of its subconstructs, namely intrapersonal, interpersonal, adaptability, and general mood, were positively correlated with ESQ and all of its subconstructs. Stress management, however, was positively correlated with ESQ ($r = 0.13, p < 0.05$) and two of its subconstructs namely visual ($r = 0.15, p < 0.05$) and kinesthetic ($r = 0.16, p < 0.05$).

Structural equation modeling analysis

A SEM model was conducted to verify the relationship between the three types of intelligence and AA. The goodness of fit indices showed that the model fits the data adequately (see [Table 3](#)). According to [Figure 2](#), IQ ($\beta = 0.18, p < 0.01, R^2 = 0.05$) and EQ ($\beta = 0.13, p < 0.05, R^2 = 0.05$) were the positive predictors of AA. Yet, ESQ could not significantly predict AA.

In order to check the predictive power of the subconstructs of EQ and ESQ, two more models were proposed ([Figures 3, 4](#)), which fitted the data adequately (see [Table 3](#)). As [Figure 3](#) illustrates, among the subconstructs of EQ, general mood was a positive predictor of AA ($\beta = 0.25, p < 0.05, R^2 = 0.03$).

According to [Figure 3](#), among the subconstructs of ESQ, auditory ($\beta = 0.26, p < 0.05, R^2 = 0.03$) was the only predictor of AA.

TABLE 1 Descriptive statistics and reliability estimates for AA and the IQ, EQ, and ESQ scores.

	Min	Max	Mean	SD	Skewness	Kurtosis	Reliability
AA	10	20	17.49	1.69	−0.86	1.41	—
IQ	9	60	46.80	11.26	−1.51	1.69	0.78
EQ	181	428	326.71	45.46	−0.28	−0.08	0.95
Intrapersonal	1.83	4.77	3.60	0.54	−0.38	0.15	0.92
Interpersonal	2.22	5.00	4.10	0.54	−0.99	0.72	0.89
Stress management	1.50	4.67	3.08	0.74	0.12	−0.69	0.93
Adaptability	1.83	4.89	3.45	0.56	−0.03	0.00	0.88
General mood	1.25	5.00	3.80	0.70	−0.68	0.29	0.90
ESQ	232	680	499.59	73.14	−0.08	0.30	0.95
Visual	59	112	84.74	10.37	−0.011	−0.39	0.95
Olfactory	26	120	83.56	14.22	−0.30	0.76	0.89
Auditory	24	120	84.07	15.73	−0.13	0.91	0.92
Gustatory	38	120	84.02	14.37	0.13	−0.16	0.96
Tactile	29	120	82.96	15.43	−0.25	0.30	0.88
Kinesthetic	24	120	80.24	15.01	−0.40	1.83	0.91

TABLE 2 Correlational analysis for the variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AA	1														
IQ	0.18**	1													
EQ	0.12*	0.06	1												
Intra	−0.07	0.08	0.92**	1											
Inter	−0.00	0.06	0.74**	0.58**	1										
Stress	−0.05	0.02	0.76**	0.62**	0.43**	1									
Adapt	−0.03	0.08	0.86**	0.78**	0.49**	0.62**	1								
Mood	0.12*	−0.04	0.87**	0.77**	0.67**	0.56**	0.66**	1							
ESQ	0.06	0.08	0.31**	0.34**	0.23**	0.13*	0.32**	0.23**	1						
Visual	0.08	0.00	0.26**	0.25**	0.27**	0.15*	0.24**	0.15*	0.69**	1					
Olfactory	0.03	0.06	0.31**	0.35**	0.24**	0.13	0.32**	0.21**	0.88**	0.65**	1				
Auditory	0.14*	0.04	0.26**	0.30**	0.14*	0.11	0.31**	0.18**	0.88**	0.51**	0.79**	1			
Gustatory	0.06	0.11	0.23**	0.25**	0.16*	0.09	0.26**	0.15*	0.91**	0.51**	0.74**	0.81**	1		
Tactile	0.02	0.10	0.23**	0.26**	0.17*	0.06	0.22**	0.20**	0.88**	0.51**	0.69**	0.70**	0.79**	0.1	
Kinesthetic	0.01	0.06	0.30**	0.31**	0.22**	0.16*	0.28**	0.26**	0.84**	0.49**	0.63**	0.64**	0.75**	0.76**	1

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). AA, Academic Achievement; Intra, Intrapersonal; Inter, Interpersonal; Stress, Stress Management; Adapt, Adaptability; Mood, General Mood.

TABLE 3 Goodness of fit indices for the models.

Model	χ^2/df	df	CFI	TLI	IFI	GFI	RMSEA	SRMR
Figure 2	1.82	56	0.97	0.96	0.97	0.93	0.06	0.05
Figure 3	2.53	1	0.96	0.95	0.95	0.92	0.05	0.03
Figure 4	1.24	1	0.96	0.96	0.95	0.90	0.05	0.03

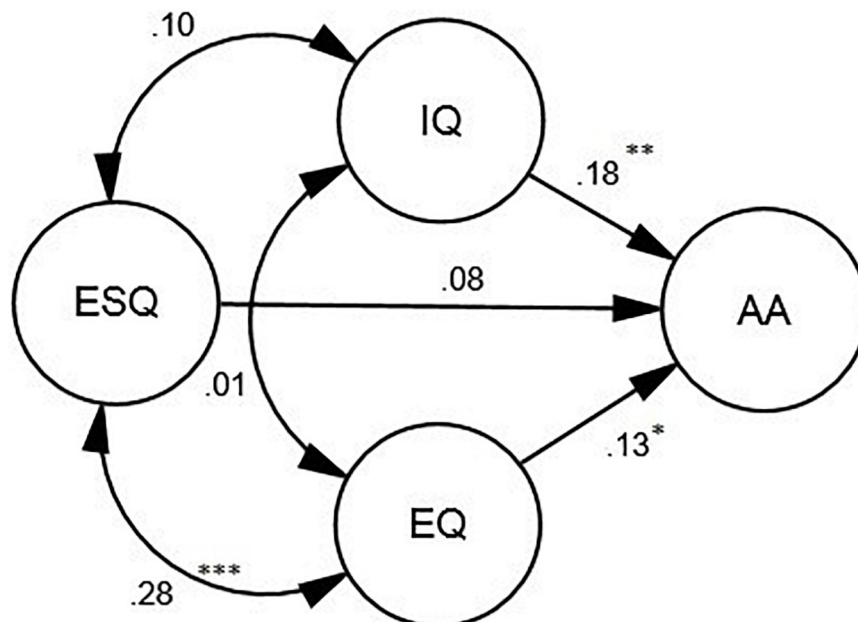


FIGURE 2

The schematic representation of the relationships between the three types of intelligence (i.e., IQ, EQ, and ESQ) and Academic Achievement (AA). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

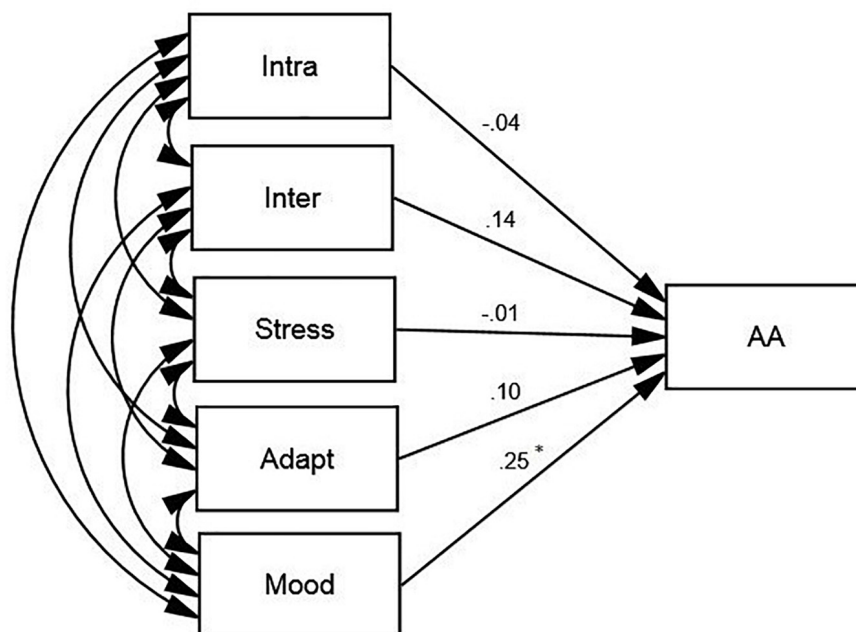


FIGURE 3

The schematic representation of the relationships between Academic Achievement (AA) and the subconstructs of EQ (Intra, Intrapersonal; Inter, Interpersonal; Stress, Stress Management; Adapt, Adaptability; Mood, General Mood; * $p < 0.05$).

Discussion

The main aim of this study was to investigate the association between the three types of intelligence (i.e., IQ, EQ, and ESQ) and university students' AA. Additionally, this study tried to determine which type of intelligence has stronger power to predict AA, whether it is IQ, as a representation of cognitive ability, EQ, as a representation of social-emotional competence, or ESQ, as an interplay between EQ and SQ.

In response to the first research question, we aimed to look into the relationship between IQ and AA. Participants' answers to the first questionnaire revealed that IQ has a strong and positive relationship with AA. The findings also revealed that IQ could strongly predict academic success and achievement. Therefore, individuals with higher levels of IQ were more academically successful, and their level of academic success could be predicted based on their IQ level. Previous attempts found moderate (Gottfredson, 2005) to strong (Jensen, 1998; Lohman, 2005; Guez et al., 2018; He et al., 2021) correlations between the two variables, but the findings of the present study confirmed only a weak yet significant correlation. The low correlation suggests that over the past decades, IQ seems to have lost its strong association with AA due to environmental factors, social status, influences of gender, and even the COVID-19 pandemic. Yet, more research needs to be done to confirm this claim.

Regarding the relationship between EQ and AA, participants' responses to the Bar-On test of EQ revealed that students' overall level of EQ and its general mood sub-component were strongly and positively correlated with AA and had a significant predictive validity. That is, students tend to perform better in university settings when they can functionally understand and regulate their emotions. The finding could confirm previous attempts about the association between the overall EQ score and AA (Partido and Stafford, 2018; Denny et al., 2019; Suleman et al., 2019; MacCann et al., 2020; Pozo-Rico and Sandoval, 2020; Rajendran et al., 2020; Sánchez-Álvarez et al., 2020); however, regarding the sub-components, while other studies found positive associations between intrapersonal, adaptability, stress management, and general mood sub-components and English language students' AA (Parker et al., 2004; Fahim and Pishghadam, 2007), the findings of this study could only confirm the association between general mood and AA. It can imply that students are more academically successful only if they are in a good mood which might be generated in classroom settings. A possible reason for the dissimilarity of the findings could be the different sample populations and the nature of the students' majors.

Except for its auditory subconstruct, no significant correlation was found between ESQ and AA. In fact, ESQ seems to be a young theory in need of more theoretical and empirical research and training to clarify its association with AA or other educational domains. The representation of the

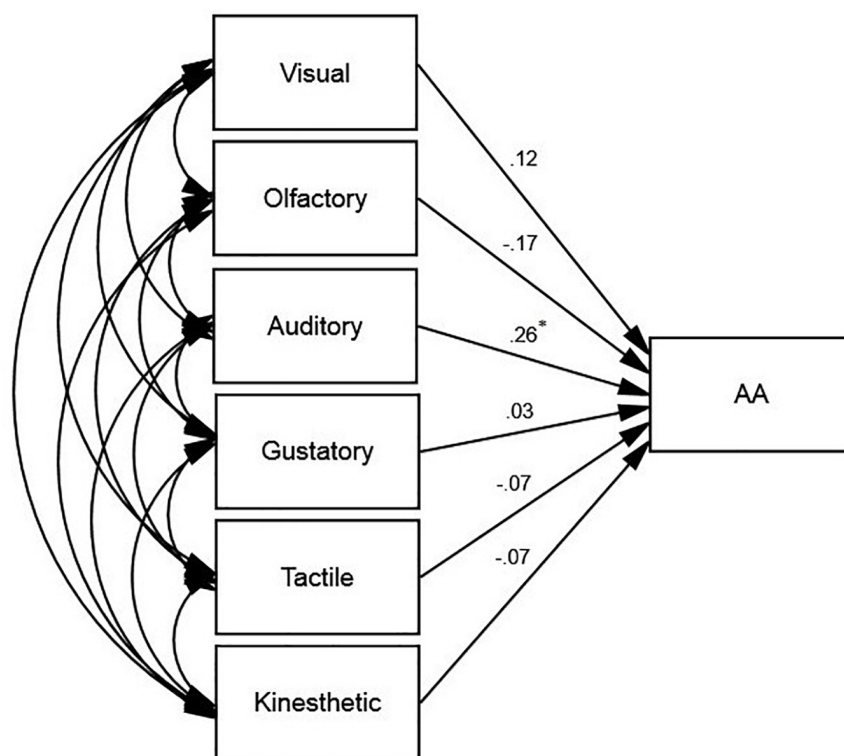


FIGURE 4

The schematic representation of the relationships between Academic Achievement (AA) and the subconstructs of ESQ, namely visual, olfactory, auditory, gustatory, tactile, and kinesthetic (* $p < 0.05$).

relationships of ESQ and its sub-components with AA revealed that the auditory sub-component was positively and strongly related to and could predict AA. That is, university students who were high academic achievers were more auditory-based. Inevitably, the sense of hearing seems to be more active in these students since the educational system in Iran focuses more on auditory teaching styles and lectures, and thus, most of what they need to learn comes from auditory sources. As a result, the more active their auditory sense, the better they can learn and perform in academic settings. This finding was partially in line with that of Pishghadam et al. (2020), who found associations between visual and kinesthetic sub-components and English language students' GPA. A possible reason for the inconsistency in their finding could be the major of the participants. While the participants of Pishghadam et al.'s (2020) study were English language university students, the participants of this study had miscellaneous majors.

Considering the second research question, it was found that the students' level of IQ is more strongly associated and can best predict their academic achievement compared with other intended intelligence types in this study. It can be concluded that in traditional educational systems like that of Iran, the main focus is still on the stereotypical understanding of intelligence which is the representation of cognitive ability or IQ. This trend

represents itself in teaching and testing practices which mutually assume that students with higher IQ levels stand better chances of success. More importantly, it is implied that other types of intelligence, such as EQ, are still new in the context of Iran and need to be more focused upon by the educational system so that this ability also gets developed and contributes to academic success even more. Finally, the lack of association between ESQ and AA in this study reveals that senses and their induced emotions are not well-recognized in the context of Iran, and the educational system has not yet invested in developing this capability of individuals.

Implications

The results of this study can be practical for different groups of individuals. First, teachers are expected to be more familiar with the concepts of IQ and EQ. Moreover, curricula should seek to educate learners about the value of IQ, EQ, and ESQ. Material developers are required to include practices with at least a peripheral focus on EQ and ESQ, which can enable learners to discover other aspects of their intelligence. It also seems necessary to pay attention to senses other than auditory by including other sub-component of ESQ in our academic context

to promote them in learners and suit a wider range of learning styles. Finally, test developers can also benefit from the findings of this study such that in testing individuals' academic success, they can also tap into aspects of intelligence such as EQ and ESQ. In this way, students are indirectly informed that success in tests is not limited to IQ only.

Limitations and suggestions for future research

This study can be improved if the following issues are taken into account. One limitation is that this study focused on fluid intelligence only. Future research can apply more comprehensive models of IQ, such as Cattell–Horn–Carroll (CHC), given that intelligence is a relative concept with multiple aspects and cannot be covered by a single theory. Moreover, this study did not take age, gender, and major into account, thereby, generalizing the findings of this study across different ages, genders, or majors is subject to certain limitations. Further studies regarding the role of SQ would be useful as well. Finally, similar studies to this one can be conducted in other settings to compare the results and determine the extent to which the associations between IQ, EQ, ESQ, and AA differ in different settings.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Ethics statement

This study was reviewed and approved by the Ferdowsi University of Mashhad Ethics Committee, Mashhad, Iran. The participants provided written informed consent to participate in this study.

Author contributions

RP conceived and designed the experiments. MF, MK, FS, and MG performed the experiments. SS and RP analyzed the data, contributed reagents, materials, and analysis tools, and reviewed and edited the manuscript. MF, MK, FS, MG, and SS wrote the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Appendix 1 | Sample items from the emo-sensory intelligence scale.

1. I know the sounds that make me feel sad (Auditory, Recognition).
2. Expressing my feelings toward images that are surprising is hard for me (Visual, labeling).
3. I can control and monitor the sorts of smells that have disgusted me in the past (Olfactory, Monitoring).
4. Refraining from touching things that frighten me is hard for me (Tactile, Management).

¹AA, Associate of Arts; BA, Bachelor of Arts; MA, Master of Arts; Ph.D., Doctor of Philosophy.



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Do college students with future work self-salience demonstrate higher levels of career adaptability? From a dual perspective of teachers and students

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Faced with tremendous employment pressure, how to enhance effective career exploration and career adaptability is crucial for college students' career. This study uses self-assessed data from 840 undergraduate students at three time points to reveal the formation mechanism of career adaptability from a dual perspective of teacher support and students' effective part-time behavior. In particular, the mediating role of career exploration is introduced based on self-regulation theory, and the moderating role of teacher support and students' effective part-time work is introduced based on social cognitive career theory. The results show that (1) Future work self-salience positively influences career adaptability; (2) future work self-salience indirectly influences career adaptability through career exploration; (3) both teacher support and students' effective part-time behavior positively moderate the indirect relationship between future work self-salience and career adaptability through career exploration. This study attempts to provide practical guidance for college graduates to engage in career exploration and career construction.

KEYWORDS

future work self-salience, teacher support, career exploration, effective part-time behavior, career adaptability

Introduction

In China, the expansion of college enrollment has brought about a sharp rise in the number of college graduates in the past 30 years, leading to more and more fierce competition for college students' employment (Barr and Turner, 2013; Jackson, 2021), and the problem of "employment difficulties" of college students has been increasingly exposed and focused by the public and researchers (Ye et al., 2016; Chen et al., 2022).

University graduation is a critical stage for college students to change their career roles and starting watershed in their career development (Wu et al., 2016); Although taking postgraduate exam and studying abroad are welcomed by fresh graduates, the challenge of constructing a career through job hunting and interviewing at graduation is still the most direct choice for most people (Donald et al., 2018). However, in the dual context of the COVID-19 and graduation season, the tense economy status and fierce competition for jobs caused by the shutdown of enterprises due to the impact of the epidemic; simultaneously, the job characteristics of college students with little work experience, low job proficiency, and long training cycles are two major causes of uncertain career development (Schwartz, 2016; Song and Zhou, 2020).

Career exploration is a prerequisite for career planning and a key part of career development for college students (Super, 1957). After career exploration, individuals plan their future careers based on the information obtained from career exploration (Super, 1980) and try to adapt their careers (Koen et al., 2012), influencing their future career development (Bartley and Robitschek, 2000; Ling et al., 2022). Self-regulation theory holds that the clearer an individual's self-knowledge is, the easier it is for the self-regulation system to drive an individual to make efforts for his or her own goals and then engage in a series of actions (Bandura, 1991; Karoly, 1993). College students' hopes and aspirations for future jobs will drive them to engage in job-hunting behaviors (Kanfer et al., 2001). College students with future work self-salience will be willing to act for career development and conduct career exploration (Zhang et al., 2014; Taber and Blankemeyer, 2015). College students who have a clear future job will conduct career exploration to build their career and show more adaptability to career uncertainty (Guan et al., 2014; Taber and Blankemeyer, 2015).

Second, career adaptability is a psychological construct that individuals use to cope with current and future career tasks, which varies with environment interaction (Savickas and Porfeli, 2012). Social cognitive career theory suggests that the environment, individual differences, and behaviors interact will influence an individual's career development (Lent et al., 2000). Environmental factors that college students perceive as teacher helping them with their career exploration, along with their own effective part-time behaviors, may interact with college students' future work clarity, career exploration, and collectively influence their career and adaptability (Martin and Sinclair, 2007; Jaworski et al., 2018; Pan et al., 2018). Due to the policy impact of college enrollment expansion (Goldrick-Rab, 2010) and the economic downturn caused by the COVID-19 epidemic, there are challenges for college students to develop and construct their careers (Mok et al., 2021). In addition, whether the two boundary conditions of teacher support and effective part-time behavior of college students positively affect the career exploration and future career adaptability of college

students with future job clarity, which has a guiding role in the construction of college students' future careers, and enhancing the employment rate and adaptability of college students, as well as the expansion value of career education in colleges and universities.

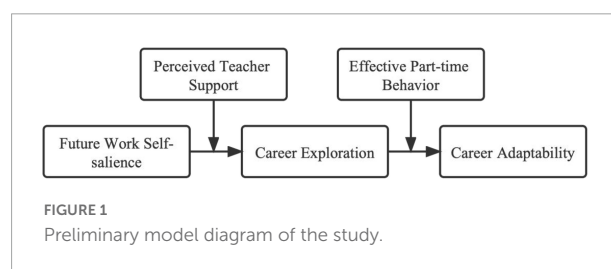
Thus, based on self-regulation theory to explore the mediating role of career exploration in future work self-salience and career adaptability, and on social cognitive career theory to explore the moderating effect of teacher support and effective part-time behavior in this indirect role, we can better explain the influence mechanism of career adaptability, and have more theoretical and practical significance. In view of this, this study addresses the shortcomings of previous studies and tries to solve the problem of "employment difficulties" for college students in mainland China, as well as to contribute to helping college students to have clearer career development under the economic downturn caused by the normalization of the epidemic, and to provide theoretical and practical suggestions for colleges and enterprises to carry out career guidance work. The research model is shown in Figure 1.

Theory and hypothesis

The relationship between future work self-salience and career adaptability

Career adaptability is a social psychological construction (Savickas and Porfeli, 2012) that is a core competency for individuals to achieve long-term career success (Hirschi, 2009) and exerts a positive predictive effect on future employment status (Koen et al., 2010; Guan et al., 2014), employment quality (Guan et al., 2013), career development (Ebberwein et al., 2004), and job promotion (Tolentino et al., 2013). Therefore, clarifying the formation mechanism of career adaptability of university students is beneficial for their future career development.

Strauss et al. (2012) first introduced the concept of future work self-salience, that is, the degree to which individuals can easily imagine their future job self-salience. Most subsequent studies have found that clarity and ease of imagining future work can help individuals better set career goals and clarify the behavioral paths they need to take (Taber and Blankemeyer, 2015; Arif et al., 2017). According to self-regulation theory: the



clearer an individual is about himself, the easier it is for his self-regulation system to drive him toward a goal and thus show more practical actions (Karoly, 1993). College students with clear future work self-salience are more likely to motivate themselves to set goals for their future career development, exploring and making attempts to their career goals and showing higher career adaptability (Strobel et al., 2013). Second, college students with future work self-salience will actively seek feedback and proactively adjust their behaviors for career development to accommodate work and job search behaviors (Zhang et al., 2014). Furthermore, college students who are clear about their future job will be less bound by their environment, clarify their career goals, identify opportunities, and adopt a range of behaviors to accommodate their career development (Bateman and Crant, 1993). Finally, college students who are clear about their future jobs will actively engage in a variety of career planning, obtain career support, work to overcome obstacles, and demonstrate higher levels of career resilience (Seibert et al., 1999; Guan et al., 2014; Joanne Chan and Chan, 2021). Therefore, hypothesis 1 is proposed:

Hypothesis 2: Future work self-salience positively influences career adaptability.

The mediating role of career exploration

In career, career exploration not only helps students move from school to the workplace, but also contributes to future job transitions (Flum and Blustein, 2000). Career exploration is the act of individuals gathering and analyzing information about their characteristics and job aspects (Stumpf et al., 1983). The act of career exploration positively affects short- and long-term career outcomes, such as better career decisions (Feldman and Bolino, 1996), more interview chances (Cheung and Jin, 2016), higher pay, and higher job satisfaction and happiness (Maggiori et al., 2013). During the course of career development, individuals will use career exploration to gain information and make decision planning for their future career, which influences their future career development (Werbel, 2000). An individual who is clear about their future job will actively gather information, engage in career exploration activities, and make more proactive career adaptive behaviors (Kaminsky and Behrend, 2015).

Career exploration is a self-regulatory process (Kanfer et al., 2001). Self-regulation theory suggests that individuals will self-regulate by dividing themselves into: self-observation, self-judgment, and self-response (Bandura, 1991). Future work self-salience represents an individual's observation and judgment of future jobs (Strobel et al., 2013). Based on the information observed and judged, with clear career goals, the behavioral response of career exploration will be carried out (Côté et al., 2006). In addition, future work self-salience is a willingness of

the individual and serves as an important prerequisite for goal generation (Parker et al., 2010). College students who are clear about the goals they hope to achieve will drive how they look for jobs, how they adapt to the future, and how they deal with the various issues that arise in their careers. Therefore, college students with future work self-salience can fully appreciate their expectations and ambitions for their future jobs, thus forming a clear job search goal and engaging in job search behavior by conducting career exploration for this goal (Zhao et al., 2022). At the same time, after completing career exploration with clear goals, college students will be more adaptable to tasks, problems, and changes in their future jobs to cope with career changes and career development to accomplish their career goals. Therefore, hypothesis 2 is put forward:

Hypothesis 2: Future work self-salience indirectly influences career adaptability through career exploration.

The moderating role of perceived teacher support

Social cognitive career theory holds that individuals do not live in a vacuum and that the choices they make are influenced by factors in themselves and their surroundings (Lent et al., 2000, 2002). In particular, when individuals feel positively supported by their environment, they will act positively to achieve their goals (Lent et al., 2001). School and teachers play the most important influence on career development when college students transition from a student status in school to a professional status (Bronfenbrenner and Evans, 2000). Teacher support contributes to students' confidence, attitudes, and behaviors (van der Ross et al., 2022). Perceived teacher support refers to students' perceived support from teachers for their learning, attitudes, and abilities (Babad, 1990). Teacher support serves as an external stimulus for college students as they engage in career exploration, providing adequate support and encouragement and reducing deviant behavior (Wang and Eccles, 2012).

College students with future work self-salience are clear about their job hunting goals and know when they are going to look for a job of any type. Individuals who set goals for their future jobs will be motivated to make efforts to achieve their goals and engage in career exploration; At this time, if teachers give college students competence affirmation and career guidance support, college students will be motivated to engage in specific exploration behaviors in order to achieve their goals (Bandura, 1991). Next, according to social cognitive career theory-individual career development is influenced by both individual psychology and social environment (Lent et al., 2000). Based on environmental support from teachers, and their own unwavering job hunting goals and clear future jobs, college students will actively submit resumes, participate in interviews with an optimistic attitude, and engage in positive and effective

career exploration behaviors (Lee et al., 2016). Moreover, good support from teachers at school can effectively facilitate the satisfaction of individual psychological needs, create a healthy psychological state, and alleviate the anxiety of uncertainty (Forster et al., 2020), promoting college students to change from the psychological level of clear future work to the behavioral level of career exploration with positive teacher support. Finally, in order to further expand the boundary conditions of the influence effect of future job self-salience among college students, efforts are made to explore the mechanism of the influence of the contextual variable of teacher support on the role of future work self-salience and career exploration, and Hypothesis 3 is proposed:

Hypothesis 3: Teacher support positively moderates the positive relationship between future work self-salience and career exploration, and the stronger the perceived teacher support is, the stronger the positive relationship between future work self-clarity and career exploration is. Conversely, the relationship is weaker.

The moderating role of effective part-time job behavior

Individual differences, environmental factors, and one's own behavior affect individual career development through interactions that positively influence career interests, career values, perceptions of career success, and career resilience according to social cognitive career theory (Lent and Brown, 1996). Part-time behavior among college students is an effective approach to know about jobs, clarify future work, and improve work adaptability before formally entering society (Helyer and Lee, 2014; Brooks and Youngson, 2016). Effective part-time behavior among college students is a value-conditioned resource related to future job development and career success (Jacoby, 2006). Such effective part-time work behavior facilitates the transition from career exploration to future job adaptability under the premise of clear career goals, promotes career identity, and enhances job search exploration, thus acquiring job adaptability (Yizhong and Hailing, 2016).

Career exploration, as one of the most critical aspects of career development, can effectively enhance college students' future work adaptability (Super, 1957). Through career exploration, college students satisfy their self-efficacy for work (Werbel, 2000) and are more likely to show positive psychological capital, identify with their future job, and demonstrate high levels of resilience (Porfeli and Savickas, 2012). Still, according to the social cognitive career theory, self-differentiated behaviors affect career development, and effective part-time behaviors help optimize the positive job resilience generated by career exploration. College students can enhance their professionalism and teamwork through part-time behavior, and the qualities generated by such part-time can

help facilitate career exploration for future job adaptation. Meanwhile, in order to explore the boundary role of effective part-time behavior on career exploration and career adaptability and to compensate for the differential contextual effects of their own part-time behavior in the process of college students' career development, Hypothesis 4 is proposed:

Hypothesis 4: College students' effective part-time job behavior positively moderates the positive relationship between career exploration and career adaptation. The stronger the degree of effective part-time job behavior is, the stronger the positive relationship between career exploration and career adaptation is. Conversely, the relationship is weaker.

Mediation model with moderation

Integrating Hypothesis 2, Hypothesis 3 and Hypothesis 4, this study proposes a mediated model with moderation. When college students perceive the support given by teachers: individuals who have future work self-salience will fully experience their hopes and imagination of their future work, and thus set clear and explicit goals for career exploration according to their actual situation; At the same time, when college students have also engaged in part-time behavior related to their future work, and such part-time work is effective and developmental, college students will transfer the professional qualities and resources acquired in part-time to the jobs they have explored and show more adaptive behaviors. On the contrary, if college students do not receive career guidance and support from teachers during career exploration and career construction, and do not participate in part-time behavior that are beneficial to future job development, even if they have clear knowledge of future jobs, it is difficult to implement career exploration and adapt to future jobs, which affects career development. In view of this, hypothesis 5 is proposed:

Hypothesis 5: Teacher support and college students' effective part-time behavior positively moderate the indirect effect of future work self-salience on career adaptability through career exploration. The stronger the degree of teacher support and effective part-time behavior is, the stronger the indirect effect is. On the contrary, this indirect effect is weaker.

Research methods

Research subjects and collection procedures

This study selects college students who are in the career selection period as the research object. According to the

classification of career stages, it is generally accepted that young people around the age of 20 are in the exploratory stage, during which young people gradually develop career-related cognition (Super, 1953). In addition, the school-to-workplace transition process affects individuals' future career development and career outcomes, and such age group is a critical period for developing clear career directions and setting career goals (Dietrich et al., 2012).

The specific study sample was selected from college students in Shanghai, Chongqing, Guangdong Province, and Jiangsu Province, which could meet the requirement of sample diversity because the student was from all over the country. To reduce the effect of common method bias (CMB), this study used a multi-stage completion approach for questionnaire collection as suggested by Podsakoff et al. (2003). Data were collected at the first time point for future work self-salience, perceived teacher support, and control variables with data collected at the second time point about career exploration and effective part-time behavior and at the third time point about career adaptability. Each time interval was one month with entire survey lasting three months (February to May 2022). Furthermore, the survey was adopted anonymously in order to avoid concerns of the respondents about the questionnaire items. The respondents were also informed before the official survey that their personal information and the content of the survey would be kept confidential and used only for this academic study.

At the first time point, a total of 920 questionnaires were distributed and 900 were collected with loss rate of 2.2%. At the second time point, a total of 900 questionnaires were sent out and 885 were recovered with loss rate of 1.7%. At the third time point, 885 questionnaires were issued and 855 were received with loss rate of 3.9%. At the end of the whole survey, a total of 840 valid questionnaires were obtained by taking student ID as the basis for three times matching and excluding the missed and wrongly filled questionnaires. The effective rate of this questionnaire was 91.3%. According to the survey results, descriptive statistical analysis was conducted and the following results were as follows: for the overall sample, there were 375 male students and 465 female students; 44 freshmen, 213 sophomores, 151 juniors and 432 seniors; The average age was 19.43 years old.

Measuring tools

This study draws on established scales to ensure the reliability and validity of the questionnaire. Before investigation and research, the English scales were accurately translated into Chinese according to the standard translation and back-translation procedure (Brislin, 1986) and was repeatedly checked with the questionnaire distribution team. A 5-point Likert scale (1 to 5 in the questionnaire indicates "strongly disagree" to "strongly agree") was used throughout the study.

Future work self-salience: Future work self-salience scale developed by Strauss et al. (2012) was adopted. The questionnaire has a total of 5 questions. Examples of questions are: "I can easily imagine my future job" and "I am clear about who and what I want to be in my future job." The scale has an alpha coefficient of 0.912 in this study.

Teacher support: A questionnaire was applied to measure college students' perception of teacher support behavior, with 19 items in total according to the scale compiled by Ou (2005). Examples of questions are "My teacher is always gentle with me" and "My teacher often encourages me in my study and life." This scale was used in the study and the Cronbach's alpha coefficient is 0.939.

Career exploration: The Career Exploration Scale developed by Stumpf et al. (1983) was employed to measure students' career exploration activities with a total of 17 items in this questionnaire. Examples of questions are: "I know a lot of information about the career field I have focused on" and "I will try different career activities." The scale has a Cronbach's alpha coefficient of 0.913 in this study.

Effective part-time behavior: There are 4 questions with reference to Mingqian and Sanman (2021) part-time behavior scale. Examples of questions are "Part-time jobs are a boon to employment" and "In general, the part-time job I choose is more related to my major." This scale has an alpha coefficient of 0.901 in this study.

Career Adaptability: The Career Adaptability Scale, as revised by Hou et al. (2012), was used to measure students' adaptability to their future careers. The questionnaire has 24 questions, covering four dimensions of career concern, control, curiosity, and self-confidence, and Examples of questions are: "I can think about what my future will be like" and "I will make my own decisions." The scale has a Cronbach's alpha coefficient of 0.948 in this study.

Control variables: Based on previous studies, gender, age, and education have been found to influence individual career adaptability (Guan et al., 2013; Cai et al., 2015). In addition, students' place of origin also has an impact on career development and job resilience (Garriott, 2020; Kim and Smith, 2021). To more accurately validate the model, gender, age, grade, and birthplace were measured as control variables in this study.

Data analysis methods

This study used SPSS 21.0 for Harman's one-way test, descriptive statistics, correlation analysis, and multiple regression analysis, and Amos 21.0 for confirmatory factor analysis. In testing for mediating effects, this study used the three-step method of Baron and Kenny (1986) and combined it with the Bootstrap technique (using the PROCESS program) (Hayes, 2017) to estimate confidence intervals for mediating effects. In testing for mediators with moderation, this study

relied on Edwards and Lambert's (2007) study and integrated with the bootstrap technique (Bootstrap) to test for the significance of the values and differences of indirect effects under high and low moderating variables.

Research results

Common method deviation test

In the research investigation, the multi-stage fill-in approach suggested by Podsakoff et al. (2003) is followed to control for possible common method bias in the study at the methodological level (Podsakoff et al., 2003). At the data level, Harman's one-way test was performed on the data collected and the percentage of explained variance by the first factor was found to be 27.79%, a rate that is less than the 40% criterion (Podsakoff et al., 2003). Also, as can be seen in Table 1, the fitting results of the confirmatory factor analysis of the one-factor model were also poor ($\chi^2 = 18760.698$, $df = 2225$, $RMSEA = 0.094$, $SRMR = 0.144$, $CFI = 0.705$, $TLI = 0.689$), indicating that there was no serious common method bias among the variables.

Confirmatory factor analysis

In this study, the following fitting indicators were selected to judge the model fit, including the chi-square difference must reach a significant level, the root mean squared error

of approximation (RMSEA) must be less than 0.08, and the comparative fitness index (CFI) and Tucker-Lewis index (TLI) must be greater than 0.9. A series of competing models were compared in this study, and the results of the analysis are shown in Table 1. It can be seen from Table 1 that the model fit of the five-factor model ($\chi^2 = 7322.779$, $df = 2215$, $RMSEA = 0.050$, $SRMR = 0.047$, $CFI = 0.909$, $TLI = 0.904$) was better than the other competing models in this study. Furthermore, all the fitness indicators of the five-factor model passed the test. Accordingly, all the variables in this study were distinguishable.

Correlation analysis

The results of the correlation analysis between control variables and variables are shown in Table 2. From Table 2, it can be known that there is a significant positive correlation between all variables, providing a preliminary basis for hypothesis testing of the model. There is a significant positive relationship between future work self-salience and career adaptability ($r = 0.364$, $p < 0.001$), which can initially prove the validity of hypothesis 1.

Hypothesis testing results

1. Test results of main effect

As shown by Model 3 in Table 3, future work self-salience presents a significant positive relationship with career adaptability ($\beta = 0.35$, $p < 0.001$). Hypothesis 1 is supported.

TABLE 1 Results of confirmatory factor analysis ($N = 840$).

Model	χ^2	df	$\Delta \chi^2$	RMSEA	SRMR	CFI	TLI
Five-factor model (hypothesis)	7322.779	2215		0.050	0.047	0.909	0.904
Four-factor model (A + B)	9187.303	2219	1864.524***	0.061	0.062	0.876	0.869
Four-factor model (C + D)	9823.666	2219	2500.887***	0.064	0.094	0.865	0.857
Three-factor model (A + B + C)	13889.446	2222	6566.667***	0.079	0.174	0.792	0.781
Three-factor model (B + C + D)	13070.504	2222	5747.725***	0.076	0.189	0.807	0.796
Two-factor model (A + B + C + D)	14857.165	2224	7534.386***	0.082	0.187	0.775	0.763
One-factor model (A + B + C + D + E)	18760.698	2225	11437.919***	0.094	0.144	0.705	0.689

A: Future work self-salience; B: Perceived teacher support; C: Career exploration; D: Effective part-time behavior; E: Career adaptability; + indicating integration.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

TABLE 2 Mean values, standard deviations and correlation coefficients of variables ($N = 840$).

Variables	Mean values	Standard deviations	1	2	3	4	5	6	7	8
1 Gender	0.550	0.497								
2 Age	19.433	1.342	0.012							
3 Grade	15.156	0.977	-0.070*	-0.812***						
4 Place of origin	0.924	0.266	-0.177***	0.173***	-0.198***					
5 Future work self-salience	3.545	0.662	-0.207***	0.023	0.010	0.063				
6 Perceived teacher support	3.706	0.569	-0.194***	-0.020	0.020	0.113**	0.495***			
7 Career exploration	3.654	0.531	-0.204***	0.061	-0.051	0.103**	0.356***	0.361***		
8 Effective part-time behavior	4.079	0.658	-0.164***	-0.027	0.011	0.130***	0.375***	0.703***	0.281***	
9 Career adaptability	4.133	0.513	-0.153***	0.049	-0.035	0.103**	0.364***	0.356***	0.778***	0.259***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

1. Test results of mediating effect

According to Model 4 in **Table 3**, there is a significant positive relationship between future work self-salience and career adaptability ($\beta = 0.10$, $P < 0.001$), and a significant positive relationship between career exploration and career adaptability ($\beta = 0.74$, $P < 0.001$), verifying the indirect effect of future work self-salience on career adaptability through career exploration. To clarify this indirect effect again, this study uses the Bootstrap method test (Hayes, 2017). The Bootstrap method test for the mediating effect is shown in **Table 4**, where both the direct and indirect effects of future work self-salience and career adaptability do not include zero at the 95% confidence interval. Thus, it can be confirmed that career exploration plays a partially mediating role in the relationship between future work self-salience and career adaptability. Hypothesis 2 is supported.

1. Test results of moderating effects

Confirming the moderating effect of perceived teacher support. As displayed by Model 3 in **Table 3**, the interaction item between future work self-salience and perceived teacher

support presents a prominent positive relationship with career exploration ($\beta = 0.10$, $p < 0.01$). Simultaneously, Bootstrap method test of moderating effect is shown in **Table 5**. At 95% confidence interval, with low level of teacher support, the indirect effect of future work self-salience on career exploration is low (with effect value of 0.09), while with high level of teacher support, the indirect effect of future work self-salience on career exploration is high (with effect value of 0.23). This research is determined by using Aiken et al. (1991) to regulate the high and low levels of the moderating variables in an attempt to clarify such moderating effect. As seen in **Figure 2**, the positive relationship between future work self-salience and career exploration is stronger when the degree of teacher support is higher. Hypothesis 3 is supported.

Confirming the moderating effect of effective part-time behavior. As shown in Model 5 of **Table 3**, the interaction item between career exploration and effective part-time behavior takes on a remarkable positive relationship with career adaptability ($\beta = 0.08$, $p < 0.001$). Meanwhile, the Bootstrap method test for the moderating effect is presented in **Table 6**, the indirect effect of career exploration on career adaptability is weaker at low levels of effective part-time behavior (with effect value of 0.66) and stronger at high levels of effective part-time

TABLE 3 Hypothesis testing model.

Variables	Career exploration		Career adaptability			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variable						
Gender	-0.13***	-0.11**	-0.07*	0.03	0.02	0.03
Age	0.01	0.02	0.02	0.01	0.03	0.02
Grade	-0.05	-0.04	-0.02	0.02	0.03	0.02
Place of origin	0.05	0.03	0.06	0.03	0.03	0.03
Independent variable						
Future work self-salience	0.33***	0.20***	0.35***	0.10***		0.07*
Mediating variable						
Career exploration				0.74***	0.76***	0.07***
Moderating variable						
Perceived teacher support		0.22***				0.07*
Effective part-time behavior					0.04	0.02
Interaction items						
Future work self-salience * Perceived teacher support		0.10**				0.02*
Career exploration * Effective part-time behavior					0.08***	0.06*
R ²	0.15	0.20	0.14	0.61	0.61	0.62
F	29.60***	29.66***	28.17***	222.91***	189.39***	136.27***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

TABLE 4 Bootstrap test for mediating effects.

Mediating effect	Effect value	Standard error	95% of confidence interval	
			Lower confidence limit	Upper confidence limit
Indirect effect	0.19	0.02	0.04	0.11
Direct effect	0.08	0.02	0.15	0.23

Bootstrap sample size $N = 5000$.

TABLE 5 Bootstrap test of the moderating effect with perceived teacher support.

Moderating effect	Effect value	Standard error	95% of confidence interval	
			Lower confidence limit	Upper confidence limit
Low (−1SD)	0.09	0.04	0.01	0.17
Medium	0.16	0.03	0.10	0.22
High (+ 1SD)	0.23	0.03	0.16	0.29

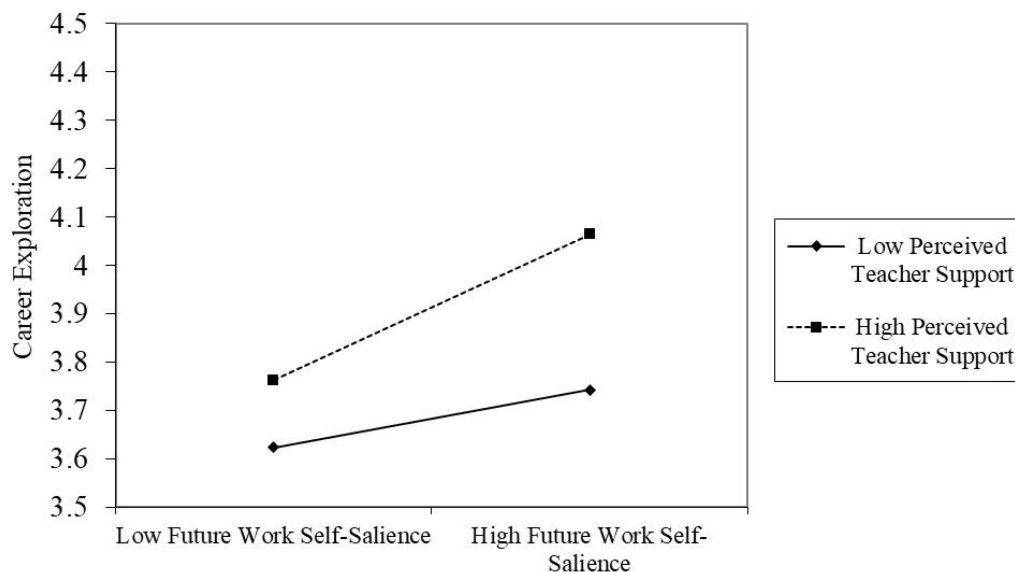
Bootstrap sample size $N = 5000$.

FIGURE 2

The moderating role of perceived teacher support between future work self-salience and career exploration.

TABLE 6 Bootstrap test of the moderating effect of effective part-time behavior.

Moderating effect	Effect value	Standard error	95% of confidence interval	
			Lower confidence limit	Upper confidence limit
Low (−1SD)	0.66	0.03	0.60	0.72
Me-dium	0.73	0.02	0.69	0.78
High (+ 1SD)	0.81	0.03	0.76	0.87

Bootstrap sample size $N = 5000$.

behavior (with effect value of 0.81). This research is determined by using Aiken et al. (1991) to regulate the high and low levels of the moderating variables to clarify such moderating effect. As seen in Figure 3, the positive relationship between career exploration and career adaptability is stronger at higher levels of effective part-time behavior. Hypothesis 4 is supported.

1. Test results of mediating effects with moderation

This study employs the effect values of indirect effects of Bootstrap's method test at high and low levels of moderating

variables (Edwards and Lambert, 2007) in a bid to verify whether perceived teacher support and effective part-time behavior moderated the indirect effect of future work self-salience on career adaptability through career exploration. As understood in Table 7, under the condition of high degree of teacher support and high level of effective part-time job behavior, the indirect effect of future work self-salience on career adaptability through career exploration is 0.18, whose value is [0.13,0.23] at 95% confidence interval. With low levels of teacher support and effective part-time behavior, the indirect effect of future work self-salience through career exploration on career adaptability

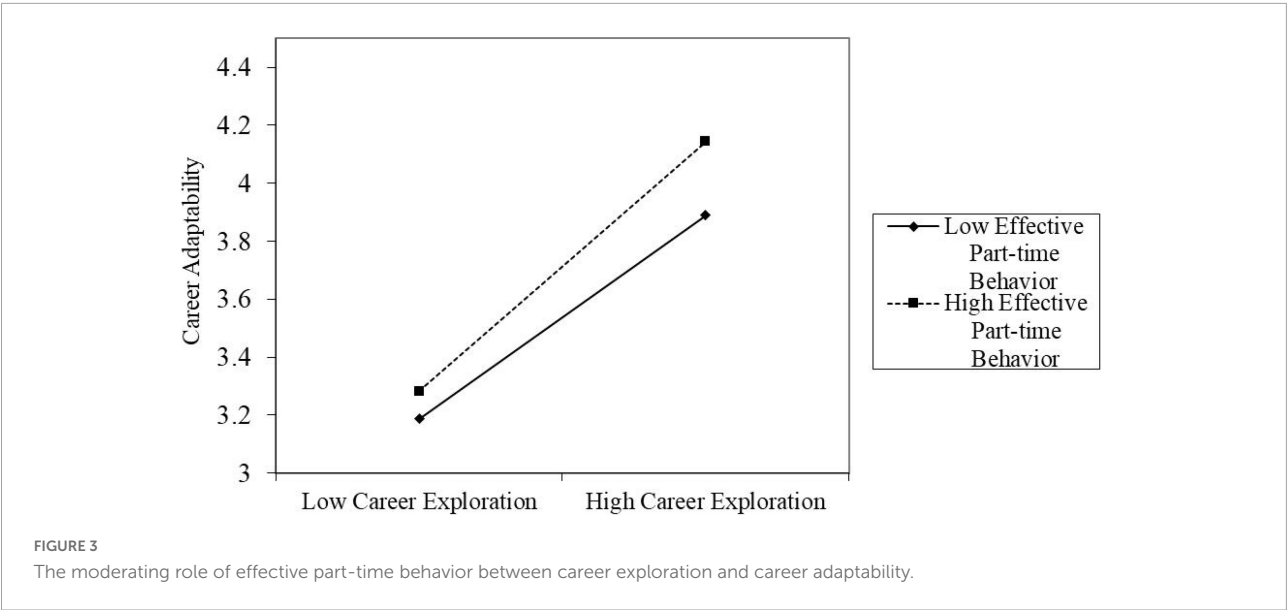


TABLE 7 Bootstrap test for mediating effects with moderation.

Independent variable	Moderating variable (perceived teacher support)	Moderating variable(effective part-time behavior)	Indirect effect	Standard error	95% of confidence interval	
					Lower confidence limit	Upper confidence limit
Perceived teacher support	low(−SD)	low(−SD)	0.06	0.03	0.01	0.11
	low(−SD)	high(+ SD)	0.07	0.03	0.01	0.18
	high(+ SD)	low(−SD)	0.15	0.02	0.11	0.20
	high(+ SD)	high(+ SD)	0.18	0.03	0.13	0.23

Bootstrap sample size $N = 5000$.

is 0.06, with value of [0.01,0.11] at 95% confidence interval. At the same time, given the inconsistency between high and low levels of teacher support and effective part-time behavior, the indirect effects of future work self-salience on career adaptability through career exploration are 0.07 and 0.15, respectively, which also remained significant at the 95% confidence interval. In conclusion, the higher the degree of perceived teacher support and effective part-time job behavior, the stronger the indirect effect of future work self-salience on career adaptability through career exploration. Hypothesis 5 is supported.

Conclusion

Career adaptability is significant for college graduates to conduct career construction (Rudolph et al., 2017). Starting from self-regulation theory and social cognitive career theory, this study delves into the mechanism inherent in future work self-salience through career exploration on career adaptability

and discusses the moderating role of teacher support, effective part-time behavior in this mechanism. It attempts to propose theoretical and practical guidance for college students on this issue of career construction.

Discussion

Theoretical contributions

First, this study systematically identifies the causes of career adaptability. A moderated mediation model is proposed in terms of individual psychology, environmental support and individual's own behavior. The theoretical basis of career adaptability is extended by exploring how college students can acquire career adaptability.

Second, this study proposes a positive relationship between future work self-salience and career adaptability, enriching the

exploration of career adaptability in terms of psychological factors. Meanwhile, it is consistent with the predictions of Career Construction Theory (CCT) and The Model of Proactive Motivation (Guan et al., 2014).

Third, the mediating role of career exploration. College students' future work self-salience (psychological level) through career exploration (behavioral level) affects future work adaptability. The bridging role of career exploration is systematically shown; At the same time, this finding not only supports the self-regulation theory, but also makes some supplementary studies on career adaptability.

Fourth, two moderating variables like individual perceived teacher support and effective part-time behavior are introduced. The indirect effect of future work self-salience on career adaptability through career exploration is stronger when college students feel more supported by teachers or engage in more effective part-time jobs. This finding exactly supports social cognitive career theory (Lent and Brown, 1996). It also provides some reference for follow-up research on teachers' occupation and part-time behavior of college student.

Practical contributions

From the perspective of career construction of college students and college career guidance, this study provides some practical suggestions for the management of the topic of "how college students can be more comfortable with their careers".

Improving career exploration behavior and career adaptability

This study takes college students as the research object and explores their career exploration behavior and career adaptability from the psychological factors. Based on the findings of the study, the following suggestions are made. Primarily, college students need to increase their own clarity about their future jobs to cope with employment problems. In the next place, college students should clarify their career goals as early as possible, which is conducive to more effective job exploration and job adaptation. Thirdly, they should prepare for their career by clarifying what kind of job they want to do, when they want to do, and how to do.

Situation role of teacher support and part-time behavior

This study considers the contextual role of teacher support and individual part-time behavior based on the social cognitive career theory. When providing career guidance to college students, colleges should make students perceive support from schools and teachers, which can guide them to actively engage in career construction. Meanwhile, students should actively realize that effective part-time jobs are beneficial

to their future work growth and actively engage in part-time jobs and internships. Premised on the above research findings, the following suggestions are made. First, colleges and universities should establish professional career guidance teachers, offer professional career guidance courses and strengthen the efforts to provide college students with career guidance (Solberg et al., 2002; Magee et al., 2022). Second, increase the proportion of social practice courses in the curriculum design, and guide college students to participate in practical activities that are beneficial to career development (Hrivnak, 2019). Third, provide employment opportunities appropriately (Yang et al., 2002). For example, carry out school-enterprise cooperation activities and strengthen the efforts of holding campus job fairs (Weiming et al., 2016).

Family support to help with career construction

In addition to school support, family support is also very crucial for college students' careers, especially in Chinese society where career choice and job search go hand in hand with family (Hansen and Pang, 2008). As parents, friends and relatives, they should not only give financial support to college students, but also give more networking support. During the period of career construction, more help should be given in time to successfully solve the employment problem and start career.

Limitation and future research directions

Firstly, the sample data of this study are all obtained from self-reported questionnaires of college students, and it is suggested that multiple sources will be used to obtain survey data subsequently.

Secondly, the college students in this study are all undergraduate students. Whether the career construction or work adaptability of postgraduate and doctoral students is universal is still worthy of follow-up research. Therefore, it is suggested that future studies should take students at different academic levels as research subjects to extend the applicability of the study.

Thirdly, this study takes into account the influence of college students' psychological factors, college environment and teachers' support on career adaptability. However, the influence of family atmosphere and parental support on the construction of college students' career is not considered. Therefore, it is suggested that future research can be conducted from a perspective of cross-level research of family, society and school.

Fourthly, the research method of this study adopts questionnaire survey, which is a single research method. It is

suggested that the quasi-experimental method can be applied to invite college students to participate in relevant experiments to do following research on career adaptability.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Unpacking the role of Chinese EFL teacher aggression and burnout in their professional success: A teachers' psychology perspective

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This study aims to investigate the role of Chinese English as a foreign language (EFL) teachers' aggression and burnout in their professional success. To accomplish this, 362 EFL teachers (i.e., 59 males, 303 females) were invited to respond to three valid measures of the variables (i.e., Maslach burnout inventory, teacher aggression scale, and teacher professional success scale). Performing Spearman's rho correlation tests, negative and significant correlations were found between teacher burnout, teacher aggression, and teacher professional success. Moreover, as the results of regression analyses indicated, both teacher aggression and teacher burnout were found to be the negative predictors of EFL teachers' professional success. It implies that the higher the amount of teacher aggression and teacher burnout, the less professionally successful a teacher would be. The implications of the results are finally discussed.

KEYWORDS

teacher aggression, teacher burnout, professional success, Chinese EFL teachers', regression analyses

Introduction

Without any doubt, the importance of psychological variables in teachers' professional development could be of great importance. For example, a study conducted by Zhang et al. (2021) showed that motivation is a crucial factor for teachers that allows them to professionally develop. But what type of motivation is mentioned in the study? Teachers' motivation to take part in professional learning is an important factor, considering their professional development. These factors were looked at from two aspects: the teacher level and the school level. At the teacher level, teachers' prior experience with learning activities, teaching experience, self-efficacy, and conceptions of learning could be regarded as important, and at the school level, work and emotional pressure, colleague support, and principal leadership were associated with

their motivation to take part in professional learning, leading to their professional development (Yang, 2021). Hence, all psychological variables have a paramount effect on teachers' professional development.

Teachers are perceived as the main pillars of educational systems in that many factors are affected by them (Coombe, 2014). Teacher success has attracted attention in the pedagogical realm. Teacher professional success can be conceptualized as the extent to which a teacher obtains a sense of achievement (Hung et al., 2007). According to this definition, this sense of achievement comprises boosting skills, increasing knowledge, and modifying behavior. In addition, teachers' success is influenced by teachers' attitudes, worries, and expectations (Hung et al., 2007). According to Derakhshan et al. (2020b) teachers' success is impacted by two factors, teachers' positive attitudes and their constant professional development. Likewise, teachers' autonomy and their professional identity are great predictors of teacher success (Derakhshan et al., 2020a). Furthermore, three positive features including being satisfied with life, optimistic explanatory style, and grit are believed to affect teacher success, considering students' academic success (Duckworth et al., 2009).

Teacher aggression is said to play a vital role in students' behavior. Due to teachers' aggression, students feel distracted from what they do (Montuoro and Lewis, 2018) and feel embarrassed and shameful (Thomas and Montgomery, 1998), their self-perceptions can be damaged (Henricsson and Rydell, 2004), and their classmates may start resenting each other (McAuliffe et al., 2009). Post-traumatic stress disorder (Hyman and Snook, 1999) and academic difficulties (Brendgen et al., 2006) have also been associated with teacher aggression. Likewise, students' sense of responsibility has been reported to reduce (Roache and Lewis, 2011) owing highly to teacher aggression, resulting in misbehavior (Mitchell and Bradshaw, 2013). Moreover, owing to teacher aggression, students' perception of teacher caring has been believed to diminish (Teven, 2013), leading to lowering teacher effectiveness (Mainhard et al., 2011).

Burnout is a psychological syndrome that causes a person to be under work-related stress for a long time (Maslach, 2003; Wang and Guan, 2020; Derakhshan et al., 2022). It was Freudenberg (1974) who developed this term in psychology for the first time. It was described as a state of exhaustion that occurs due to working too much without giving much attention to one's own needs (Byrne, 1999). Later, burnout was defined as "a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that can occur among individuals who do people work of some kind" (Maslach and Jackson, 1986, p. 1). Further, Pines and Aronson (1988) made burnout relevant to emotional, mental, and physical exhaustion that can be created due highly to the fact that one has been exposed to emotionally demanding situations for a long time. When one must cope with such prolonged stress which is

relevant to work and he fails to be successful in doing it, it can be called burnout (Jennett et al., 2003). Considering teacher burnout, emotional exhaustion is when teachers' energy is really sapped due to emotional exhaustion. Likewise, another subscale of depersonalization refers to when teachers feel heartless and they are uninterested in their students and their jobs. The third subscale of burnout, low personal achievement is when teachers cannot feel effective or competent to help their students in their learning process (Maslach et al., 2001).

Studies revealed that both individual and environmental factors can cause burnout. There was a thorough study conducted by Skaalvik and Skaalvik (2010) which probed the relationship among burnout, self-efficacy, job satisfaction, and contextual factors. It was found that time pressure and relations with parents are the first and most important predictors of emotional exhaustion and depersonalization. Furthermore, a weak, yet significant association between problems relevant to the discipline regarding the students' behavior and emotional depletion and depersonalization was found. In another research carried out by Vaezi and Fallah (2011), a negative correlation between emotional intelligence and burnout was reported, meaning that the more emotionally intelligent a person is, the less burnout he experiences. Skaalvik and Skaalvik (2009) also indicated that there is a negative association between all the dimensions of burnout and teacher independence and support. In other words, autonomous, supportive teachers are unlikely to feel burnout. In another research, it was proposed that institutional supervision could predict teacher burnout, which means that they are highly likely to feel burnout (Ghanizadeh and Ghonsooly, 2014) when teachers are supervised by the institute authorities. Moreover, it was revealed by them that self-regulation is negatively and significantly correlated with teacher burnout. Lauerman and König (2016) also disclosed that self-efficacy and pedagogical knowledge are negatively associated with burnout, meaning that the more well-educated and self-efficacious a teacher is, considering the pedagogical knowledge, the less burnout experience they will have.

Grayson and Alvarez (2008) evaluated the impact of school atmosphere (including the relationship between parents and school, administrations, and student behavioral values) on the dimensions of burnout. Some demographic factors including years of experience, gender, age, job satisfaction, and the relationship between students and teachers were also regarded. The findings of the study showed that different factors relevant to school ambiance were correlated with each of the three burnout dimensions. In another study conducted by Eghteasadi Rudi (2011), it was also indicated that low levels of students' proficiency, lack of advocacy from administration, and second language itself were the crucial reasons for teacher burnout. Moreover, autonomous, self-efficacious, and extroverted teachers resisted burnout in comparison to their counterparts with lower levels of the personal traits mentioned. Furthermore, job satisfaction was

found to play a paramount role in all three burnout subscales (Etminan, 2014). In other words, emotional exhaustion and depersonalization were negatively correlated with job satisfaction, while personal accomplishments were positively associated with job satisfaction. Nayernia (2021) believed language proficiency is negatively in line with depersonalization and emotional exhaustion as two subscales of burnout, and it is positively correlated with the personal achievement dimension of burnout. Based on Faskhodi and Siyyari (2018), a significant and negative relationship was found between work engagement and burnout. Furthermore, burnout level was reported to lessen as the years of experience increase. In contrast, teachers' experience is positively correlated with work engagement.

As a result, these teachers who do not have the capability to channel their negative feelings, such as aggression and burnout, are reported to be less resilient when facing difficulties in the classroom. All in all, teachers with a great positive psychological capital are perceived to manage their negative feelings in a way that it cannot affect the amount of teachers' success toward their jobs and they would be still motivated enough to challenge their teaching methods every now and then (Derakhshan et al., 2022; Wang et al., 2022c). It has been believed that factors leading to students' demotivation are self-related, teacher-related, and instruction-related, the lack of positive psychological capital. A study conducted in Chinese universities showed that freshmen and sophomores are more likely to feel demotivated, out of whom freshmen ascribed their demotivation to their teachers because of their teachers' tedious teaching mood. As opposed to freshmen, sophomores put the blame on the teaching materials, textbooks contents, for example (Wang and Guan, 2020). Accordingly, it should be taken into consideration that there is a link between students' demotivation and English as a foreign language (EFL) teachers' negative feelings. In a conceptual study conducted by Wang et al. (2022b), the emphasis that was placed on love or a loving learning atmosphere has been ignored. Therefore, it can be said that both aggression and burnout do not allow a teacher to provide students with love which seems necessary in a fair educational system.

There are some advantages and disadvantages considering the previous studies. Regarding the drawbacks, few studies, if any, to the best of my knowledge thus far, have been done to find the interplay between these three variables of this study. Thus, teachers' aggression and burnout which are perceived as one of the contributory factors affecting the educational system were to be dealt with positive psychological capital. It is important since the more burned out teachers are, the more aggressive they are. That is, they are less likely to encourage the students to follow their academic goals, and in this way, the learning process cannot be facilitated and, as a result of which, the educational system will not be boosted. Secondly, when teachers feel anxious and burned out, they are less likely to be actively engaged in what they do, and accordingly, it causes them to be less satisfied with

their job and feel agitated since they cannot be creative to come up with new ideas for their teaching methods and encouraging their students. Little by little, they may lose inspiration and they fail to be professionally successful. Therefore, it can negatively influence the educational system in which teachers play a pivotal role. That is the reason why the effect of EFL teachers' aggression and burnout on their professional success has been studied in the current research.

As the review of previous studies revealed, little, to my best knowledge, has been written in EFL context to probe into the association between teacher aggression, burnout, and professional success. Moreover, cultural and geographical factors play a significant role in the results of this study since aggression is really associated with cultural factors (Hofstede, 1986; Wang et al., 2022a). Therefore, this study can be conducted in other countries rather than China in which the current research was carried out. To address this issue, this research strives to discover the associations between teachers' aggression, burnout, and professional success. In this regard, the following research questions were posed:

1. Are there any significant relationships between Chinese EFL teachers' aggression, burnout, and their professional success?
2. Do Chinese EFL teachers' aggression and burnout significantly predict their professional success?

Materials and methods

Participants

Of the 430 Chinese EFL teachers whom we approached, a total of 362 teachers (male = 59, 16.3%; female = 303, 83.7%), aged between 25 and 59 (average = 40), volunteered to participate in the present study. All the participants were university EFL teachers, whose teaching experience ranged from 1 to 26 years. Their majors mainly included English literature studies and applied linguistics, with Ph.D. holders ($N = 11$, 3.04%), master's degree in literature ($N = 174$, 48.07%), and bachelor's degree in English language teaching ($N = 121$, 33.43%), and others ($N = 56$, 15.47%).

Instruments

Teacher aggression scale

The teacher aggression scale was developed. This instrument included 12 items developed to evaluate teachers' tendencies to react to learners' misbehavior aggressively. Those participants replied to each item utilizing a six-point Likert scale which ranges from 1 (not at all descriptive of me) to 6 (very descriptive

of me). Reactive, instrumental, and passive aggressions were measured through this scale. To ensure the reliability of the questionnaire administered in this study, the Cronbach's alpha test was run. It was indicated that the teacher aggression scale (0.88) had satisfactory reliability indices.

Teacher burnout scale

To evaluate teachers' burnout, the teacher version of the Maslach burnout inventory (MBI-ES), designed and validated by Maslach et al. (1996), was exploited. It comprises 22 items evaluating three subscales of burnout, the reduced personal achievement, depersonalization, and emotional exhaustion, a seven-point Likert scale ranging from 0 (never) to 6 (every day). To make sure of the reliability of the questionnaire administered in this study, the Cronbach's alpha test was run. It was indicated that the teacher burnout scale (0.79) had satisfactory reliability indices.

Teacher professional success questionnaire

For the EFL teacher's professional success to be measured, the Characteristics of Successful Language Teachers Questionnaire (CSLTQ) developed and validated by Sadeghi and Babai (2009) was utilized to evaluate teachers' perceptions of the features of a successful language teacher. The CSLTQ consists of eight factors in the form of 46, five-point Likert-type items ranging from 1 (strongly disagree) to 5 (strongly agree). To guarantee the reliability of the questionnaire administered in this study, the Cronbach's alpha test was run. It was indicated that the teacher success questionnaire (0.97) had satisfactory reliability indices.

Data collection

Based on the EFL teachers' language competence, the questionnaires we adopted were distributed in the English original through the researcher's WeChat groups (note: WeChat is a communication app that is popular with all the Chinese people) to get trustworthy data. At the very beginning of the questionnaire, all the participants were provided with their consent to allow their data to be used as research data if their identity information was kept confidential. The present study was carried out in three provinces (Henan, Shanxi, and Zhejiang) in China, beginning in December 2021 and ending in February 2022. Then, we collected more than 400 questionnaires, but only 362 participants' data were valid to be further analyzed after we gleaned the original data.

Results

To decide upon the parametric or non-parametric analysis, a test of normality was run. The results are shown in the following:

Table 1 shows the indices of Kolmogorov–Smirnov and shows that the distribution of data was not normal for any of the variables since the p -value is lower than the significance level ($p = 0.000$). Consequently, the non-parametric analysis, namely, Spearman's rho test, was used.

The first research question

The first research question deals with the relationship among three variables of this study (i.e., teacher aggression, teacher burnout, and teacher success) which was calculated through running a Spearman's rho correlation test.

Table 2 shows the relationship among the Chinese EFL teachers' aggression, burnout, and success. As seen in this table, there are negative relationships, first, between TA and TS (-0.231) and, second, between TB and TS (-0.122). Moreover, the relationship is significant for both teachers' aggression ($\text{Sig} = 0.000$) and burnout ($\text{Sig} = 0.000$). It can be concluded that if teachers' indices of aggression and burnout increase, the index of teachers' success decreases.

The second research question

The second research question deals with measuring the predictability power of teacher aggression and burnout for teacher success. To this end, a linear multiple regression analysis was performed in the following tables:

The model summary (in **Table 3**) shows how much of the variance in the dependent variable scores can be explained by the model. Expressed as a percentage, it implies that the model explained 34 percent of the variance in scores from teachers' success.

To evaluate the statistical importance of the findings, it was significant to consider **Table 4** labeled ANOVA. This scrutinizes the hypothesis that multiple R in the population equals zero (0). The model achieved statistical significance ($\text{Sig} = 0.000$, meaning that $p < 0.05$).

In this investigation, the researcher was fond of making a comparison among the contribution of each independent variable. Hence, the beta values (in **Table 5**) were utilized. Paying attention to the beta column, it was discovered that the largest beta coefficient was 0.19 ($\text{sig} = 0.000$), that was ascribed to teachers' aggression, meaning that this variable was greatly correlated with the dependent variable and it can vividly clarify it when the variance clarified by all other variables in the model was controlled. The beta value for the other variable (i.e., teacher burnout) was also significant ($\text{sig} = 0.000$). It implies that teachers' burnout, similar to teachers' aggression, is a significant predictor of teachers' success.

TABLE 1 Test of normality.

	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
TA	0.100	362	0.000	0.908	362	0.000
TB	0.101	362	0.000	0.925	362	0.000
TS	0.073	362	0.000	0.948	362	0.000

a. Lilliefors Significance Correction.

TABLE 2 Correlations among Chinese EFL teachers’ aggression, burnout, and success.

			TA ¹	TB ²	TS ³
Spearman’s rho	TA	Correlation coefficient	1.000	0.327	−0.231
		Sig. (2-tailed)	.	0.000	0.000
		N	362	362	362
	TB	Correlation coefficient	0.327	1.000	−0.122
		Sig. (2-tailed)	0.000	.	0.000
		N	362	362	362
	TS	Correlation coefficient	−0.231	−0.122	1.000
		Sig. (2-tailed)	0.000	0.000	.
		N	362	362	362

**. Correlation is significant at the 0.01 level (2-tailed).

¹: Teacher aggression.

²: Teacher burnout.

³: Teacher success.

TABLE 3 Model summary for Chinese EFL teachers’ aggression, burnout, and success.

Model	R	R-square	Adjusted R-square	Std. error of the estimate
1	0.18	0.34	0.029	22.23

a. Predictors: TA, TB.

TABLE 4 ANOVA for Chinese EFL teachers’ aggression, burnout, and success.

Model		Sum of squares	Df	Mean square	F	Sig.
1	Regression	6336.12	2	3168.06	6.40	0.000
	Residual	177448.91	359	494.28		
	Total	183785.03	361			

a. Dependent variable: TS.

b. Predictors: TA, TB.

TABLE 5 Coefficients for Chinese EFL teachers’ aggression, burnout, and success.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std. error	Beta		
1	(Constant)	201.16	7.09		28.33	0.000
	TA	−0.50	0.14	−0.19	−3.53	0.000
	TB	−0.31	0.09	−0.13	−1.67	0.000

a. Dependent variable: TS.

Discussion

This study scrutinized the relationship between three important variables, Chinese EFL teachers' aggression, burnout, and their professional success. This is of utmost importance because hardly ever has such a study been conducted before, especially in the context of China. If teachers' well-being is threatened and their values are violated, they no longer can pursue their jobs. That is the reason why conducting such studies would be of great benefit for both teachers and educational administrators. According to the current investigation, both teachers' aggression and burnout are negatively and significantly correlated with teachers' professional success. Teachers with higher levels of aggression and burnout, therefore, have been thought of as less professionally successful because they feel aggressive and burnout, all energy would be sapped, and they are not inclined to support and help their students and allow them to experience a friendly atmosphere in class in which the process of learning is facilitated. The teacher–student relationship is reciprocal; thus, when one feels aggressive, it adversely affects the other and an interactive class would turn into a place with less motivation. Given that, aggression can be encouraged by many factors, including personal problems, not feeling competent enough in the teaching context, and not being up-to-date with the latest facilities or teaching methods that can be utilized, to name a few. Whatever the root cause of the problem is, the ramification of teachers' feeling aggressive is that they may feel burnout over time, and it directly influences their success.

The results of this study are somewhat in line with some reviewed articles which were mentioned previously in the introduction part. The consequences in the present study showed that there is a negative correlation between both teachers' aggression and burnout and their professional success. These results support those of other conducted studies (Duckworth et al., 2009; Etminan, 2014; Lauerman and König, 2016; Faskhodi and Siyyari, 2018; Nayernia, 2021). It was reported in Etminan's (2014) study that varied dimensions of burnout and job satisfaction are negatively associated with each other. It is in congruence with the results found in this study because both teachers' burnout and teachers' aggression are regarded as negative feelings, so they are both adversely correlated with teachers' professional success and their job satisfaction, respectively. According to Lauerman and König (2016), self-efficacy and educational knowledge are negatively aligned with burnout. In this regard, it can be inferred that positive attributes such as self-efficacy in the study mentioned above and professional success which has been proposed in this study can be in a negative relationship with burnout. Likewise, aggression and burnout are adversely consistent with positive features such as professional success in this research. Based on Duckworth et al. (2009), three positive features including

being satisfied with life, optimistic explanatory style, and grit are thought to affect teacher success, considering students' academic success. Therefore, the mentioned study would be in line with the current study in that if the health span of teachers is lowered by some negative factors including aggression and burnout, other aspects of a teacher's life can be exacerbated, namely, their personal and professional success.

In accordance with what has been proposed by Nayernia (2021) language proficiency is negatively in line with depersonalization and emotional exhaustion as two subscales of burnout, and it is positively correlated with the personal achievement dimension of burnout, another component of burnout. Likewise, it can be proposed that based on the findings of this study, professional success is negatively associated with all dimensions of burnout mentioned above. Based on Faskhodi and Siyyari (2018), a significant and negative relationship was found between work engagement and burnout. Furthermore, burnout level was reported to lessen as the years of experiences increased. In contrast, teachers' experience is positively correlated with work engagement. It is, therefore, clear that professional success may increase when a teacher is highly experienced and their feeling of burnout reduces which has been proved in the present study.

As mentioned by Wang et al. (2022a), it was indicated that Asian EFL teachers' psychological well-being and work engagement had a positive impact on their immunity. Moreover, psychological well-being better predicted the teacher immunity than work engagement in Asia. That study discussed in the key role of positive psychology (PP) and emphasized the language teachers' need for working in a psychologically healthy atmosphere to stay committed to their job and immune to its difficulties. The mentioned study is aligned with the current one because when teachers have a psychologically healthy environment in which they can work, they can be immune to troubles and it may decrease their risk of aggression and burnout in order to feel professionally successful. It was also mentioned by Gregersen et al. (2020) that the most important stressors for teachers by far were time pressure and the juggling of roles, and the greatest uplifts were felt while socialization followed by the stress-reducing activity of "resting". It is in line with the current study because aggression may increase when teachers are pressed for time, and in the long run, feeling burned out may raise as well. Socializing may decrease the risk of feeling burned out and heighten teachers' success.

Conclusion, pedagogical implications, and limitations

The conclusion that can be drawn from this study is that the role of Chinese EFL teacher aggression in their burnout and professional success has been found to be significantly

important. It should be highlighted that teacher aggression and burnout are both good predictors of teachers' professional success. The results of this study can be of high interest for teachers themselves and educational authorities. It can be taken into consideration for the administrations that many contributory factors, such as "job satisfaction, supporting teachers and allowing them to feel autonomous in the way they teach and manage the class, providing them with the cutting-edge facilities through which both teachers' motivation and creativity, can be enhanced, and providing them with in-service training from time to time" can cause teachers to feel less aggressive and burned out even if the underlying cause of these feelings may be rooted in some personal problems. On the other hand, owing to the stressful, demanding job that a teacher has, they may experience such prolonged feelings, and they had better be aware of the point that if care is given, they will not last for a long time which is worrisome for many teachers. Furthermore, they could be cognizant of different symptoms of these feelings, and when they know the exact underlying cause of the problem, solutions wisely can be put forward to address the problem. It is highly crucial for a teacher to be professionally successful and acclaimed by his students because in this respect they would be more motivated to increase their pedagogical knowledge and modify their problematic behavior that may mostly affect students' performance and their academic success.

From another point of view, it is extremely important to shift attention to the point that these three variables help the educational system to grow. When it comes to the educational system, it can be divided into three categories: students, teachers, and teacher educators. Without a shadow of a doubt, all the factors including the educational ambiance and the facilities can fall under these categories as well. It is vividly clear that teachers' professional success plays a paramount role in enhancing students' knowledge; when teachers are optimistic and hopeful both about what has been done and taught by them and about their students' achievements, students can find the motivation to learn more and more in a friendly atmosphere where the learning process is facilitated, for example. Similarly, if teachers are satisfied with greater success, they are more likely to feel committed to what they teach and the materials and teaching methods they use to convey their message while teaching. Since problems are perceived as something soluble by them, not the barriers by which they can be stopped from what they are focusing on. So it definitely ameliorates the educational system. From another point of view, teachers' professional success can highly improve the educational system because the more engaged a teacher is in their work, the better atmosphere can be built both for teaching and learning process where both teachers and students can get benefit. Teachers, who are less aggressive and feel less burned out, are professionally successful, and they can urge students more to reach their apex of learning and achieve their goals which have been planned. Considering

the opposite, students are not motivated enough to find the learning process productive and follow their goals. They may feel demotivated and find no meaning in this process which otherwise could be vibrant. Thus, this study can enhance the educational infrastructures.

One of the practical implications of this study would be the fact that how aggression can be reduced and how burnout would be prevented for teachers to be professionally successful. Aggression would be lessened if teachers' confidence and buoyancy are raised. Likewise, feeling burned out can also be prevented when they are motivated enough and enthusiastic to be actively engaged in the teaching process which causes students to feel involved as well.

Finally, this study is limited in some ways. First, China was the only context where this research was conducted; consequently, the same study can be carried out by avid teachers in any other country since different cultures can tremendously affect the consequences reported. Secondly, the reasons behind aggression were not dealt with in the current study; therefore, they can be probed with their relations to professional success in the future studies. Thirdly, even though quantitative studies are believed to be more reliable in that they are objective, qualitative investigations can be conducted to find some deeper results since teachers can report everything precisely by keeping a diary and journal over time, and with the passage of time, more precise details can be revealed about teachers' feelings. All in all, every study has its own limitations even though it paves the way for further studies.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Yancheng Teachers University Academic Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships

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The triarchy of L2 learners' emotion, cognition, and language performance: Anxiety, self-efficacy, and speaking skill in lights of the emerging theories in SLA

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Given the bond between emotion and cognition underlying the broaden-and-build theory of positive emotions, positive and negative emotions have critical roles in cognitive skills. The aim of this review was to probe into the triarchic relationship between L2 learners' cognition, emotion, and language performance, reflected in the bond between self-efficacy, foreign language anxiety, and speaking skill, in light of the main emerging theories in the field of SLA underpinning this relationship. Moreover, the theoretical foundations, such as learners' cognitive performances, Bandura's self-efficacy theory, control-value theory, and positive psychology theory, were explicated in order to justify the relationship between self-efficacy and oral communication skill. Furthermore, the underlying theories such as attentional control theory, complex dynamic system theory, affective filter theory, and cultural schema theory, which relate foreign language anxiety to speaking skill were scrutinized in this review. The review also expounded on the implications and future directions for EFL teachers, material designers, teacher educators, educational policy-makers, and advisors. The ideas can improve their awareness of learner self-efficacy, foreign language anxiety, and oral communication skill in educational contexts.

KEYWORDS

foreign language anxiety, self-efficacy, speaking skill, oral communication, emotion, cognition

Introduction

Mastery of speaking skill in English is a priority for many second-language and foreign-language learners. The reason lies in the fact that speaking, as a significant skill, is the prime means of communication (Sadullaevna and Safarovna, 2020). Likewise, speaking in a foreign language will boost practical communication skills in a way that reading or listening alone will never do, which is why speaking is stressed so

much among L2 language learners (Al Zoubi, 2018). Many language learners find it difficult to express themselves in spoken language. They often have difficulty expressing their thoughts effectively. They stop talking because they face psychological barriers or can't find the right words and phrases. If teachers want to help learners dominate problems in learning the speaking skill, they need to identify some factors that affect their speaking performance. Speaking performance of learners is influenced by factors such as environments, affective factors, listening skill, and feedback during speaking tasks (Tuan and Mai, 2015). Learners of English as a second language (ESL) often encounter discouraging situations, in and out of the classroom, that make it difficult for them to maintain the positive cognitive state needed to achieve their desired learning objectives. In order for students to successfully face such challenges, cognitive interventions may be needed to counteract the negative cognitive state that students might experience (Bandura, 2006). One such state is a lack of self-efficacy. Self-efficacy refers to an individual's belief about his or her capabilities to perform the specific tasks required to produce certain outcomes (Bandura, 2012).

According to Bandura (2001 p. 10), "unless people believe [that] they... by their actions... can produce desired results... they have little incentive to act or to preserve in the face of difficulties". There is a growing body of self-efficacy research in educational contexts among teachers (Seifalain and Derakhshan, 2018; Fathi and Derakhshan, 2019; Fathi et al., 2020a, 2021), and learners (Ghonsooly et al., 2012; Elahi Shirvan et al., 2018; Fathi and Derakhshan, 2018; Fathi et al., 2020b). Moving on to the important individual-difference variable of this review, anxiety is another most influential factor in the domain of L2 learning (Kasbi and Elahi Shirvan, 2017; Elahi Shirvan and Taherian, 2018; Elahi Shirvan et al., 2018; Fathi et al., 2020b; Saghafi and Elahi Shirvan, 2020). In the presence of anxiety, L2 knowledge often gets affected and deteriorates (Dörnyei, 2005). According to Arnold and Brown (1999), "anxiety is quite possibly the affective factor that most pervasively obstructs the learning process" (p. 8). Based on Dörnyei and Stephen (2015), anxiety is not a monolithic factor, but rather a complex construct that is made up of different components.

Yashima et al. (2004) strongly suggested that future research on oral communication in English should focus on contextual or situational positive and negative variables that make a person enhance oral communication in English classroom settings, and outside classes. In other words, it is necessary to look into how negative and positive emotional constructs influence communication behavior. Accordingly, this review examines the theoretical underpinnings of the relationship between self-efficacy, foreign language anxiety and speaking skill. The results of this study will also influence language teachers, teacher trainers, and course/program material designers. This research can enable English teachers to understand what variables determine oral communication in English among EFL learners

and allow them to design effective teaching pedagogy and activities to improve oral skill.

Given the advent of the positive psychology movement in the field of SLA in recent years (Wang et al., 2021), attention has been drawn to the integration of both affective and cognitive variables and its association with language-related outcomes such as oral communication. The broaden-and-build theory of positive emotions (Fredrickson, 2001) puts emphasis on the tight link between language learners' affective and cognitive traits. Thus, language learners' belief systems and appraisal of their linguistic competencies are supposed to be susceptible to their positive emotions. Despite the salience of this theoretical framework of positive emotions, the link between cognitive and emotional variables and their ties with L2 outcomes have hardly been addressed yet.

Review of literature

From a theoretical perspective, it should be noted that the link between L2 learners' emotion and cognition, as reflected in anxiety and self-efficacy, can be supported by Fredrickson's broaden-and-build theory of positive emotions (Fredrickson, 2001). Based on this theory, individual cognitive capacity and belief systems can be built and broadened by their positive emotional experience. In what follows, since speaking skill (oral communication) has been mainly investigated as an outcome of anxiety and self-efficacy in the field of SLA, and also due to the word limits of the journal, it has been incorporated in the sections on its association with self-efficacy and anxiety.

The concept of learner self-efficacy

The notion of self-efficacy is summarized by Oxford and Shearin (1994), as a "broadened view of expectancy which is drawn from social cognition theory" (p. 21). According to Bandura (1986), self-efficacy refers to "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). He asserted that self-efficacious individuals rely on their own competence to deal with demanding activities, and carry out the required strategies to be effective in forthcoming situations. Jeong et al. (2021) stated that self-efficacy specifies students' confidence in arranging their learning process and influences their apprehension of cognitive growth. Schunk and Pajares (2010) also indicated that individuals with higher levels of self-efficacy are inclined to have higher intrinsic interest, set themselves thought-provoking objectives, and keep a strong commitment to activities.

Bandura (1997) listed four primary sources of self-efficacy beliefs as (1) enactive mastery experiences, (2) vicarious experiences, (3) verbal persuasion, and (4) the physiological

and affective state of an individual. Zhang and Ardasheva (2019) stated that enactive mastery experiences, are the most significant cause of self-efficacy. They mentioned that enactive mastery experiences are related to an individual's insight over his/her own capability to positively undertake a specific task informed by earlier accomplishments. They mentioned that enactive mastery experiences are related not only to individuals' perception of their capability, but also to the task's difficulty, and the amount of effort they will exert to accomplish the task. According to Wilde and Hsu (2019), vicarious experiences, as the second source of self-efficacy, are concerned with the social comparison of a person's performance to that of others with similar abilities. El-Abd and Chaaban (2021) asserted that observing others' comparable capabilities can improve one's self-efficacy by approving the sufficiency of his/her own knowledge, abilities, and approaches. Verbal persuasion, the third source of self-efficacy, refers to "socially persuasive feedback, comments by significant others regarding one's performance" (Bandura, 1997, p. 20). Wangwongwiroj and Yasri (2021) mentioned that constructive comments emphasizing an individual's aptitudes or achievements would improve self-efficacy. The physiological and affective state of an individual, the fourth source of self-efficacy, is related to individuals' capability to control bodily and emotional stress reactions (e.g., breathing and anxiety) over task performance (Webb-Williams, 2018).

Underpinning theories in the relationship between learners' self-efficacy and oral communication

Bandura's self-efficacy theory is considered a theoretical construct in the relationship between self-efficacy and oral communication. According to the theory of self-efficacy (Bandura, 1997), individual behavior is subject to awareness of and congruence with the anticipated results, which inevitably affect a person's learning outcomes. Nur and Butarbutar (2022) stated that Bandura's self-efficacy theory stems from motivation. In simple terms, motivation is about the students' self-view of their ability to complete tasks. When operating at that own rate, it could be suggested that the improvement in self-awareness could improve self-efficacy as well. Based on this theory, self-efficacy has an impact on people's feelings, beliefs, and behaviors. In terms of emotions, a low sense of self-efficacy is associated with despair, anxiety, and helplessness. Individuals with low self-esteem and pessimistic perceptions of their accomplishments and personal growth are equally vulnerable. In terms of thinking, a high sense of competence aids cognitive processes and scholastic accomplishment (Nur and Butarbutar, 2022). People with strong self-efficacy put in more effort and remain with it long after taking action than those with low self-efficacy. When they experience impediments, they improve faster and remain committed to their purposes

(Habibi and Yazdani, 2016). Using Bandura's self-efficacy theory, Zhang et al. (2020) studied English for academic purposes (EAP) and English-as-a-foreign-language (EFL) literature, found a significant relationship between self-efficacy and speaking performance. Zhang and Ardasheva (2019) examined the relationship between four sources of Chinese English learners' self-efficacy, including enactive mastery experience, vicarious experience, verbal persuasion, physiological, affective states, and their oral communication. Their findings largely support Bandura's hypothesized sources of self-efficacy, with enactive mastery experience, vicarious experience, verbal persuasion, but not physiological affective states, significantly predicting learners' oral communication skill.

Self-efficacy, as a positive emotional state, can influence foreign language performance. Based on Pekrun's (2006) control-value theory, emotional states influence learners' motivation to learn, their learning strategies, and self-regulated learning, thereby influencing their learning achievement. Pekrun et al. (2002) stated that the control-value theory postulates that the subjective control and subjective value, as the types of cognitive appraisals, are central components of achievement emotions.

Luo et al. (2016) defined subjective control as "an individual's perceived causal influence of the self over achievement activities and outcomes" (p. 2). They mentioned that subjective control can take the forms of retrospective causal attribution and prospective expectancy of success or failure, often operationalized as self-efficacy, academic self-concept, or academic control. There are two types of subjective value. Intrinsic values stem from academic studying, including a feeling of pleasure or satisfaction from doing academic tasks or achieving academic success. Extrinsic values are also described as individual's supposed instrumental usefulness of academic actions or outcomes for achieving other goals. These two types of appraisals combine to evoke various achievement emotions. Pekrun (2017) stated that control-value theory is considered an inclusive framework for examining antecedents and consequences of student emotions. Roick and Ringeisen (2017) argued that the control-value theory offers a sequence of cognitive predictors assumed to trigger anxiety in performance-related test situations. They mentioned that high dispositional control beliefs like self-efficacy improve mastery perceptions in achievement situations, thus reducing the anticipated risk of failure.

Positive psychology is regarded as another theory that can relate learner self-efficacy to linguistic skills. Traditionally, psychologists have highlighted the deficiencies and negative emotions among learners and teachers, and they have made an effort to decrease them (Deweale and Alfawzan, 2018; Derakhshan et al., 2021). Positive psychology, as a modern approach to learning of foreign language, has been expanded in recent years (Wang et al., 2021). It tries to illuminate the optimal educational situations and processes for the achievement of

learners and teachers (Jiang, 2020). Fredrickson and Cohn (2008) stated that positive affect is the major trigger of active engagement with the learners' environment and his/her will to participate in classroom activities. Fathi et al. (2021) categorized the constructs of positive psychology into empathy, enjoyment, happiness, contentment, optimism, tolerance, flow, love, and mindfulness, which can result in a person's satisfaction, self-efficacy, and success. Through applying principles of positive psychology, higher education practitioners can help improve self-esteem, self-concept, and self-efficacy among college learners (Costello and Stone, 2012). On the other hand, Abdolrezaipour (2018) stated that positive emotions tend to widen learners' viewpoint and open their viewpoint to absorb the language. Also, MacIntyre et al. (2019) asserted that positive psychological interventional studies used numerous approaches in order to enhance EFL learners' skills.

The concept of foreign language anxiety

Anxiety, as a negative emotion, is described anxiety as a state of sensitive awareness correlated with an augmentation in stress as a result of ambiguity (Wells and Matthews, 1996). Many researchers (e.g., Aydin, 2018; Ulupinar, 2018; Russell, 2020; Hu et al., 2021; Toyama and Yamazaki, 2021) have highlighted foreign language anxiety in the field of education. In an educational context, Horwitz et al. (1986) defined foreign language anxiety as "a distinct complex of self-perceptions, feelings and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (p. 127). Gardner and MacIntyre (1993) pointed out that "foreign language anxiety is fear or apprehension occurring when a learner is expected to perform in the second or foreign language" (p. 59). They linked it to the stimulation of the autonomic nervous system.

Horwitz et al. (1986) categorized foreign language anxiety construct into (a) test anxiety, (b) fear of negative evaluation, and (c) communication apprehension. Cakici (2016) mentioned that test anxiety is regarded as learners' fear of experiencing failure in academic evaluation in testing contexts. He also stated that negative evaluation is concerned with worrying about individuals' negative judgments. Communication apprehension, based on Horwitz et al.'s (1986) definition, refers to "a distinct complex of self-perceptions, beliefs, feelings, and behavior related to classroom language learning arising from the uniqueness of the language-learning process" (p. 28). Communication apprehension is a critical element in limiting the received comprehensible input, and it plays a vital role in determining accomplishment in educational contexts (Darmawangsa et al., 2020).

Studies have shown several sources of foreign language anxiety, such as minor levels of self-confidence

(Tridinanti, 2018), lower levels of self-efficacy (Bensalem, 2018), low levels of grit (Liu and Wang, 2021), lack of practice (Bárkányi, 2018), low levels of language proficiency (Teimouri et al., 2019), low levels of emotional intelligence (Chen et al., 2021), fear of making mistakes (Suparlan, 2021), insufficient input flooding, first language overuse, cultural background factors (Shan et al., 2020), socio-economic status (Ali et al., 2021), and teachers' negative impression about learners' academic performance (Liu and Wu, 2021).

Underpinning theories in the relationship between learners' foreign language anxiety and oral communication

To increase students' desire to communicate and use the language, affective factors should be carefully considered (Lee and Lee, 2020). Learners' cognitive performances have been affected by their foreign language anxiety. Mede and Kararmak (2017) pointed out that "foreign language anxiety significantly affects the domains of language achievement, learners' actual proficiency and performance, gender, prior foreign language experience, negative evaluation, and self-evaluation" (p. 119). Foreign language anxiety has been widely considered a leading factor in academic achievement and language proficiency (MacIntyre, 2017). Studies have testified that higher levels of anxiety are negatively correlated with foreign language proficiency, and with positive orientation, and peer emotional support (Zheng and Cheng, 2018). Regarding the relationship between foreign language anxiety as a negative type of emotion and cognitive skills, Fallah and Movahed (2014) indicated that there was a negative correlation between foreign language anxiety, and listening, reading, speaking, and writing skills, and learners' academic achievements were negatively influenced by anxiety. Hu et al. (2021) also found that learners' foreign language anxiety was negatively associated with their foreign language skills. Aghajani and Amanzadeh (2017) investigated the relationship between foreign language anxiety and oral communication performance, and they tried to determine to what extent foreign language anxiety affects the oral communication performance among adult EFL learners. They concluded that there is a strong negative correlation between the two variables which acknowledged the negative role of high anxiety in oral communicative performance of students.

The negative relationship between foreign language anxiety and oral performance can be attributed to Eysenck et al.'s (2007) attentional control theory. Muris et al. (2007) stated that attentional control theory explains the regulation of different attentional processes within the attentional system. They mentioned that attentional control refers to the individuals' capability to flexibly concentrate and change their attention

based on existing objectives. Wells and Matthews (1996) mentioned that anxiety can be characterized by inadequate control over disturbing opinions and attentional and cognitive predispositions, leading to an excessive concentration on undesirable incentives. It is worth noting that anxiety is negatively affected by input, processing and output as the phases of cognitive processing (MacIntyre and Gardner, 1994). Eysenck et al. (2007) argued that “attentional control theory proposes that increased anxiety results in reduced attentional control such that the effect of the goal-directed system is reduced and the influence of the stimulus-driven system is increased through preferential processing of task-irrelevant threat related stimuli” (p. 30). Eysenck and Derakshan (2011) asserted that attentional control theory also suggests that poor attentional control can be a risk factor for the development of high trait anxiety. They mentioned that threatening stimuli would capture attention, and the more state or trait anxiety individual experiences, the more likely ambiguous information would be interpreted in a threatening way and hence capture attention. Zhou et al. (2020) mentioned that Eysenck et al.’s (2007) attentional control theory can justify the reason behind the negative correlation between foreign language anxiety and cognitive processing performance. They maintained that foreign language anxiety limits the attentional control of learners in adverse situations, so that learners are more prone to threat-related stimuli or distractors.

The complex dynamic system theory is also used to justify the relationship between anxiety and oral communication. On the issue of second language speaking and anxiety from an ecological perspective, Kasbi and Elahi Shirvan (2017) conducted a case study on four intermediate level female students with an average age of 15 at five sessions of 90 min, to investigate EFL learners’ anxiety in oral performance from an ecological perspective based on nested ecosystems model and complex dynamic system theory. Their findings indicated that the events within the dynamics of classroom ecology can influence EFL learners’ anxiety in speaking performance differently. Highly anxious students can be very relaxed even in situations where others with low anxiety are highly anxious. They concluded that in some situations, context was important and unexpected anxiety increased in some students. On the other hand, in some cases “powerful forces like oral informal class assessments, teachers’ questions, did not have any impact on all the participants in a similar way, which was in line with the complex dynamic system theory principles of non-linearity in system behavior” (p. 18).

Another theory that can justify the relationship between foreign language anxiety and oral communication is affective filter theory. Wang and Wu (2020) indicated that when learners’ affective filters are high, the mental block created makes it impossible for them to acquire or be comfortable with the input. Thus, that filter level will create a hostile environment in which the students feel insecure about themselves and their capacities to use the language to communicate. Garcia Uquillas (2021), using affective filter theory, found out that

anxious learners underperform in foreign language production. He argued that affective filter, including emotional constructs of anxiety, motivation, and self-efficacy, influences foreign language learning. He mentioned that instructors should lower the affective filter because all of the factors involved in it, such as higher anxiety, lower motivation, and lower self-efficacy may bring a negative influence on language production. That is, the affective filter plays an important role in the foreign language learning process. All the aspects involved in it do affect the way in which learners acquire the language. Therefore, educators should have the capability to preserve the filter on the right levels. Fernández Silva (2019) investigated the effect of using audio-visuals on EFL learners’ affective filter to enhance their oral communication. His study demonstrated that audio-visual materials can lower learners’ affective filter, which reduces their foreign language anxiety and their speaking fluency increases. His study revealed that some different language activities can facilitate the reduction of negative emotions like foreign language anxiety, which, in turn, boosts learners’ communicative skills. He concluded that as students are motivated, with low levels of anxiety and with confidence, they can make use of more vocabulary, grammar, etc., to finally become more fluent when they speak. Nath et al. (2017) asserted that some learners had a high filter which had negative consequences on their oral production of the target language, whereas other learners had a low filter that encouraged the appropriate oral production of the language and use of the metacognitive strategies for their own sake. In a few words, the affective filter has an incidence on how much students can make use of strategies to overcome difficulties when learning a language.

Another theory for justifying the relationship between foreign language anxiety and speaking skill is Anderson’s (1977) cultural schema theory. Turkan and Çelik (2007) argued that the consideration of cultural issues is very significant in foreign language learning. They asserted that familiarizing with cultural issues can reduce anxiety, and it can be effective in foreign language communication. Using Anderson’s cultural schema theory, Diep et al. (2022) found a significant correlation between Indonesian EFL learners’ foreign language anxiety and oral communicative skill. They found out that cultural-based instruction can be a mediating factor in developing oral performance and reducing foreign language anxiety. Based on learners’ cultural schema theory, they argued that cultural familiarity can help learners outperform in foreign language learning. They also mentioned that triggering learners’ cultural schema can develop speaking skill. Bilokcuoglu (2014) stated that triggering background knowledge can result in language learning achievement. He asserted that learners’ anxiety in foreign language learning can be reduced by schemata activation. This type of theory is based on preceding knowledge about the educational context, which can contribute learners to link new information to that earlier knowledge. This association helps them in language learning education (Bilokcuoglu, 2014).

Implications and suggestions for further research

This review examined the theoretical underpinnings of the relationship between EFL learners' self-efficacy and oral communication. Some theories, such as Bandura's self-efficacy, Pekrun's (2006) control-value, and positive psychology have been presented to elucidate the relationship between EFL learners' self-efficacy and oral communication. Also, this review considered the theoretical foundations of foreign language anxiety and oral communication. The theories, such as attentional control theory, complex dynamic system, affective filter, and cultural schema can be the basis for the relationship between foreign language anxiety and oral communication. Revisiting the associations among the affective, cognitive, and performance-related variables within the L2 context contributes to our achievement of a deeper understanding of the credibility of the broaden-and-build theory of positive emotions in this context. This means that language learners' main sources of self-efficacy such as mastery and vicarious experiences as well as the psychological feedback and states should be viewed from the perspective of the emotions they experience. Any mastery or vicarious experiences *per se* might not lead to high levels of L2 skills such as oral skills unless learners go through positive emotions such as enjoyment. This review includes some pedagogical implications for teachers, learners, syllabus designers, teacher educators, educational policy-makers, and advisors. Also, different associations and related authorities can benefit from this review. For instance, a better understanding of emotional and cognitive factors in oral communication in the target language may help language teachers improve the communicative language teaching approach and curriculum design to provide more communication opportunities for language learners, more importantly, encourage actual engagement in communication behaviors, and finally, facilitate second/foreign language learning and acquisition. More specifically, language instructors can enhance the level of oral production through the following ways: raising students' opportunity to talk by reducing the amount of teacher talk and allowing adequate wait-time; letting students produce language without restrictions, uncontrolled use of language; take responsibility to engage all students evenly and equally in classroom activities; videotaping themselves in the classroom, reflect on their interactional behavior to see if it has extended or limited the opportunity for the students to enter dialogs; increasing their own awareness of what interaction strategies work or do not work with specific students, and giving the instruction that lends itself to more giving and receiving of unpredictable information.

Another implication of this review is to develop learners' self-efficacy to enhance their oral communication. Teachers may also benefit from this review in that they must be aware of the positive correlation between the learners' self-efficacy

and their proficiency. They have to take care of and help the learners who suffer from poor self-efficacy and help them improve in terms of self-regulation, self-esteem, and self-concept as these traits form the bases of self-efficacy (Ghonsooly and Elahi, 2010). It is believed that instructing learners on techniques to improve their self-efficacy should be given the same priority as other language skills in the EFL context. Self-efficacy could have an important role in the application and use of the approaches and methodologies in the EFL context. Instructors can use moderately-difficult activities which can empower learners with low levels of self-efficacy. The activities should not be too difficult to curb learner self-confidence in doing tasks. Teacher support, including, scaffolding, assigning sufficient time, decomposing complex tasks into simple phases, and explicating the task in technology-supported education is influential for the enhancement of learner self-efficacy. This can produce insight into the reasonable challenge and equalizes the complexity of technology-supported tasks. Praising and giving feedback to learners are also important for the improvement of learner self-efficacy. Moreover, teachers should not compare the performances of learners with each other. Teachers can provide learners with some strategies such as self-verbalization. For example, they can motivate learners to express the procedure of learning grammatical points or vocabulary aloud and give feedback on their effort. Moreover, teachers can set a cooperative context, rather than a competitive one, to increase learner interaction and scaffolding, improving learner self-efficacy. They can also ask learners to write comments about their feelings and progressions in technology-supported contexts (see Brown, 1994; Aghaei et al., 2020).

The review revealed that anxiety has a detrimental effect on learners' speaking performance. Thus, in order to encourage students' oral communication and enhance their involvement in the class activities, teachers need to reduce students' FL anxiety in the class by making the class atmosphere more friendly and comfortable. In a less threatening atmosphere, learners' anxiety may reduce while their level of perceived competence increase. Therefore, teachers need to make a relaxed and intimate atmosphere to increase oral communication skill among students and as a result, enhance language learning in the class. Using activities like role play, small group work, pair work, small group discussion, and presenting the lecture may make the class atmosphere less threatening for students. Moreover, teachers should not directly suppose that poor performance by unresponsive and unwilling students is absolutely due to their lack of motivation, aptitude or ability; they should instead identify the possibility that some students might be suffering from anxiety. Hence, rather than disregarding students' speaking anxiety or leaving them to cope with it on their own, EFL teachers should consider it as a reality in EFL classrooms and attempt to prepare learners with useful strategies to help them cope with multiple anxiety-producing situations. Similarly, it is suggested that EFL teachers hold

seminars and workshops to inform students about the nature of speaking anxiety and how it can be effectively handled. It is proposed that EFL teachers provide English classes with useful strategies such as communication games. Teachers, via applying such games, may keep students from emotional stress through effective communication, help them build habits of interaction and participation, assist them in constructing their sense of enjoyment, enthusiasm, and feeling of satisfaction, enhance their predisposition and motivation toward language learning, work together in a friendly relationship, confidential, relaxed, supportive and sociable atmosphere, and consequently to foster their self-confidence to be able to overcome their own anxiety. It is also recommended that teachers while communicating with their classes, comprehend learners' concerns in their learning process, and try to open the classroom climate.

To support EFL learners to become better communicators, it seems to be important to handle communication challenges, specifically in speaking area. To this end, it is suggested that textbook compilers, before designing a specific textbook, firstly, attempt to recognize the extensive area of sources of speaking anxiety in EFL classrooms, to obtain a comprehensive and realistic view from students' speaking difficulties, then include effective and useful activities in English textbooks to help teachers reduce learners' communication apprehension and assist students to cope with multiple speaking anxiety-generating situations. To this aim, textbook compilers are recommended to design or compile applicative communication games and integrate them precisely into lessons. These games-oriented lessons may help teachers be able to construct a friendly relationships amongst students, establish a supportive and stress-free classroom atmosphere, promote learners' motivation toward language learning, and accordingly reduce the level of speaking anxiety in EFL learners.

Moreover, teacher training courses can reach their ideal goals by considering the importance of self-efficacy, anxiety, and willingness to communicate. In order to increase learner self-efficacy, they can implement some instructional changes in a large population of teachers by holding academic workshops. Educational policy-makers should hire experienced teachers, as the instructive experience can be an important issue for increasing self-efficacy and lowering anxiety among learners. They can ask teachers to do their best within varied educational contexts. They must build up teaching effectiveness through providing contexts for observations of other teachers' activities and mastery experiences to decrease foreign language anxiety in particular ranges of the instruction. They should also provide critical thinking, creativeness, and motivation to the education in classrooms, which encourages self-efficacy (see [Aghaei and Rad, 2018](#)). The importance of self-efficacy, anxiety and speaking skill can motivate advisors to expand their horizons to identify learners' sources of foreign language anxiety, and self-efficacy, and to probe the reasons for increasing oral communication skill.

Many cross-sectional studies have been done on the role of emotional constructs in learners' oral communication. A longitudinal qualitative study is necessary to examine the effect of emotional constructs on learners' oral communication in English in various situations both inside and outside class. It would also prove fruitful to examine instructor's perceptions of the communication behaviors of their learners. In order to increase learners' speaking skill, teachers need to monitor various aspects of teaching styles and classroom management. Moreover, the relationship between oral communication skill and other positive psychological constructs, such as academic engagement, well-being, enjoyment, and resilience can be investigated in the future ([Rajabi and Ghezelsefloo, 2020](#)). Factors that could be more closely examined include the relationship between age, gender, background, personality, intercultural communication experiences, and learners' oral communication skill. Finally, the relationship between positive emotional constructs and writing, reading, and listening skills should be studied in the future.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Modeling the interplay between emotion regulation, self-efficacy, and L2 grit in higher education

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Teaching in higher education is critical and fraught with potential vicissitudes, which necessitates the presence of efficient professors armed with positive attributes to perform effectively. Although it is generally accepted that emotion regulation (ER) has numerous benefits for language teachers, in particular university professors, little is known about how it interacts with two other important constructs, i.e., self-efficacy and L2 grit. Furthermore, the effect of ER on L2 teacher grit has not been sufficiently investigated. To fill this gap, the current study was to test a structural model of English as a Foreign Language (EFL) university professors' ER, self-efficacy, and L2 grit. The participants were 356 Iranian EFL university professors who completed the Language Teacher Emotion Regulation Inventory (LTERI), the Teacher Sense of Efficacy Scale (TSES), and the L2-Teacher Grit Scale (L2TGS). The results of Structural Equation Modeling (SEM) revealed that ER and self-efficacy were strong predictors of L2 grit. Moreover, the significant role of self-efficacy on ER was discovered. The implications of this study may foster effective teaching in higher education, particularly during the COVID-19 pandemic and its impacts on education.

KEYWORDS

higher education, EFL university professors, ER, self-efficacy, L2 grit

Introduction

Teaching at university is very demanding, and university professors should use a wide range of skills to teach and act effectively. It is necessary that teachers, in particular university professors be aware of what qualities and skills enhance an efficient instruction. Considering the indisputable relevance of teacher emotion and cognition to their effectiveness, it is prominent that teachers utilize useful methods in order to manage experienced emotions and boost cognitive affairs. In the domain of effective teaching, in particular language teaching, it seems plausible to presume

that a higher level of emotional competencies helps teachers to manage and modify their performance. As Wubbels and Levy (1991) put it, emotional competencies affect not only the effectiveness of instructors but also the cognitive and emotional development of students, leading to successful and effective teaching. ER as a complex process refers to different strategies used for initiating, hampering, or modifying individuals' position or behavior in a specific circumstance (Gross, 1998a). Teacher emotion regulation (TER) refers to "their capability to manage emotional experiences and expressions" (Burić et al., 2017, p. 2). Through the lens of emotion regulation (ER), teachers are able to evaluate and modify the intensity and duration of the emotional experiences at the workplace (Chang and Taxer, 2020). In ever-changing and challenging teaching contexts, TER acts as a shield to protect and immune teachers in the face of plights. The role of TER is more significant in language teaching because it is an emotionally charged endeavor (Tsang and Jiang, 2018; Richards, 2020).

Another key construct on the road to university professors' professional growth is self-efficacy. According to Bandura (1997, 1986), self-efficacy may be described as an individual's perception of their own capacity to successfully complete or display an activity or sequence of behaviors in a certain setting. From another view point, self-efficacy is defined as a cognitive, motivational, emotional, and selection-based regulator of performance (Bandura, 1994). Self-efficacious people set more challenging goals and envisage success. Based on Bandura (1997), self-efficacy beliefs play a significant role in the regulation of motivation and boost individuals' confidence in their abilities, which may also decrease the stress and depression that self-efficacious people experience in threatening or demanding conditions.

More specifically, self-efficacy beliefs influence the kind of activities and environments that individuals select. Self-efficacy beliefs affect individuals' thinking, their future actions, their coping strategies while facing emotional demands, and the attempts they put forth in a given endeavor (Bong and Clark, 1999; Bandura, 2012). Self-efficacy is both a personal and social construct because each person functions individually and collectively. Individuals' worries about the effectiveness of the group as a whole have an impact on the activities they choose to pursue together, how much attempt they make to perform it, their persistence and tolerance, and their probability of success (Bandura, 1994). Collective efficacy refers to a group's common beliefs in its ability to achieve goals and desired tasks (Schunk and Pajares, 2002). Teacher self-efficacy is defined as to the extend they have conviction to successfully execute behaviors to achieve educational objectives (Gibson and Dembo, 1984). Efficacious teachers tend to support, persevere during challenges, open to new ideas, and implement helpful teaching strategies (Gordon et al., 2022; Ma, 2022). Teachers with higher perceived self-efficacy are more engaged in their work activities (Burić and Macuka, 2017; Li et al., 2019) and willing to

implement curriculum reform (Cerit, 2019). Efficacious teachers also deal with Students' misbehavior and demotivation more efficiently (Burić and Kim, 2020).

The metaphor of teacher L2 grit is a personality trait resulting from an amalgamation of perseverance of attempt and teaching passion for long-term objectives (Sudina et al., 2021). Teacher L2 grit is quite uncharted territory, which awaits further research, and its relationships with other teacher-related construct is still under a shadow, in particular in higher education. Teacher L2 grit might be of immediate relevance to TER and self-efficacy. Despite its dominant role, and perhaps because of the novelty of teacher L2 grit, research has not focused on the relationship between TER, self-efficacy views, and L2 grit. Especially within the realm of higher education. To this end, the present study set out to model the relationships between ER, efficacy beliefs, and L2 grit among EFL university professors. Exploring the relationship between these constructs, which are conducive to effectiveness may envision a picture of EFL of university professors' ER, self-efficacy, and L2 grit and accordingly their effectiveness.

Literature review

In the following sections, the relevant literature on teacher emotion regulation, teacher self-efficacy, and teacher L2 grit is briefly reviewed.

Teacher emotion regulation

ER is "a heterogeneous set of physiological, behavioral, and cognitive processes" (Gross and John, 2003, p. 348) that individuals apply to manage their emotional experiences. As Gross (1998a) stipulated, emotions are processes that unfold over time, and ER is a dynamic process that extends beyond a single episode. That is, a specific situation is attended to, appraised, adjusted, and generates emotional responses (Gross, 2014). According to Gross and Barrett (2011), the activation of a regulatory objective, the engagement of regulatory mechanisms, and the alteration of the emotion trajectory are the three components that combine to produce ER. The activation of a goal is the first constituent of ER (Gross and Barrett, 2011). The activation of a goal might take place either inside oneself (via intrinsic ER) or within another individual (extrinsic ER) (Gross and Barrett, 2011). Intrinsic ER describes instances in which people modulate their own emotions (ER in self), while extrinsic ER is when one person regulates another person's emotions (ER in another). Specialists consider intrinsic ER for studies relevant to adults (Gross, 1998b), while in working with infants and children, extrinsic ER is highlighted (Cole et al., 2004). On some occasions, both intrinsic and extrinsic ER are applied; for instance, in one situation, a person may regulate another

person's emotions (extrinsic regulation) to calm himself/herself down (intrinsic regulation) (Gross, 2014).

The second constituent of ER refers to the engagement of the processes involved in changing emotion trajectory. Different processes are involved in ER that may be explicit or implicit (Gross, 2014). If ER happens with conscious awareness, it is considered as explicit ER. For instance, when a person tries to consider the bright side of a bad happening to cheer themselves up, they are employing explicit ER (Gross, 2014). ER activities may also happen unconsciously and implicitly (Gross, 2014). For example, when individuals quickly turn their attention away from potentially annoying materials (Gross, 2014). In previous studies, explicit and implicit processes in ER are considered separately (Masters, 1991). However, it is recommended to consider ER processes as a spectrum that extends from overt, intentional, and deliberate control to covert, unconscious, seamless, and automatic regulation (Gyurak et al., 2011; Vadivel and Beena, 2019). The effect of ER on emotion dynamics is the third core feature of ER (Thomas, 1990). In this regard, Gross (1998b) pointed out that the ER can have an increased or decreased latency, rising time, size, length, or offset depending on the individual's objectives (Gross, 1998b). Moreover, as the emotion develops, ER may alter the degree to which the various components of the emotional reaction cohere (Dan-Glauser and Gross, 2013; Vadivel et al., 2021).

Over the years, different ER models were developed to describe the involved procedures. The Hot/Cool System of ER, for example stimulates the processes involved in ER into willpower (Mischel and Ayduk, 2004). It is imagined that the cool system generated in adulthood helps individuals to keep calm in intensive emotional disturbances. Hot system developed in childhood working as quick emotional processing (Sutton and Harper, 2009; Liu et al., 2021). Another suggested model for ER is the Resources or Strength Model, which is supported by self-regulation theory (Schmeichel and Baumeister, 2004). A more comprehensive model is the process model of ER (Gross, 1998a,b, 2014; Gross and Thompson, 2007), which stipulated five temporal points in the process of emotion generation as follows: situation choice, situation adjustment, attentional deployment, cognitive transformation, and reaction modulation. According to the definitions provided by (Gross, 1998a,b), these five points illustrate five different families of ER processes.

The first four families of strategies (i.e., situation choice, situation adjustment, attentional deployment, cognitive transformation) are grouped as antecedent-focused. But, the fifth set (i.e., reaction modulation) modulates the aspects of the fully developed emotional response (Gross and Thompson, 2007). Situation selection, as the first step in ER, refers to employed strategies to decrease the likelihood of any happening that may trigger an undesirable emotion. Situation modification processes enhance changing the features of an occasion that evoke a specific emotion. Attentional deployment refers to individuals' attempts to redirect their attention to regulate their

emotion. Cognitive change mainly alters the cognitive appraisal of a situation that triggers emotional experience by reforming an individual's thinking either by changing the situation or an individual's capacity to modify it. Response modulation, as the last process, refers to various strategies to intensify, reduce, or extend the physiological, experiential, or behavioral responding components of emotional responses (Gross, 2014).

Regarding Language TER, recently a model was proposed by Heydarnejad et al. (2021b). This model was generated based on the existing literature on TER (e.g., Burić et al., 2017; Chang, 2020; Chang and Taxer, 2020; Richards, 2020; Alipour et al., 2021; Chen and Cheng, 2021), ER (Gross and Thompson, 2007; Taxer and Gross, 2018) in particular, Gross' process model of ER (1998a,b, 2014). This suggested model for language TER involves six dimensions as following: situation selection, situation modification, attention deployment, reappraisal, suppression, and seeking social support. Situation selection, situation modification, and attention deployment were formulated based on Gross' process model of ER (1998a,b, 2014). The two dimensions of reappraisal and suppression were generated based on Gross and John's findings (2003). Seeking social support, as the last dimension originated from Jennings and Greenberg (2009) as well as Taxer and Gross (2018).

As reviewing the existing literature on TER, in particular university professors reflected, this important concept is still in its infancy and calls for more research to fill this gap. The existing literature confirmed the contributions of ER to other teacher related constructs. For example, Morris and King (2018) investigated the influence of ER in controlling the frustration experienced by university professors in their classes. They found that using contextually dependent ER behaviors assist language university professors in improving their confidence levels and manage their stress. In another study by Chang and Taxer (2020), TER strategies regarding classroom misbehavior were examined. According to their outcomes, those teachers who reappraised were less touched by their learners' misbehavior; they also experienced less suppression. Taking a similar path, Morris and King (2018) found that emotion regulatory strategies were the best mechanism for managing frustrations among EFL university professors. In a mixed method study, the learners' attitudes toward their teachers' emotions and ER in the teaching processes were investigated by Jiang et al. (2016). Based on their findings, antecedent-focused emotion regulatory strategies were preferable to response-focused ones. Furthermore, they concluded that teachers' reappraisals increased positive-emotion expressions. Recently, Fathi et al. (2021) investigated the relationship between teacher reflection, self-efficacy, burnout, and ER. Their findings suggested that teacher self-efficacy and reflection predicted ER. The negative relationship between ER and burnout was also confirmed by this study. Parallel with this line of inquiry, the mediator roles of teacher self-efficacy and ER on psychological wellbeing in an EFL context was concluded (Xiyun et al., 2022).

Teacher self-efficacy

Self-efficacy refers to individuals' impressions about their abilities to execute behaviors, leading to specific achievements (Bandura, 1982). Self-efficacy does not necessarily involve affective reactions toward the self, but it is mainly a cognitive judgment of one's ability that attach diverse weights to different sources of information when arriving at such perception (Bong and Clark, 1999). Teacher self-efficacy is defined as "the teacher's conviction in his or her capacity to plan and carry out a course of action necessary to effectively complete a given task in a specific situation" (Tschannen-Moran et al., 1998, p. 22). Self-efficacy enhances teachers inter and intra-relationships (Martin and Mulvihill, 2019) and increases their passion for instructional practices (Moè, 2016). Furthermore, teachers' efficacy beliefs influence Students' motivation, achievement, and efficacy (Tschannen-Moran et al., 1998). From another perspective, it is evident that teachers' self-efficacy predicts their attitude, teaching style, self-regulation, commitment, motivation, and effectiveness (Barni et al., 2019; Fathi and Saeedian, 2020; Fathi et al., 2021; Heydarnejad et al., 2021a; Amirian et al., 2022) and supports Students' academic achievement (Martin and Mulvihill, 2019).

In the current study, the Teachers' Sense of Efficacy Scale was utilized (Tschannen-Moran and Hoy, 2001), which includes three subscales (efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management). The efficacy in student engagement focuses on the teachers' efficacy beliefs, which in turn fosters support for Students' learning and motivation. The instructional strategies consider the instructor's capability to modify teaching to achieve learner needs. The classroom management evaluates the instructor's efficacy in managing learner behavior (Tschannen-Moran and Hoy, 2001; Azari Noughabi et al., 2022; Shirvan and Alamer, 2022).

Teacher self-efficacy is generated from Bandura's self-efficacy theory, which concentrates on the teacher's beliefs of their abilities to involve their students in the learning processes effectively with the aim of realizing teaching and learning objectives efficiently (Tschannen-Moran et al., 1998; Sudina et al., 2020; Heydarnejad et al., 2021a). Bandura (1997) stipulated sources of efficacy beliefs as mastery experience, vicarious experience, social or verbal persuasion, and physiological or affective states. Mastery experience has the most influential role in self-efficacy beliefs, suggesting that successful performance increases self-efficacy (Bandura, 1997; Zarrinabadi et al., 2022). In other words, the perception of successful performance facilitates perceived self-efficacy and ensures future proficiency and success. In contrast, the perception of unsuccessful performance weakens efficacy beliefs and leads to the expectation that future performance will also be inefficient.

As Helsin (1997) stated, self-mastery may be accomplished by disassembling a difficult challenge into its component parts, which will increase the likelihood of one's first achievement. The second significant influence is rooted in observing other similar people to perform a behavior successfully. It can provide individuals with ideas about successful performance (Tompson and Dass, 2000). The third source is social or verbal persuasion which is originated from other people. Successful persuasion enhances individuals' beliefs in their abilities and ensures that future achievement is achievable (Wolfe, 1997). Whereas, negative persuasion may decrease self-beliefs. According to Schunk and Pajares (2002), the most contributing influence of social persuasion revolves around initiating a task, trying new strategies, and attempting hard to succeed. The fourth source, psychological and affective states such as engagement, anger, and anxiety provide information about efficacy perception and enhance the sense of proficiency. Therefore, attempting to reduce negative experiences and modifying negative debilitating states to positive facilitator states may help amend the perceived self-efficacy beliefs. The influence of these sources on self-efficacy is not automatic, but cognitively weighted and assessed (Bandura, 1997).

The importance of teacher self-efficacy among psychologists, educationalists, and social scientists has fueled intensive research over the last decades. For instance, Burić and Kim (2020) found that teacher self-efficacy predicts classroom management, cognitive activation, and supportive climate. Similarly, Burić and Frenzel (2019) concluded that teacher self-efficacy is associated with anger in a negative direction. In the same vein, Li et al. (2019) affirmed that teachers' work engagement and self-efficacy were positively related. The beneficial effect of teachers' motivations on their self-efficacy, openness to change, and self-transcendence was confirmed by Barni et al. (2019). To picture the possible impact of teachers' self-efficacy and collective teacher efficacy on their psychological wellbeing, a study was conducted by Fathi et al. (2020) in the Iranian EFL context. Their data analysis indicated that teacher self-efficacy was a stronger predictor of psychological wellbeing than collective teacher efficacy. In a recent study, the contribution of critical thinking and self-efficacy beliefs to teaching style preferences among university professors was concluded (Amirian et al., 2022). In the same vein, the contributions of EFL teachers' self-efficacy and creativity on their Students' academic achievement was confirmed by Ma (2022).

Teacher L2 grit

The Grit theory was introduced by Duckworth (2016), which emphasized that the reciprocal relationships of enthusiasm and persistence affected individuals' potential to achieve their goals effectively. As Duckworth et al. (2007)

defined grit refers to “working strenuously toward challenges, maintaining effort and interest over the years despite failure, adversity, and plateaus in progress” (pp. 1,087–1,088). Thus, enthusiasm and persistence are the key constructs in grit formation (Duckworth, 2016). Enthusiasm is a feeling of eager interest in or desire for a special subject or activity. Persistence is an element of the trait-level grit that provoke individuals to dedicate themselves to competence activities with long-term success (Duckworth, 2016). According to Dale et al. (2018), Grittier people have positive attitudes toward life and show high job dedication. Grit is enhanced when individuals understand the difference between high-priority and low-priority objectives and learn how to manage their energies (Hejazi and Sadoughi, 2022; Lan, 2022).

Teacher grit is defined as the perseverance of effort and consistency of interest (Duckworth et al., 2007; Pawlak et al., 2022). Teacher grit attributes teachers in handling their stress which leads to effective teaching (Alamer, 2021; Sudina et al., 2021) and work engagement (Maiers and Sandvold, 2017; Namaziandost and Çakmak, 2020). As it was evidenced, gritty teachers devote their energy to their teaching for a long time and enjoy their teaching procedures even if they encounter problems at the workplace (Sudina et al., 2021). Although studies in the realm of language learners’ grit were quite rosy in recent years (e.g., Khajavy et al., 2020; Wei et al., 2020; Cheng, 2021; Khajavy, 2021; Yang et al., 2022), language teachers’ L2 grit and its correlates are quite untouched (Sudina et al., 2021; Li, 2022). As Teimouri et al. (2020) discussed, this shortage can be attributed to a lack of domain-specific scales to measure grit in Second Language Acquisition (SLA). As it was concluded by Cormier et al. (2019) and Yang et al. (2022), grit is a domain-specific construct. This idea encouraged Sudina et al. (2021) to propose the model of L2 grit among language teachers. Teacher L2 grit is considered a personality trait that involves perseverance of effort and consistency of interest (Sudina et al., 2021). In this regard, Sudina et al. (2021) developed and validated L2-Teacher Grit Scale (L2TGS) to evaluate the L2 grit among language teachers.

Due to the recent introduction of language teachers’ L2 grit in 2021, the existing gaps in empirical studies echo a clear need to investigate the correlates of language teachers’ L2 with other teacher-related constructs. Recently, Ashkani et al. (2021) conducted a study to inspect teachers’ cognitive and behavioral manifestations of pedagogical beliefs and how teacher grit influences these two constructs in EFL contexts. Based on their findings, the grittier teachers presented strong associations between their beliefs and actual instructional practices. Moreover, they concluded that teacher grit predicted the relationships between EFL teachers’ self-reported pedagogical beliefs and their actual practices. Confirming the scant attention to L2 teacher grit, a theoretical analysis was completed by Xu (2022), in which the theoretical and empirical literature related to teachers’ hope, trust, and grit were reviewed. Shabani et al. (2022) examined to what extent pedagogical thoughts vary as a

function of EFL teachers’ levels of grit. Their findings revealed that there were significant differences between low grit and high grit teachers considering the subscales of pedagogical thoughts. In the same line of inquiry, Liu (2022) concluded that gritty teachers are more motivated and enjoy the experience of language Instruction. In the realm of university students, Baerschmidt (2022) highlighted the significant role of grit as a predictor of foreign language proficiency.

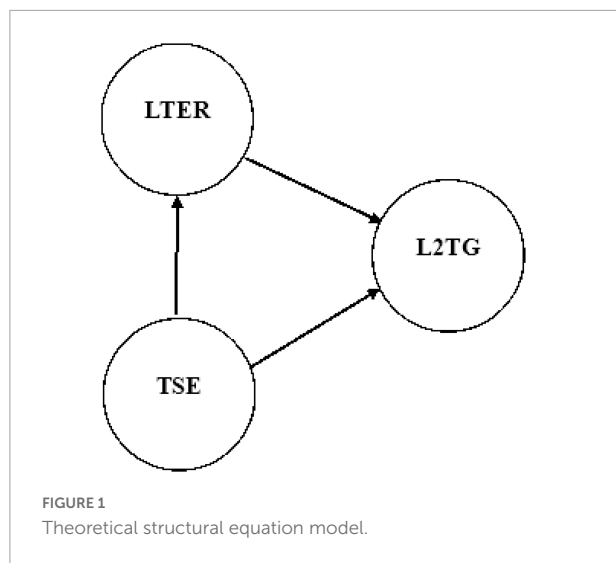
Objectives of the present study

In ever-changing and challenging teaching contexts, teachers in general and university professors, in particular, are exposed to various emotional experiences at the workplace. On such occasions, they need to be equipped with self-aid constructs to help them decide and act effectively. Through the lens of ER and self-efficacy, university teachers are expected to sustain their interest and make more effort to accomplish the established goals (L2 grit). Despite this, it appears that university TER and L2 grit are uncharted territories that await further research. Only within the last decades, TER has generated considerable attention from educators and researchers (Jiang et al., 2016; Taxer and Gross, 2018; Chang, 2020; Chen and Cheng, 2021), although it is virtually unexplored in the L2 domain (Richards, 2020; Alipour et al., 2021; Heydarnejad et al., 2021b). The same is true for L2 grit with emphasis that this concept was generated in 2021 and echoes urgent needs for further research.

Moreover, TER and L2 grit as well as their influences on other factors and constructs conducive to effective teaching remained relatively unexplored in the field of second/foreign language education. Having attributed this gap, this study sought to propose a model to portray the relationships between ER, self-efficacy beliefs, and L2 grit with the prospect of shedding light on these issues and initiating further research (see Figure 1). The findings of this research may be both theoretically and practically significant. Such a study provides information to be taken into consideration by policymakers, language planners, curriculum designers, language teachers, university professors, as well as learners and their parents. Furthermore, the result of this study could provide Iranian EFL teachers and researchers with an awareness that can help them advance the more meaningful and effective teaching and learning strategies. To this end, the following research questions were posited:

RQ1: To what extent does EFL university professors’ ER predict their L2 grit?

RQ2: To what extent does EFL university professors’ self-efficacy predict their L2 grit?



The following null hypotheses were formulated based on the above-mentioned research questions:

H01. EFL university professors' ER does not predict their L2 grit.

H02. EFL university professors' self-efficacy does not predict their L2 grit.

Materials and methods

In the following, the methodological steps that were taken in conducting this study were demonstrated:

Participants

The study participants consisted of 356 Iranian EFL university professors teaching at different universities in Iran. The target population were chosen based on convenience or opportunity sampling procedures. To achieve generalizability, variation in years of teaching experience, age groups, genders, and universities/cities where university professors teach were considered during the data collection processes. Among 356 participants, there were 195 male and 161 females. Their age range between 29 and 52, and 1–28 years of teaching experience. All of the university professors were Ph.D. holders or Ph.D. candidates, and they majored in different branches of English: English Teaching (143), English Literature (93), English Translation (74), and also linguistics (46).

Instruments

The following instruments were employed in the current research:

The language teacher emotion regulation inventory

To explore university professors' ER strategies, LTERI was utilized. This instrument was developed and validated by Heydarnejad et al. (2021b), and the validity and reliability for all sub-scales of the LTERI were examined in two educational contexts (school and university), and the results of Cronbach's alpha were acceptable (ranging from 0.718 to 0.814). To complete this instrument, the university professors are required to consider similar situations from their teaching experiences and choose their preferred ER strategies. This instrument involves 27 items on a five-point Likert scale anchored by 1 ("never") and 5 ("always") with six components, i.e., situation selection (e.g., I avoid conflicting or emotionally disturbing situations in the staff room.), situation modification (e.g., When an unpleasant discussion is raised in my classes, I try to change the topic.), attention deployment (e.g., If I feel frustrated in language classes, I try to engage myself in different class activities to forget it.), reappraisal (e.g., If for some reasons, I feel upset at work, I remind myself of my goals in my life.), suppression (e.g., If I feel helpless in my language classes, I disregard that.), and seeking social support (e.g., When I feel hopeless in my language classes, I seek advice from experts such as psychologists and school counselors.). In this study, the reliability of the LTERI estimated through Cronbach's alpha was acceptable (ranging from 0.743 to 0.911).

The teacher sense of efficacy scale

The TSES (long form), developed and validated by Tschannen-Moran et al. (1998), was employed to gauge university professors' self-efficacy beliefs. This instrument includes 24 items on a 9-point Likert scale with three subscales: (1) efficacy in student engagement (e.g., How much can you do to help your students think critically?), (2) efficacy in instructional strategies (e.g., How much can you do to foster student creativity?), and (3) efficacy in classroom management (e.g., How well can you implement alternative strategies in your classroom?). The reliability of the instrument was supported by the findings of Amirian et al. (2022). Based on the report of Cronbach's alpha, the reliability of the TSES was acceptable (ranging from 0.756 to 0.891) in the current research.

The L2-teacher grit scale

The L2TGS, designed and validated by Sudina et al. (2021), was applied to inspect the university professors' L2 grit. This instrument includes 14 items on a 5-point Likert scale with two subscales: perseverance in teaching (e.g., I am determined to withstand the work demands of the teaching profession) as well

as passion and purpose in teaching (e.g., I manifest excitement in my teaching profession for a long time). This instrument is domain-specific and developed for evaluating EFL/ESL teachers' grit. The report of Cronbach's alpha for L2TGS was 0.944, which indicated acceptable reliability.

Procedures

The data collection of this phase was started in February and ended in April, 2022 through a web-based platform. That is, the participants received an electronic survey form including the LTERI, the TSES, and the L2TGS through Google Forms. Conducting the electronic survey enables researchers to collect data from different regions with varying age groups and teaching experiences. The return rate was 89.2% and 356 forms were received. Each section in the electronic survey form was designed to be necessarily linked, thus no data were missed.

Data analysis

The normality of the data was explored via Kolmogorov-Smirnov Test. As the data were normally distributed, CFA and SEM using LISREL 8.80 were conducted. SEM is a robust multivariate procedure used to take a confirmatory hypothesis-testing approach for the proposed structural theory (Schreiber et al., 2006). An SEM model involves two parts, the measurement model and the structural model (Kunnan, 1998). The measurement model is used to examine the relationships between the observed variables and latent variables. The structural model is used to gauge the relationships between the latent variables. Before testing a structural model, all the latent variables should be validated using CFA (Hair et al., 1998).

Results

The results of the statistical analysis computed by the collected data are reported in this section. The descriptive

statistics of EFL university professors' ER, self-efficacy beliefs, and L2 grit are displayed in the following table.

Based on Table 1, among language TER strategies, reappraisal ($M = 4.278$, $SD = 0.593$) and attention deployment ($M = 3.939$, $SD = 0.636$) got the highest mean scores, whereas the mean score of suppression was the least ($M = 3.503$, $SD = 0.767$). Furthermore, among the components of self-efficacy beliefs, instructional strategies ($M = 7.229$, $SD = 1.050$) presented the highest mean scores. Efficacy in student engagement ($M = 6.816$, $SD = 0.777$) and efficacy in classroom management ($M = 6.234$, $SD = 1.003$) were the subsequent subscales of self-efficacy beliefs. Considering teacher L2 grit, the mean scores of subscales were as following: perseverance in teaching ($M = 6.748$, $SD = 0.780$) and Passion and Purpose in Teaching ($M = 6.186$, $SD = 1.076$), respectively. Then, to gauge the normality distributions of the data and consequently decide on employing a suitable statistical method for the current study, the Kolmogorov-Smirnov Test was utilized. In the following table, the result of the Kolmogorov-Smirnov Test is provided.

As Table 2 displays, the data were normally distributed because the sig value for all the instruments and their subscales were higher than 0.05. Therefore, parametric methods could be used to examine the related research hypotheses. In this regard, the LISREL 8.80 statistical package was utilized to inspect the structural relations between ER, self-efficacy, and L2 grit. The chi-square magnitude, the Root Mean Squared Error of Approximation (RMSEA), the comparative fit index (CFI), and the normed fit index (NFI) were used to evaluate the model fit.

Based on Jöreskog (1990), the chi-square is suggested to be non-significant and the chi-square/df ratio should be lower than 3. Moreover, the root mean square error of approximation (RMSEA) should be to be lower than 0.1 (Jöreskog, 1990). The NFI with the cut value greater than 0.90, GFI with the cut value greater than 0.90, and CFI with the cut value greater than 0.90 indicates a good fit (Jöreskog, 1990). According to Table 3, the chi-square/df ratio (2.801) and the RMSEA (0.071) were also acceptable. The other three fit indices, GFI (0.923), NFI (0.951), and CFI (0.914), reached the acceptable fit thresholds.

To check the strengths of the causal relationships among the variables, the t -values and standardized estimates were

TABLE 1 Descriptive statistics.

Instrument	Subscales	N	Minimum	Maximum	Mean	SD
ER	Situation selection	356	1.00	5.00	3.627	0.722
	Situation modification	356	1.00	5.00	3.703	0.527
	Attention deployment	356	1.00	5.00	3.939	0.636
	Reappraisal	356	1.00	5.00	4.278	0.593
	Suppression	356	1.00	5.00	3.503	0.767
	Seeking social support	356	1.00	5.00	3.546	0.606
Self-efficacy	Efficacy in student engagement	356	1.00	9.00	6.816	0.777
	Efficacy in instructional strategies	356	1.00	9.00	7.229	1.050
	Efficacy in classroom management	356	1.00	8.38	6.234	1.003
L2 grit	Perseverance in teaching	356	1.00	9.00	6.748	0.780
	Passion and purpose in teaching	356	1.00	8.83	6.186	1.076

TABLE 2 The results of Kolmogorov-Smirnov test.

Instrument	Subscales	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
ER	Situation selection	1.290	0.072
	Situation modification	1.219	0.102
	Attention deployment	1.398	0.064
	Reappraisal	1.104	0.175
	Suppression	1.075	0.198
Self-efficacy	Seeking social support	0.927	0.357
	Efficacy in student engagement	1.106	0.173
	Efficacy in instructional strategies	1.252	0.087
	Efficacy in classroom management	0.908	0.382
L2 grit	Perseverance in teaching	0.698	0.714
	Passion and purpose in teaching	1.364	0.068

TABLE 3 Fit indices (model 1).

Model	Cut value	
χ^2		114.84
df		41
χ^2/df		2.801
RMSEA	>0.1	0.071
GFI	0.9 <	0.923
NFI	0.9 <	0.951
CFI	0.9 <	0.914

examined. As **Figures 2, 3** illustrate, university professor ER affected their sense of efficacy beliefs ($\beta = 0.75$, $t = 14.37$) and L2 grit ($\beta = 0.83$, $t = 16.30$) significantly and positively; the t -value was greater than 1.96. The effect of self-efficacy beliefs on ER was significantly positive ($\beta = 0.66$, $t = 11.06$) and the t -value was lower than -1.96 .

Table 4 presents the acceptable criteria for fit indices in the second model. That is, the chi-square/df ratio (2.884) and the RMSEA (0.073) reached the acceptable fit thresholds. Moreover, GFI (0.934), NFI (0.962), and CFI (0.923) were acceptable.

Figures 4, 5 (Model 2) demonstrate the schematic representation of path coefficient values for the influential role of ER and self-efficacy on L2grit' subscales. Based on the findings, that university professor ER significantly and positively influenced two sub-components of teacher L2 grit as following: passion and purpose in teaching ($\beta = 0.88$, $t = 17.27$) and perseverance in teaching ($\beta = 0.79$, $t = 14.69$). The same is true for self-efficacy beliefs and the sub-components of teacher L2 grit. That is, teacher self-efficacy beliefs significantly and positively

influenced perseverance in teaching ($\beta = 0.78$, $t = 14.10$) as well as passion and purpose in teaching ($\beta = 0.66$, $t = 11.92$).

To investigate the relationships between TER, self-efficacy beliefs, and L2 grit, a Pearson product-moment correlation was utilized.

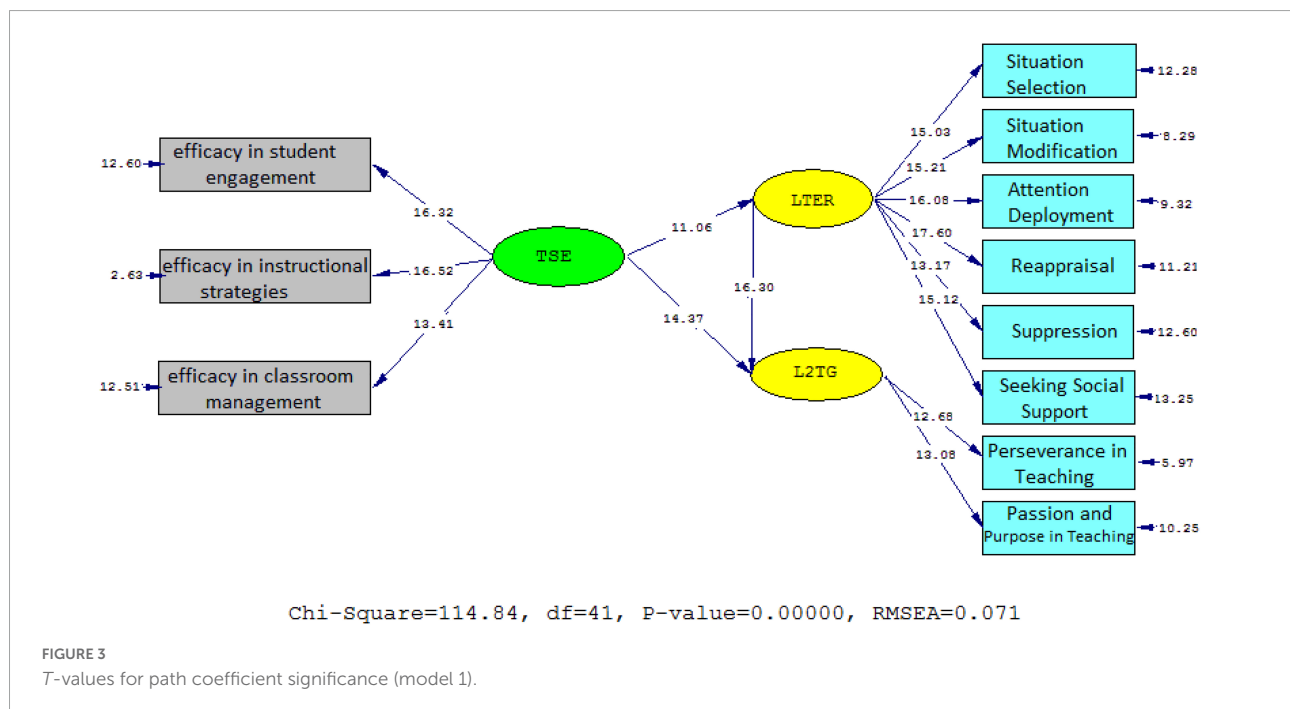
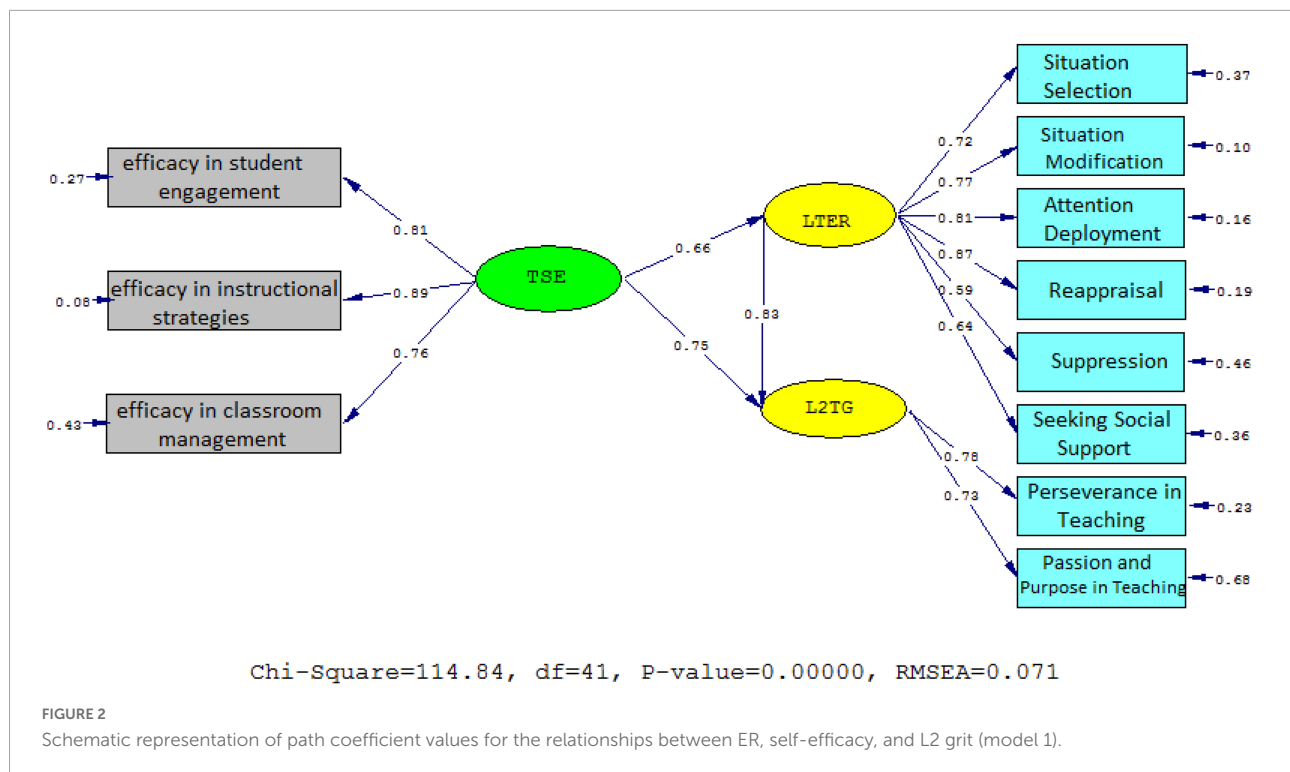
As **Table 5** indicates, there were significant relationships among ER and the subcategories of L2 grit were as follows: passion and purpose in teaching ($r = 0.912$, $p < 0.01$) as well as perseverance in teaching ($r = 0.834$, $p < 0.01$). Considering the correlations among self-efficacy beliefs and the sub-components of L2 grit, the results were as following: perseverance in teaching ($r = 0.834$, $p < 0.01$) as well as passion and purpose in teaching ($r = 0.719$, $p < 0.01$).

Discussion

The aim of the current study was to uncover the interrelatedness of language TER, self-efficacy, and L2 grit. This aim was accomplished by utilizing a structural equation modeling approach targeting at building a causal structural model by which the contribution of each of the aforementioned constructs can be estimated. Data analyses indicated that ER and self-efficacy skills predict grit tendencies among EFL university professors (see Model 1). The contribution of self-efficacy beliefs to ER was also found (see Model 1). Additionally, the influence of ER and self-efficacy beliefs on the two subcomponents of L2T grit was confirmed (see Model 2). Henceforth, the first null hypothesis (H01. EFL university professors' ER does not predict their L2 grit.) and second null hypothesis (H02. EFL university professors' self-efficacy does not predict their L2 grit.) were rejected, and it can be inferred that these constructs (teacher emotion regulation, self-efficacy, and L2 grit) are inextricably interwoven.

Discussing the first research question

As the data screening suggests, the effect of ER on L2 teacher grit was significantly positive (see Model 1 and 2). It means that ER influenced passion and purpose in teaching (the first subcomponent) and perseverance in teaching (the second subcomponent). It is implied that ER affects university professors' attitudes and teaching engagement, that leads to their flourishing cognitive accomplishment of them. In other words, teacher ER acts as a campus and gives direction to perform effectively. Scrutinizing the relevant literature on TER and L2 grit presented no identical studies. A recent study in the domain of language learning (Shafiee Rad and Jafarpour, 2022) confirmed that



positive emotions interventions influence learner L2 grit, ER, and resilience. Similar findings reflecting the reciprocal relationship between L2 grit, emotions and academic achievement were supported by the results of Ghanbari and Abdolrezapour (2021) as well as Khajavy and Aghaee (2022).

Based on the language TER model (Heydarnejad et al., 2021b), ER is the experience of appraisal, attention deployment, situation modification, seeking social support, situation selection, and to some extent, suppression. According to the teacher L2 grit model (Sudina et al., 2021), teacher L2 grit is assumed as the triggering element

TABLE 4 Fit indices (model 2).

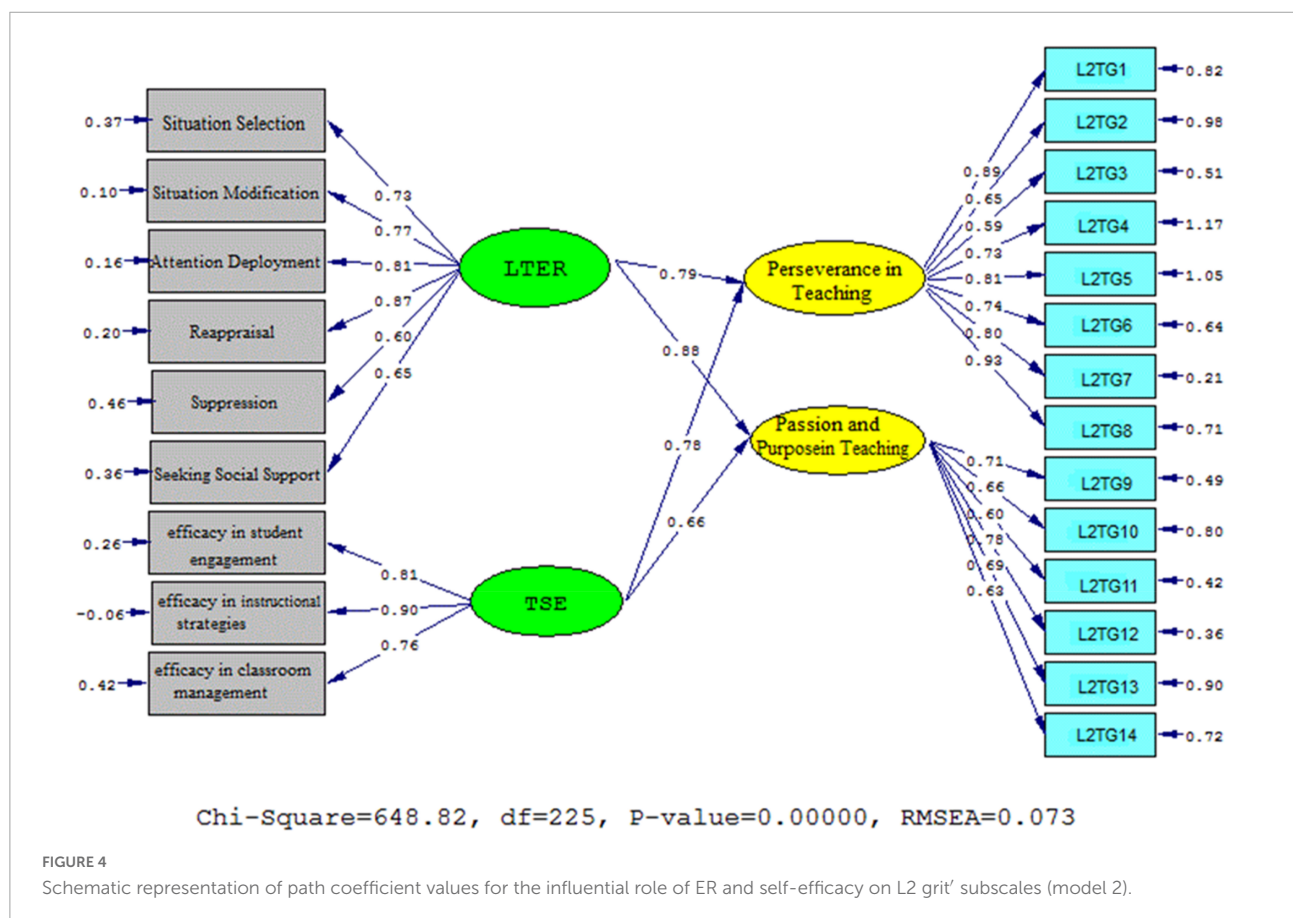
Model	Cut value	
χ^2		648.82
df		225
χ^2/df		2.884
RMSEA	>0.1	0.073
GFI	0.9 <	0.934
NFI	0.9 <	0.962
CFI	0.9 <	0.923

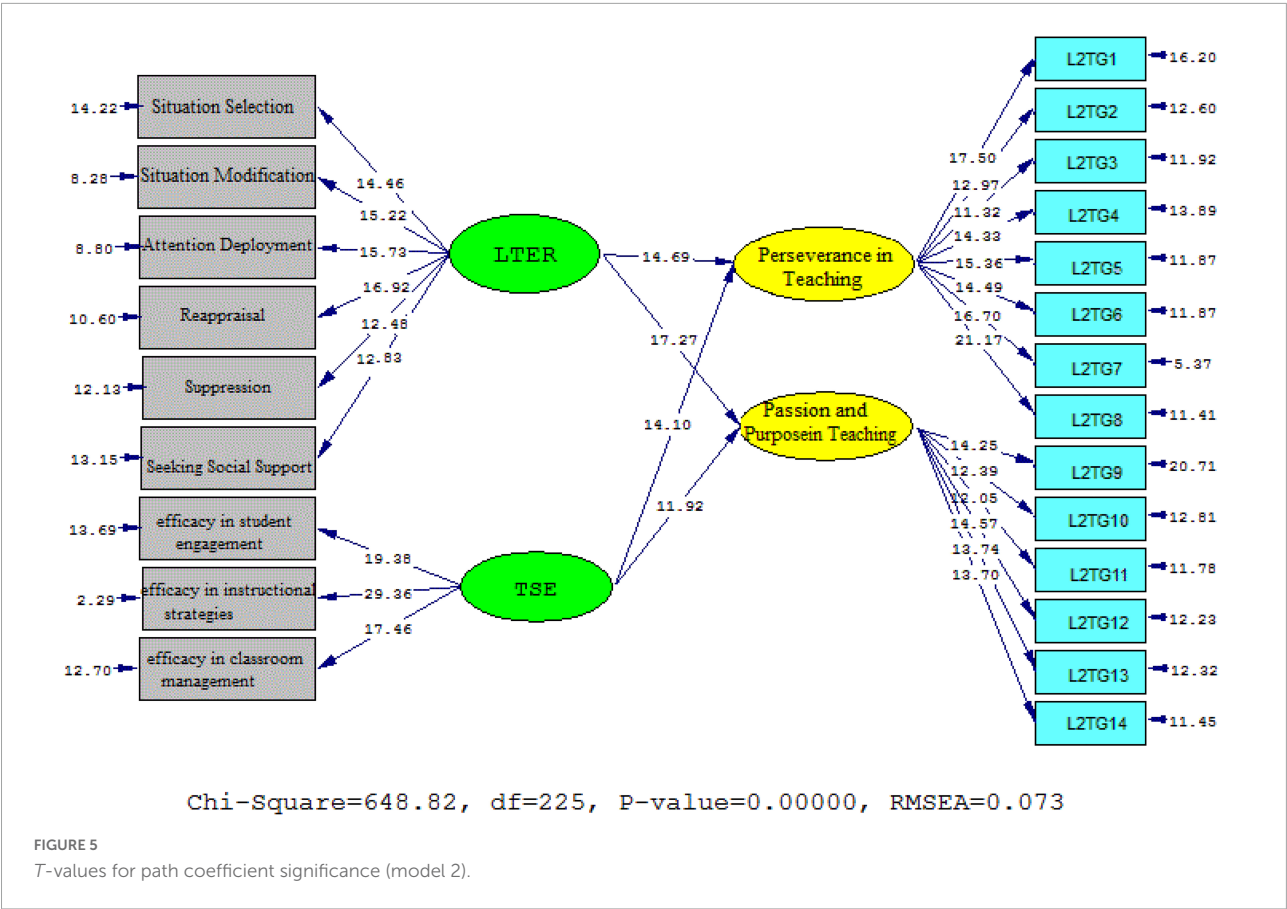
provoking perseverance of effort and consistency of interest. Regulation of emotions, which are inevitable parts of teaching improve the strategies that teachers apply (Heydarnejad et al., 2017; teacher's work life balance and their relationships with students Mulyani et al., 2021). Thus, it can be implied that when university teachers achieve a balance in their emotional states, they can effectively manage their attitudes and skills, which results in responsible decisions. In this regard, Li (2020) noted that grittier teachers are positively engaged and interested in their activities; they make efforts

and try to do their best even they face challenges and failures.

Discussing the second research question

The outcome of the present study also confirmed the predictive power of university professors' self-efficacy beliefs on their L2 grit (see Model 1). That is, university professors' beliefs in their ability to effectively handle the tasks, obligations, and challenges related to their professional activity (self-efficacy beliefs) foster dedication to and passion for the teaching (L2 grit). Moreover, the results suggested that university professors' self-efficacy beliefs correlate positively with teacher L2 grit sub-components. In other words, it is found out that self-efficacy beliefs were associated firstly with perseverance in teaching, and then with passion and purpose in teaching. This result is in accord with the findings of Joy et al. (2020), highlighting the role of self-efficacy skills in boosting grit among school teachers. The intertwined relationships between self-efficacy and L2 grit in the learning context were concluded in the L2 context (Yang et al., 2022). They also emphasize the impact of teachers' role in helping learners manage their emotions to enhance





efficacy and grit. This finding is in line with the outcomes of Shabani et al. (2022). They concluded that teacher L2 grit is the product of self-reflection, efficacy skills, and affective evaluation.

Bandura's self-efficacy theory (Bandura, 1982), as the foundation of teacher self-efficacy theory, demonstrates that efficacious teachers implement mastery experiences for cognitive development, which is a powerful predictor of teaching performance. Self-efficacy has become an important framework in education to predict and explain the perceptions

and judgments that influence teachers' and university professors' decisions and actions in the classroom. The Grit theory (Duckworth, 2016) as well as teacher L2 grit (Sudina et al., 2021), suggest that perseverance and passion for overcoming challenges are inevitable parts of gritty teachers' traits. This personality trait helps them expand their efforts and keep enthusiastic despite obstacles and inadequate progress. Thus, the results of this study can be interpreted through the lens of these theories that affirm self-efficacy serves to manage teachers' cognitions and emotions, leading to higher and longer professional development (Duckworth and Gross, 2014).

Additionally, ER was discovered to be significantly affected by self-efficacy beliefs as well (see Model 2). According to these data, it can be inferred that quite apart from its direct influences, self-efficacy appeared to assist university professors in modulating their experienced emotions. That is to say, the levels of teacher efficacy positively correlate with increased ER among EFL university professors. This result corroborates with those of Heydarnejad et al. (2021a) and Xiyun et al. (2022), as well as Fathi et al. (2020). Moreover, the findings from Zee and Koomen (2016) and Cansoy et al. (2020) evinced that teacher self-efficacy and their psychological wellbeing are interwoven. Based on self-efficacy theory (Bandura, 1982), teacher efficacy develops from a

TABLE 5 The correlation coefficients among TSE, LTER, and L2G' subscales.

	TSE	LTER	Perseverance in teaching	Passion and purpose in teaching
TSE	1			
LTER	0.694**	1		
Perseverance in teaching	0.813**	0.834**	1	
Passion and purpose in teaching	0.719**	0.912**	0.532**	1

**Correlation is significant at the 0.01 level (2-tailed).

combination of mastery experience, vicarious experience, social persuasion, and physiological and emotional states. It can be inferred that all of them are directly and indirectly connected to components of the language TER model (i.e., situation selection, situation modification, attention deployment, reappraisal, suppression, and seeking social support). This means that efficacious university professors have high levels of self-awareness, self-worth, and self-perception; thus, they can positively guide actions and responses to the emotional demands of their teaching. Consequently, they can develop relatively positive emotion regulatory strategies that pave the way for stability in the teaching profession.

Conclusion

This investigation highlighted the significant contribution of ER and self-efficacy to L2 grit, and provided strong empirical confirmation that via the help of ER and self-efficacy, university professors can ameliorate their practice for a longer period of time even in the face of teaching chaos and complexities. This leads to a positive attitude toward the teaching profession in higher education, which heightens success instead of failure. Furthermore, the present study reflected that the effect of university professors' self-efficacy on ER is also significant. Taken together, these findings suggest the predictive role of ER and self-efficacy in promoting L2 grit. In the domain of language teaching, especially in higher education, exploring the relationship between these constructs is quite rare. Thus, this domain is a fertile field and calls for more empirical studies, which pave the path for promoting teachers' wellbeing and effective pedagogy.

Implications

The findings of this study suggest some pedagogical implications for educators in higher education. The knowledge about situational and personality determinants of ER strategies and their efficiency is vital and should be considered in higher education program. Such training programs should concentrate on practicing the broad repertoire of strategies and showing the conditions under which, they are effective or not. Moreover, training should focus on reflecting more on university professors' own traits and preferences that may influence the effectiveness of their employed ER strategies. This information, also incites university professors to alter or modify their employed ER strategies to more positive ones, which are in turn expected to facilitate their self-efficacy beliefs and L2 grit.

In the area of language teaching training programs, some international centers such as TESOL and CELTA are preparing

specialized language teachers around the world. In Iran, pre-service and in-service teacher training programs are held, and teacher trainers can make a significant contribution by instructing EFL university professors about the importance of emotions and ways to regulate and modify their emotions. Furthermore, the implications of this research would be of great help to be considered in pre-service and in-service teacher training programs, which are usually held for university professors. Practicing self-aid skills (i.e., self-evaluation, self-efficacy, self-awareness, and self-regulation) in pre-service and in-service teacher training programs, particularly in higher education could boost L2 grit and foster efficient teaching, particularly during the Covid-19 pandemic and university lockdown. These programs are expected to pinpoint the effective path for enhancing their effective teaching.

Limitations and suggestions for future researchers

The findings of this research suffer from some limitations: Firstly, this study employed quantitative design. To have a deeper understanding of the causal links among the variables, future research can apply mixed-method approaches to delve into the relationship between university professors' ER, self-efficacy, L2 grit, and other teacher-related constructs (e.g., work engagement, autonomy, critical thinking, job satisfaction, reflective teaching, self-regulation, and immunity). Secondly, the effects of participants' demographic variables on ER, self-efficacy beliefs, and L2 grit were not explored, which can be a suggestion for future research. Lastly, due to practical constraints, the participants were chosen according to convenience sampling. Which is not truly representative. Therefore, results from this study should be interpreted and generalized with great caution. Concerning delimitations, this study is to focus on the employed ER strategies by EFL university professors at the workplace. Furthermore, to assess EFL university professors' ER, a trait approach was utilized. That is, frequently and intensively ER strategies in response to emotional experiences at the workplace were assessed retrospectively.

As a future research avenue, it is recommended to use a new method of data gathering called the Experiential Sampling Method (ESM) in future studies, which can assess emotions at the intra-individual level. The experience sampling method (ESM) is used to evaluate emotions contextualized in real-world settings. This method helps researchers decrease memory biases and increase ecological validity, and hypothesize testing at the between- and within-person levels. Furthermore, it is recommended to undertake further research to explore whether TER influences their learners' ER. As a further suggestion,

researchers can explore the relationships between ER, self-efficacy, and L2 grit in other educational contexts such as schools and private language institutes.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Modeling the role of emotion regulation and critical thinking in immunity in higher education

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It is deemed that the effectiveness of teachers is highly entangled with psycho-emotional constructs, such as critical thinking (CT), emotion regulation (ER), and immunity. Despite the potential roles of CR, ER, and immunity, their possible relationships have remained unexplored in the higher education context of Iran. To fill in this lacuna, this study explored the potential role of CT and ER in university teachers' immunity in the Iranian higher education context. For this purpose, a total of 293 English university teachers were selected using a convenience sampling method. They were invited to fill out the Watson–Glaser Critical Thinking Appraisal-Form, Language Teacher Emotion Regulation Inventory, and Language Teacher Immunity Instrument. The findings of path analysis indicated that the university teachers with higher CT were more productively immunized. Moreover, the results revealed that ER could predict the university teachers' immunity. The findings of the study lead to this implication that higher order thinking skills, emotion regulatory strategies, and immune enhancement should be incorporated into educational programs of higher education.

KEYWORDS

higher education, EFL University professors, critical thinking, emotion regulation, language teacher immunity, path analysis

Introduction

Clarifying the concept of effective teaching in both schools and higher education and conceptualizing the clear model of the effective teacher is not an easy task and is inherently contentious (Ericksen, 1984; Feldman, 1986; Brown and Atkin, 1988), since the term effective can be interpreted differently by different people and in a different context. Despite its long history, there is no agreed-upon definition for it. For instance, Hopkins et al. (1998) postulated three broad dimensions of effective teaching. The first dimension is teaching effects, a concept that reflects both teaching skills and teaching behaviors. The second relates to the acquisition of effective teaching models a teacher establishes in his/her classroom. The third dimension embraces teacher artistry, which highlights the teachers' responsibility for creating the conditions for effective

learning. From Acheson and Gall's perspectives (Acheson and Gall, 2003), effective teaching involves the ability to provide instruction that creates an instructional climate that causes students to develop positive attitudes toward school and self (engaged and efficacious learners), helps students to develop the knowledge, skills, and understandings intended by curriculum objectives, and responds to initiatives for curriculum change so that the new curriculum's intents are fully realized. Burroughs et al. (2019) defined teacher effectiveness in terms of teacher experience, teacher professional knowledge, and teacher behaviors (p.8). Likewise, Elliott (2010) stipulated that teacher effectiveness is a combination of personality and ability, wherein the former is being regarded as a key factor (p.14).

Considering the pivotal role of effective teaching, Elliott (2010) identifies two subtopics related to teaching effectiveness: "effective teacher characteristics may be summarized as measuring who I am or the essence of teaching, whereas teacher effectiveness may be summarized as what I do or the process/product of teaching" (p. 1). From a social cognitive perspective, effective teachers are self-regulated individuals who take appropriate actions leading to the successful accomplishment of their professional tasks (Randi, 2004). In Feldman's perspective (Feldman, 1986), enthusiasm, positive self-regard, energy, and positive regard for others are the significant qualities of an effective teacher. In other words, the skills needed for effective teaching involve more than just expertise in an academic field. Effective teaching occurs best when teachers are empowered with desirable behavior and personality traits. Among several qualities and personality traits that are defined as the attributes of an effective teacher, ER, critical thinking (CT), and immunity, as well as their reciprocal relationships have remained uncharted territory in educational research, particularly in higher education. In addition, various challenges of the 21st century require more reflections on the contributing role of higher order thinking skills and self-aid constructs, fostering effective teaching.

Teaching bound with emotional experiences and teachers believe that regulating their emotions at the workplace leads to effective teaching (Sutton et al., 2009). Teacher ER refers to their abilities to manage and modify emotional experiences and expressions (Burić et al., 2017). ER empowers teachers to change the intensity and duration of their emotional experiences at the workplace (Chang and Taxer, 2020; Frenzel et al., 2021; Heydarnejad et al., 2021c), which have significant implications for manifesting teachers' effectiveness. Despite its relevance, and perhaps because of its complexity, teachers' ER, particularly English teachers' ER, is still in its infancy, and awaits further research (Burić et al., 2017; Alipour et al., 2021; Heydarnejad et al., 2021c). More specifically, Frenzel et al. (2015) asserted that teachers' emotions are different depending on different subjects and groups of students. Hence, each context is worth exploring as it may show different findings in comparison with other contexts.

As Chen and Cheng (2021) stipulated, handling emotionality and rationality as inevitable parts of teaching contribute effective teaching. Thereby, regarding the indisputable relevance of emotions and cognition at the workplace for teachers' effectiveness, it is important that teachers are armed with effective strategies and higher order thinking skills. CT as higher order thinking skills refers to analyzing and evaluating of the information through reflection and reasoning (Dewey, 1933; Paul, 1988). Through the lens of CT, teachers think critically about their teaching strategies and look for evidence of effective teaching. It was evidenced that CT is associated with teachers' resilience (Ayoobiyan and Rashidi, 2021), self-regulation (Heydarnejad et al., 2021a), teaching style in higher education (Amirian et al., 2022), and professional identity (Sheybani and Miri, 2019). In addition, CT not only benefits individual university teachers but also the society as a whole.

The new born notion of language teacher immunity works as a defensive mechanism against different constraints in the realm of language teaching (Hiver and Dörnyei, 2017; Rahmati et al., 2019). Language teacher immunity can act as a shield to protect university teachers against high-intensity chaos and complexities of educational settings. What emerges from the review of the scarce literature on language teacher immunity, it is positively correlated with teacher-related positive constructs (e.g., Hiver, 2017; Haseli Songhori et al., 2018; Rahimpour et al., 2020; Li, 2022). Yet, there is a dearth of literature about language teacher immunity, especially in higher education which echoes for more profound studies to investigate different aspects of language teacher immunity. To the best knowledge of the researcher, to date, no study has inspected these theoretically associated constructs within a single framework to disclose how they are linked with one another and consequently, how they affect teachers' job effectiveness. Therefore, more research is needed to fill this gap.

Literature review

Emotion regulation

The term emotion is derived from the Latin word "emovere", which means to stimulate (Hargreaves, 1998). It means that the experienced emotions give direction to individuals' actions. To capture the concept of emotion, various definitions were posed based on different theoretical conceptualizations generated from physiology, philosophy, history, sociology, anthropology, and psychology (Hargreaves, 1998; Oatley, 2000; Frenzel, 2014; Burić et al., 2020; Uzuntiryaki-Kondakci et al., 2022). These conceptualizations share a common point in sense that ER is a complex, multi-component construct with different dimensions, namely, subjective, cognitive, motivational, expressive, and physiological (Lazarus, 2001; Scherer, 2009). Moreover, two

outlooks can be defined for teachers' emotions: considering emotions as short-lived and relatively intense episodes or explaining them in a more trait-like manner or as relatively stable in time (Rosenberg, 1998). From a trait-like perspective, the average frequency of experienced emotions in teachers' professional lives is considered (Wood et al., 2008). In the current research, a trait-like manner is used to inspect university teachers' ER at their workplace.

Emotions are socially constructed phenomena that are uncovered in social interactions with others (Chahkandi et al., 2016). In other words, emotions derive their shape and meaning from the ideas and practices in the larger socio-cultural context (Boiger and Mesquita, 2012; Luque-Reca et al., 2022). The cultural context also plays a critical role in several aspects of individuals' emotional experiences. The ways of expressing and managing emotions are mostly consistent with the values, goals, and concerns in each cultural model. Interdependent cultures expect individuals to define themselves more in relation to others, prioritize harmony and interconnection, and try to adjust to each other's expectations (Chahkandi et al., 2016). Independent cultures, on the contrary, emphasize preserving individuals' autonomy through underlying individuals' uniqueness and self-esteem (Boiger and Mesquita, 2012; Ford and Mauss, 2015).

Additionally, cultures are not similar in the appraisals of the emotion-antecedent events (De Leersnyder et al., 2013). For instance, offensive situations are considered as threats to individual's autonomy and self-worth in North American contexts and asking individuals to cultivate high self-regard, assertiveness, and aggression. By contrast, offensive situations in Japanese contexts were interpreted as threats to social relationships and required individuals' understanding of the other persons' motives to be resolved (Chahkandi et al., 2016). Cultures also influence emotion display rules and individuals' motivation to exercise self-regulation (Ford and Mauss, 2015). That is, collectivist cultures (e.g., Asian American and Japanese contexts) tend to use ER more frequently and exert greater levels of emotion suppression than European American people (Gross et al., 2006). More specifically, cultures differ in the adaptation of ER strategies (Ford and Mauss, 2015). Cultures also are not similar in dealing with status and power relationships. Thus, they may expect the expression of emotions that maintain status and power and avoid emotions that threaten this differential (Matsumoto, 2006).

Teachers, in particular language teachers, experience various ups and downs at the workplace, which can trigger pleasant and unpleasant emotions. As Hargreaves (1998) put it, "emotions are at the heart of teaching" (p. 835). Teachers' emotional experiences affect their relationships with others (Richards, 2022), identity (Jones and Kessler, 2020), self-efficacy (Chen, 2018; Burić et al., 2020), pedagogical adoptions (Chen, 2020), work engagement (Burić and Macuka, 2017), as well as self-regulation, and teaching style in higher education

(Heydarnejad et al., 2021a). Appraisal and attribution theories (Frenzel, 2014; Jacob et al., 2017; Frenzel et al., 2021) are the models used for explaining teachers' emotions. Appraisal theory is based on the indirect association between emotion and situation (Moors et al., 2013) and includes the following sub-sections: goal consistency, goal conduciveness, coping potential, goal attainment/impediment responsibility, and goal significance (Frenzel, 2014). Attribution is defined as a specific evaluation of the perceived causes of events (Jacob et al., 2017).

ER involves physiological, behavioral, and cognitive processes that each person utilizes to monitor, evaluate, and modulate their emotional experiences (Gross, 1998; Gross and John, 2003; Gross and Thompson, 2007). That is, ER acts as a campus and gives direction to individuals' emotions (Gross, 1998, 1999). The employed strategies in ER helps teachers to manage both pleasant and unpleasant emotions (Taxer and Gross, 2018). The activation of a regulatory goal, the engagement of regulatory processes, and the modulation of the emotion trajectory are the three core features of many diverse types of ER (Gross and Barrett, 2011). It is worth highlighting that ER activities may also happen explicitly or implicitly (Gross, 2014). In previous studies, explicit and implicit processes in ER are considered separately (Masters, 1991). However, it is recommended to consider ER processes as a continuum ranging from explicit, conscious, and controlled regulation to implicit, unconscious, effortless, and automatic regulation (Gyurak et al., 2011).

Theoretically, ER is supported by the process-oriented model of ER (Gross, 1998). The process-oriented model of ER is comprised of five temporal points (i.e., situation selection, situation modification, attention deployment, cognitive change, and response modulation). Recently, a model for the language teacher ER was proposed based on extensive review of the existing literature, the theoretical conceptualizations on ER in general, and teacher ER in particular (Heydarnejad et al., 2021c). This model involves six dimensions, i.e., situation selection, situation modification, attention deployment, reappraisal, suppression, and seeking social support. The three dimensions of situation selection, situation modification, and attention deployment were rooted in Gross's process-oriented model of ER (Gross, 1998). Reappraisal and suppression were based on Gross and John's conceptualization (Gross and John, 2003), and seeking social support as the last dimension was inspired by Jennings and Greenberg (2009) as well as Taxer and Gross (2018).

Research on university professor ER seems to be scarce. However, the conducted previous studies on teacher ER highlighted teacher-related variables, which affect or are affected by ER. As an example, Chang (2020) examined the relationship between teachers' beliefs about emotional display rules in the class, the attitudes toward ER strategies, and feelings of burnout. Based on the data analysis, display rules influenced expressive suppression and burnout. Moreover, the effect of

cognitive reappraisals on teacher burnout was significantly negative. Results of this study emphasize that teacher education should be designed to help teachers to evaluate their beliefs about display rules and to involve in cognitive reappraisal. In another study, [Morris and King \(2018\)](#) investigated the role of emotion regulatory strategies in manipulating frustration among university language professors. Their findings suggested that university language professors employed ER strategies that increased their levels of confidence and helped overcome the stressors. The influence of ER strategies in return for classroom misbehavior in response to classroom misbehavior was explored by [Chang and Taxer \(2020\)](#). They found out that teachers who usually reappraise in the face of their learners' misbehavior are less probable to experience unpleasant emotions. Their findings show how teachers could regulate their negative emotions in the face of student misbehavior. By the same token, [Fathi et al. \(2021\)](#) explored the association between teacher reflection, self-efficacy, burnout, and ER among Iranian English teachers. The results of the structural model confirmed that ER would mediate the influences of teacher reflection and teacher self-efficacy on teachers' burnout among English teachers. In their conclusion, they offer some practical measures for teachers to monitor their emotional states.

Critical thinking

CT was introduced by Socrates about 2 centuries ago, who maintained that assuming, questioning, reasoning, analyzing, and evaluating the inferences of individuals' activities are vital to justify their declarations ([Fisher, 2001](#)). Although CT has been applied in various territories (Philosophy, cognitive psychology, and education research), no unified definition was suggested for it ([Thomas and Smoot, 1994](#); [Solon, 2003](#)). According to [Halonen \(1995\)](#), CT is mystified concept. Similarly, [Fasko \(2003\)](#) asserted that "there is no consensus on a definition of critical thinking" (p.8). From Dewey's perspective ([Dewey, 1933](#)), CT is active and regular evaluation of assumptions and suppositions to reach convenient inferences. Based on [Paul \(1988\)](#), CT is a higher order thinking skill, which involves analysis, syntheses, and evaluation. Furthermore, [Halpern \(2003\)](#) defined CT as the application of mental processes and cognitive skills, which foster the probability of desired behaviors.

From another viewpoint, [Ennis \(1996\)](#) defined CT as the intellectually disciplined process of actively and skillfully conceptualizing, synthesizing, and evaluating information generated by observation and reflection. Based on [Thomas and Lok \(2015\)](#), CT is formulated by knowledge, skills, and disposition. Moreover, [Choy and Cheah \(2009\)](#) defined teacher cognition through the lens of CT and concluded that these two constructs are integrated. More specifically, no concrete learning benchmarks are

illustrated for CT progress ([Stapleton, 2011](#)). In spite of various proposed definitions and postulations, it is widely accepted that CT is a vital part of any successful education ([Zhang et al., 2020](#); [Heydarnejad et al., 2021a](#); [Azizi et al., 2022](#)).

[Dewey \(1933\)](#) was the first one who discussed about the importance of higher order thinking skills in education. He highlighted that reflective and CT skills must substitute the traditional ways of teaching, which concentrate on memorization and surface learning. As [Davidson and Dunham \(1997\)](#) argued, CT skills are teachable; thus, teachers play a significant role in teaching CT and developing critical minds ([Bourdillon and Storey, 2002](#); [Mason, 2008](#)). In so doing, the teachers should learn how to think critically. About the crucial role of CT and its enhancement, [Zhang et al. \(2020\)](#) have conducted a study among English university teachers to gauge their attitudes toward CT and its applications in their teaching. As their findings revealed, English university teachers confirmed that CT should be an integral part of classroom teaching. In addition, it was also concluded in another recent study that CT and self-regulation give directions to teachers' preferred teaching styles ([Heydarnejad et al., 2021b](#); [Parveen et al., 2022](#)).

Furthermore, it was approved that CT influenced teachers' professional identity ([Sheybani and Miri, 2019](#)). In this regard, [Jenkins \(1998\)](#) asserted that CT skills broaden teacher competencies and help them to build greater autonomy at work. The contributions of teachers' metacognitive skills, academic self-efficacy, and their CT skills is supported by [Kozikoglu and Babacan's findings \(Kozikoglu and Babacan, 2019\)](#). They highlighted the need for more research to understand how higher order thinking skills can be practiced among teachers. Taken a similar path, [Sadeghi et al. \(2020\)](#) sought to inspect qualitatively the constructs of CT from viewpoints of the English teachers and learners. Based on data analysis, they suggested some strategies for reinforcing CT ability such as: Discussion, group working, Interpretation, Open-mindedness, self-awareness, to name a few. In this study, pedagogical implications for English teachers were suggested to practice CT skills among their learners. They also invited curriculum developers and syllabus designers to consider CT activities in teaching materials and support in-service classes for teachers. Although the role of teachers' CT in their progress at work and implementing CT in their students is approved by different empirical studies, some teachers still used rote learning. It is of great importance to engage learners at schools as well as universities to ponder on challenging questions and make inferences ([Sadeghi et al., 2020](#); [Heydarnejad et al., 2021b](#); [Rezai et al., 2022](#)). The nature of CT, teachers' lack of knowledge and experience, as well as their inabilities in fostering CT skills may be among the possible reasons for not applying CT in the major parts of teaching ([Buskist and Irons, 2008](#)).

Teacher immunity

Stemmed from the Latin word “*immunis*”, teachers’ immunity is a recently introduced concept to language teaching discipline (Hiver and Dörnyei, 2017). Biologically, immunity is defined as a protective system that activates naturally occurring antibodies and plays down infection through biochemical reactions (Janeway et al., 2005). It works as a defensive system that fights against pernicious, undesirable, or detrimental effects of the external environment (Hiver, 2015). Similarly, teacher immunity refers to a defensive and adaptive mechanism, which works against various conflicts and challenges at the workplace (Hiver, 2015, 2017). As Hiver and Dörnyei (2017) stipulated, teacher immunity is an amalgamation of motivation to teach, psychological wellbeing, and openness to change on one end and teaching pressures, burnout, and attrition on the other end of the spectrum.

The formation of teacher immunity is based on self-organization theory that is adapted from complexity theory (Larsen-Freeman, 2012; Sampson, 2022). Self-organization refers to a process through which the complete function of a dynamic system alters through the interaction of different parts of that system (Larsen-Freeman, 2012; Gooran et al., 2022) and includes four developmental stages: triggering, coupling, realignment, and stabilization (Rahmati et al., 2019). Similar to its origin in biology, teacher immunity is of two kinds: productive immunity and maladaptive immunity (Hiver and Dörnyei, 2017; Sutarto et al., 2022). As a protective armor, the former protects teachers against stress, failure, burnout, and the like. In contrast, the latter negatively affects the teaching processes to make them fossilized (Hiver and Dörnyei, 2017). Different factors may trigger maladaptive immunity, such as avoidance-oriented behaviors (Hiver and Dörnyei, 2017) or resistance to change or innovation (Bullough and Hall-Kenyon, 2012; Xu et al., 2022). Productive immunity influences teachers’ thinking style, acting in social contexts, as well as professional identity (Hiver, 2017; Hiver and Dörnyei, 2017). More precisely, language teacher immunity can be classified as productive immunity, maladaptive immunity, the state of immunocompromised, and partial immunity. Productive immunity refers to a vigorous form of teacher immunity, while maladaptive immunity is the counterproductive form of teacher immunity. Immunocompromised means having not developed any coherent form of teacher immunity, and partially immunized refers to halfway features of teacher immunity.

What emerges from the review of the sparse literature on teacher immunity, this road is untrodden and calls for further studies to shed light on its associations with other teacher-related constructs. After the introduction of language teacher immunity by Hiver (2015, 2017) and (Haseli Songhori et al., 2018), the dominant type of employed immunity strategy was investigated among Iranian English teachers by Haseli Songhori et al. (2018).

They found out maladaptive immunity was the predominant type of immunity among Iranian English teachers. Furthermore, they concluded that Iranian English teachers followed triggering, coupling, realignment, and stabilization, in forming their immunity. In the same vein, Rahimpour et al. (2020) applied a path-analysis approach and postulated a model on the factors predicting language teacher immunity. Based on their findings, language teacher immunity is indirectly influenced by agreeableness, extroversion, and emotionality through job insecurity and reflective teaching. They also concluded that the influence of job insecurity on reflective teaching and language teacher immunity was significantly negative.

Along the same path, the relationship between autonomy, emotions, engagement, and immunity of experienced in-service teachers was investigated by Azari Noughabi et al. (2020). As the results of multiple regression suggested, language teacher immunity could be significantly predicted by teachers’ autonomy, emotions, and engagement. Among the three variables under study, teacher autonomy was found to be the strongest predictor of experienced EFL teachers’ immunity. The implications of this study ask for providing EFL teachers with opportunities to exercise autonomy and regulate emotions through teacher education courses, which in turn foster productive immunity. Moreover, the contributions of L2 grit and work engagement to EFL teachers’ immunity examined (Azari Noughabi et al., 2022). Their findings reflected those higher levels of work engagement and L2 grit immune EFL teachers in the face of different challenges during their professional lives. In a recent study in China, Li (2022) concluded that the relationship between EFL teachers’ immunity, mindfulness, and work engagement was significantly positive. This study also necessitates the use of training courses for language teachers to enhance EFL teachers’ immunity development, mindfulness, and engagement.

Objectives of the present study

In spite of its relevance, and perhaps because of its complexity, teachers’ ER and immunity, in particular English university teachers’ ER and immunity has remained an uncharted territory that awaits further research (Burić et al., 2017; Hiver and Dörnyei, 2017; Rahimpour et al., 2020; Alipour et al., 2021; Heydarnejad et al., 2021c). More importantly, Frenzel et al. (2015) asserted that teachers’ emotions are different depending on different subjects and groups of students. Hence, each context is worth exploring as it may show different findings in comparison with other contexts. Most of the existing studies on teachers’ ER has been conducted within a theoretical framework of stress and coping (Lewis and Haviland, 1993) or in the context of emotional labor (e.g., Hargreaves, 1998, Isenbarger and

Zembylas, 2006; Azari Noughabi et al., 2020, 2022). Regarding teacher immunity, few empirical studies (Hiver, 2015, 2017; Haseli Songhori et al., 2018; Rahimpour et al., 2020) and only one theoretical study (Hiver and Dörnyei, 2017) have been conducted among language teachers. Thereby, the realm of higher education still remained untouched and calls for more identical studies that put forward a clear picture of university professor immunity.

Furthermore, it is generally accepted that CT has numerous benefits for teachers, but little is known about how it interacts with two other essential constructs, i.e., language teacher ER and immunity, especially in higher education. Leafing through the existing literature reflects that the possible relationship between ER, CT, and immunity has not been brought to the foreground of research foci (Gross and Thompson, 2007; Burić et al., 2017; Rahimpour et al., 2020; Sadeghi et al., 2020; Li, 2022), particularly in higher education (Fathi and Derakhshan, 2019; Chang, 2020; Chang and Taxer, 2020; Heydarnejad et al., 2021a; Amirian et al., 2022). To this end, the present study sought to propose a model to display the contribution of CT as well as ER to immunity in higher education (see Figure 1). Considering the abovementioned objectives, the current investigation put forward to answer the following research questions:

RQ1: To what extent does English university teachers' critical thinking predict their immunity?

RQ2: To what extent does English university teachers' emotion regulation predict their immunity?

In line with the above research questions, the following null hypotheses were formulated:

H01. English university teachers' CT does not predict their immunity.

H02. English university teachers' emotion regulation does not predict their immunity.

Theoretical model

The present study is built on the assumption that university teachers' immunity is affected by CT and ER. That is, it is hypothesized that university teachers' immunity is shaped with their CT and ER.

Method of the study

Research design

The researchers employed a correlational design for the present study. As noted by Riazi (2016), a correlational design is used to explore the correlations between some variables without controlling or manipulating any of them. Overall, the researchers used a correlational design to uncover the role of CT

and ER in university teachers' immunity in the Iranian higher education context.

Setting and participants

The present study was run at state-run universities in Iran. They are under the direct supervision of Ministry of Science, Research and Technology. The primary mission is to guarantee free education and physical training for everyone at all levels, and the facilitation and expansion of higher education. Using a convenience sampling method, a total of 293 English university teachers were selected from 25 run-state universities. According to Riazi (2016), the convenience sampling method is a non-probability sampling method adopted by researchers to gather data from a conveniently available pool of participants. They included both men ($n = 171$) and women ($n = 122$) aged from 31 to 52. They had different majors, including English Teaching ($n = 110$), English Literature ($n = 74$), English Translation ($n = 61$), and Linguistics ($n = 48$). Due to logistical limitations, the participants' years of teaching and teaching location were not controlled. Of particular note is that the participants declared their consent to participate in the study orally. The researchers ensured that their responses would be kept confidential and they would be kept informed about the final results.

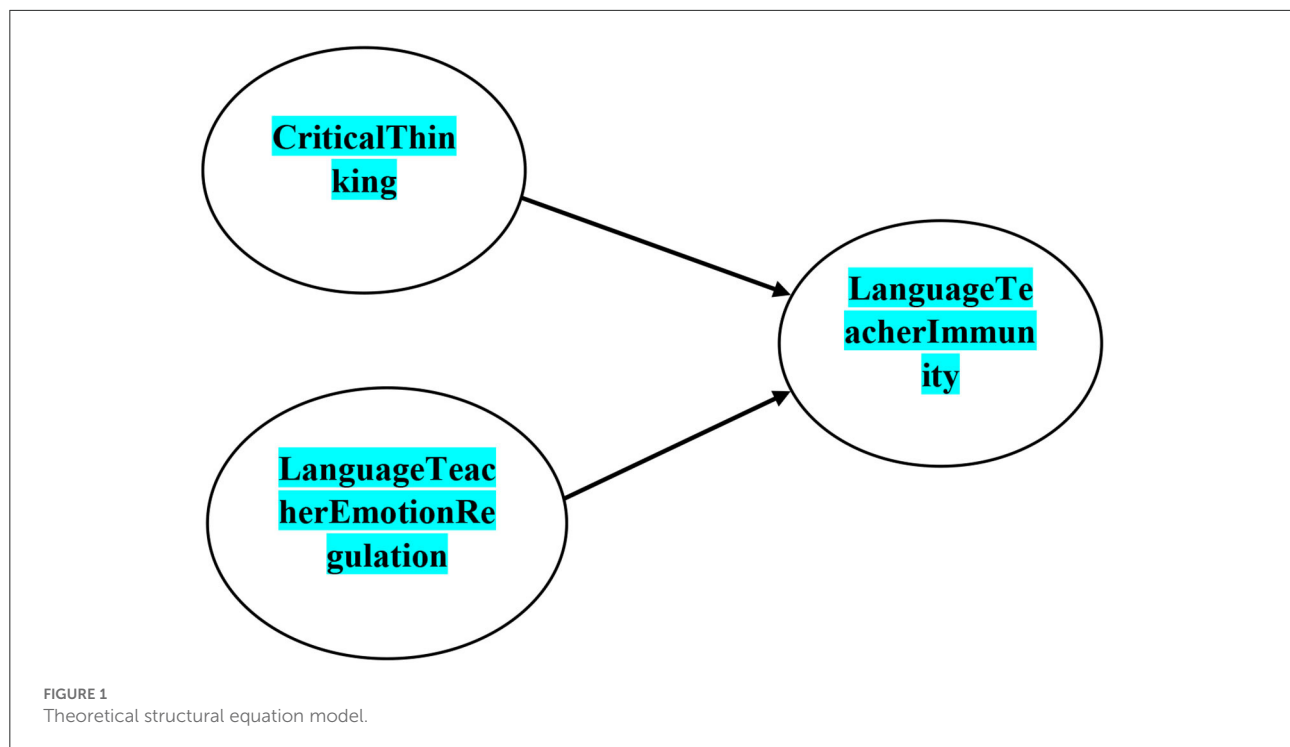
Instruments

Watson–Glaser critical thinking appraisal-form

The Watson–Glaser Critical Thinking Appraisal Form (1980) was the applied instrument to explore CT among the participants. This instrument was generated from Watson and Glaser (1980) and includes the following sections: inference, recognizing of assumptions, making deduction, interpretation, and evaluation. In a study conducted by Watson and Glaser (2002), the scale presented acceptable validity and reliability. In the present study, Cronbach Alpha was 0.944, which indicated acceptable reliability.

The language teacher emotion regulation inventory

The Language Teacher Emotion Regulation Inventory (LTERI), designed and validated by Heydarnejad et al. (2021c), was employed to gauge university teachers' ER strategies. They were required to consider similar situations from their teaching experiences at the workplace and rate the statements in the light of their preferred ER strategies. The LTERI consists of 27 items on a five-point Likert scale anchored by 1 ("never") and 5 ("always") with six components, i.e., situation selection (5 items), situation modification (5 items), attention deployment (4 items), reappraisal (5 items), suppression (4 items), and seeking



social support (4 items). The reliability for all sub-scales of the LTERI was acceptable (ranging from 0.718 to 0.814) in a study by Heydarnejad et al. (2021c). In the current study, the reliability of the LTERI estimated through Cronbach's alpha was acceptable (ranging from 0.735 to 0.932).

The language teacher immunity instrument

To measure the participants' immunity, the Language Teacher Immunity Instrument (LTII), designed and validated by Hiver (2017), was utilized. This instrument is composed of 39 items in 7 sub-scales, each with a 6-point response scale (1 = strongly disagree; 6 = strongly agree). The sub-scales of this instrument are as follows: Teaching self-efficacy (7 items), Burnout (5 items), Resilience (5 items), Attitudes toward teaching (5 items), Openness to change (6 items), Classroom affectivity (6 items), and Coping (5 items). In the current investigation, the reliability of the LTII estimated through Cronbach Alpha was acceptable (ranging from 0.831 to 0.948).

Data collection procedures

The participants were selected based on convenience or opportunity sampling procedures, and they were assured that their responses were entirely anonymous. A web-based platform was employed to conduct this investigation, which was started

in January and ended in June 2022. That is, the participants received an electronic survey form including Watson–Glaser Critical Thinking Appraisal-Form A, the Language Teacher Emotion Regulation Inventory (LTERI), and The Language Teacher Immunity Instrument (LTII) through Google Forms. Since all teachers were qualified enough in English, the language of all four scales was English and, in this way, a construct irrelevant factor was avoided. Conducting the electronic survey enables researchers to collect data from different regions with varying age groups and teaching experiences. Altogether 293 forms were received with an 87.2% return rate. Moreover, no data were missed due to the design of the electronic survey.

Data analysis procedures

As the first step, the reliability of the instruments was checked by Cronbach Alpha formula. Then, the normality distributions of the data were checked through the Kolmogorov–Smirnov Test. Further, descriptive statistics were used to describe the data. Finally, as the data were normally distributed, confirmatory factor analysis (CFA) and structural equation modeling (SEM) using LISREL 8.80 were employed to analyze the data. That is, all latent variables were validated using CFA before testing a structural model (Hair et al., 1998). SEM as a robust multivariate procedure was used to take a confirmatory hypothesis-testing approach for the proposed structural theory (Schreiber et al., 2006).

TABLE 1 The results of descriptive statistics of the english university teachers' critical thinking, emotion regulation, and immunity.

Inventory	N	Minimum	Maximum	Mean	Std. deviation
Inference	293	1.00	5.00	3.874	0.854
Recognizing of assumptions	293	1.00	5.00	3.646	0.726
Making deduction	293	1.00	5.00	3.715	0.440
Interpretation	293	1.00	5.00	3.636	0.619
Evaluation	293	1.00	5.00	3.735	0.678
Situation selection	293	1.20	5.00	3.666	0.890
Situation modification	293	1.00	5.00	3.853	1.011
Attention deployment	293	1.00	5.00	3.928	0.653
Reappraisal	293	1.00	5.00	3.512	0.714
Suppression	293	1.00	5.00	2.555	0.643
Seeking social support	293	1.00	5.00	3.921	0.818
Teaching self-efficacy	293	1.00	6.00	4.632	0.493
Burnout	293	1.00	5.80	2.451	0.764
Resilience	293	1.00	5.60	4.543	0.643
Attitudes toward teaching	293	1.00	5.86	4.623	0.518
Openness to change	293	1.17	6.00	4.187	0.495
Classroom affectivity	293	1.00	6.00	3.996	1.051
Coping	293	1.00	6.00	4.807	1.091

Results

The results of statistical analysis to probe into the relationship between CT, ER, and immunity were presented here. Table 1 reported the descriptive statistics of English university teachers' CT, ER, and immunity.

As Table 1 presented, among the CT subscales inference ($M = 3.874$, $SD = 0.854$) and evaluation ($M = 3.735$, $SD = 0.678$) got the highest mean scores. Regarding the Language Teacher Emotion Regulation subscales, attention deployment ($M = 3.928$, $SD = 0.653$) and seeking social support ($M = 3.921$, $SD = 0.818$) show the highest mean scores. Moreover, among the Language Teacher Immunity subscales, coping ($M = 4.807$, $SD = 1.091$) and teaching self-efficacy ($M = 4.632$, $SD = 0.493$) displayed the highest mean scores.

As the following step, the data distributions were examined to make a logical decision about applying appropriate statistical methods. To do so, the Kolmogorov–Smirnov test was used to check the normality distributions of the variables.

Based on Table 2, the sig value for all the scales and their subscales was higher than 0.05, which the data were normally distributed. Thus, parametric methods could be employed for testing the related research hypotheses. The LISREL 8.80 statistical package was applied to explore the structural relations among the variables in the present research.

The chi-square magnitude, the root-mean-square error of Approximation (RMSEA), the comparative fit index (CFI), and

the normed fit index (NFI) were utilized to evaluate the model fit. As Jöreskog (1990) stated the chi-square should be non-significant and the chi-square/df ratio should be lower than 3. Furthermore, the root-mean-square error of approximation (RMSEA) is suggested to be lower than 0.1 (Jöreskog, 1990). The NFI with the cut value greater than 0.90, GFI with the cut value greater than 0.90, and CFI with the cut value greater than 0.90 indicates a good fit (Jöreskog, 1990). As Table 3 reported, the chi-square/df ratio (2.593) and the RMSEA (0.074) were also acceptable. The other three fit indices, GFI (0.938), NFI (0.944), and CFI (0.925) reached the acceptable fit thresholds.

As Figures 2, 3 (model 1) illustrated, the impacts of CT and LTER on LTI were positive. That means, CT significantly and positively contributed to the English university teachers' immunity ($\beta = 0.76$, $t = 15.92$). The significant role of university professor ER on teacher immunity ($\beta = 0.82$, $t = 17.50$) was also reported.

Table 4 presented the chi-square/df ratio (2.773), the RMSEA (0.078), GFI (0.932), NFI (0.941), and CFI (0.955) related to the second model. Based on the Table 4, all of the fit indices got the acceptable fit thresholds. The following figures (Figures 3, 4) depicted the detailed relationships among the variables.

Figures 4, 5 portray the contributions of CT and LTER to LTI sub-components. As it was depicted, CT significantly and positively contributed to the LTI sub-components: Teaching self-efficacy ($\beta = 0.85$, $t = 22.03$), Resilience ($\beta = 0.61$, t

TABLE 2 The results of kolmogorov–smirnov test.

Inventory	Subscales	Kolmogorov–Smirnov Z	Asymp. Sig. (2-tailed)
Watson–Glaser critical thinking appraisal	Inference	0.689	0.729
	Recognizing of assumptions	0.737	0.649
	Making deduction	0.707	0.699
	Interpretation	1.081	0.193
	Evaluation	0.796	0.551
LTERI	Situation selection	0.711	0.694
	Situation modification	0.705	0.702
	Attention deployment	0.687	0.733
	Reappraisal	0.817	0.517
	Suppression	1.082	0.192
LTII	Seeking social support	1.054	0.217
	Teaching self-efficacy	0.891	0.405
	Burnout	0.602	0.862
	Resilience	0.895	0.399
	Attitudes toward teaching	0.907	0.383
	Openness to change	1.186	0.120
	Classroom affectivity	0.980	0.292
	Coping	0.872	0.432

= 12.90), Attitudes toward teaching ($\beta = 0.81$, $t = 19.77$), Openness to change ($\beta = 0.54$, $t = 10.11$), Classroom Affectivity ($\beta = 0.70$, $t = 14.43$), and Coping ($\beta = 0.76$, $t = 18.77$). By contrast, the contribution of CT on Burnout ($\beta = -0.64$, $t = -13.46$) was significantly negative.

Considering the contribution of LTER to LTI subcomponents, the results was as follows: Teaching self-efficacy ($\beta = 0.87$, $t = 23.40$), Resilience ($\beta = 0.71$, $t = 14.27$), Attitudes toward teaching ($\beta = 0.83$, $t = 21.14$), Openness to change ($\beta = 0.53$, $t = 10.05$), Classroom Affectivity ($\beta = 0.90$, $t = 32.18$), and Coping ($\beta = 0.79$, $t = 15.28$). In contrast, the contribution of LTER to Burnout ($\beta = -0.57$, $t = -11.11$) was significantly negative.

Table 5 displayed that CT correlated positively with LTII subcomponents as following: Teaching self-efficacy ($r = 0.874$, $p < 0.001$), Resilience ($r = 0.717$, $p < 0.001$), Attitudes toward teaching ($r = 0.852$, $p < 0.001$), Openness to change ($r = 0.562$, $p < 0.001$), Classroom Affectivity ($r = 0.723$, $p < 0.001$), and Coping ($r = 0.814$, $p < 0.001$). In contrast, the association between CT

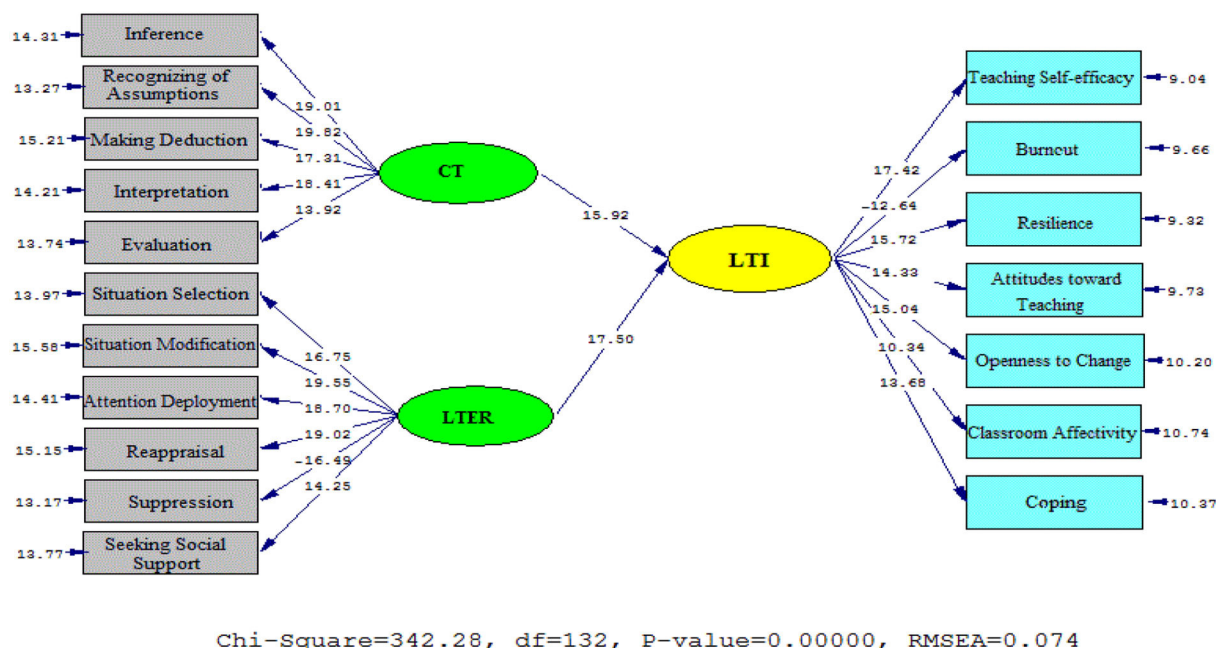
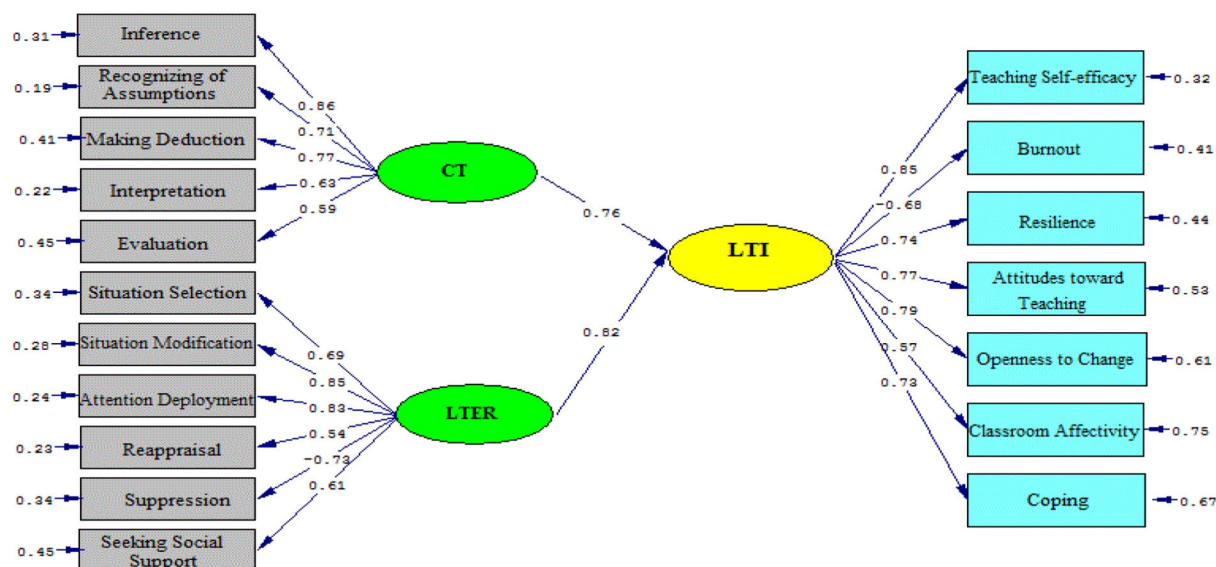
TABLE 3 The results of fit indices (model 1).

Model	Cut value
χ^2	342.28
df	132
χ^2/df	2.593
RMSEA	>0.1
GFI	0.9<
NFI	0.9<
CFI	0.9<

and Burnout was negative ($r = -0.679$, $p < 0.001$). Moreover, about the relationships between LTER and LTII subcomponents, the results were as follows: significantly positive with Teaching self-efficacy ($r = 0.895$, $p < 0.001$), Resilience ($r = 0.773$, $p < 0.001$), Attitudes toward teaching ($r = 0.895$, $p < 0.001$), Openness to change ($r = 0.598$, $p < 0.001$), Classroom Affectivity ($r = 0.945$, $p < 0.001$), and Coping ($r = 0.845$, $p < 0.001$); significantly negative with Burnout ($r = -0.589$, $p < 0.001$).

Discussion

This study explored the possible role of CT and ER in English university teachers' immunity in higher education. The results evidenced that CT is a strong predictor of the English university teachers' immunity. Based on the findings, it may be argued that CT empowers the English university teachers to zoom on their teaching processes leading to higher immunity. In other words, aligned with the findings of the study, it may be argued that the participants who were critical in their profession, they might have gained a comprehensive understanding the planning, implementing, and evaluating of the teaching processes. This, in turn, might have empowered them to overcome the tensions and unpleasant situations in their job. Accordingly, the first null hypothesis stating that the English university teachers' CT does not predict their immunity was rejected. The contribution of higher order thinking skills to English teachers' immunity has been confirmed in the previous studies (e.g., Rahmati et al., 2019; Rahimpour et al., 2020; Atefi Boroujeni et al., 2021; Li, 2022). For instance, Rahimpour et al. (2020) found that reflective teaching and language teachers' immunity were closely related. The gained findings also corroborated with those of Rahmati et al. (2019), emphasizing the cultivation of reflection in developing language teachers' immunity. Furthermore, the obtained results offered a deeper picture of how the English university teachers' CT may predict the different subskills of immunity. As the findings depicted, the participants' CT had significant positive correlation with their self-efficacy, resilience, attitude toward teaching, coping, openness to change, and classroom affectivity. In line with the findings, it may be argued that critical



between the English teachers' resilience and metacognitive skills was also confirmed by Mehrabian et al. (2022). The association between self-efficacy, resilience, and burnout was also supported by the findings of Fathi and Saeedian (2020). In the same line of inquiry, the link between CT and openness

TABLE 4 The results of fit indices (model 2).

Model	Cut value	
χ^2		3217.82
df		1160
χ^2/df		2.773
RMSEA	>0.1	0.078
GFI	0.9<	0.932
NFI	0.9<	0.941
CFI	0.9<	0.955

to change as one of the sub-components of personality trait was concluded by [Acevedo and Chelsie \(2022\)](#), as well as [Frenzel et al. \(2021\)](#). One possible reason for the gained findings is that the English teachers who were highly reflective in their job, they might have applied coping strategies result in the promotion of perseverance and productive immunization. Another justification for the findings may is that being equipped with CT might have enabled the English university teachers to show remarkable resilience in the face of tensions and difficulties.

Moreover, another line of discussion for the gained findings may be ascribed to view that the university teachers who were more critical thinkers might have managed reappraisal tends and coped with the challenges and difficulties of their jobs ([Pe et al., 2013](#); [Sheppes et al., 2014](#)). In other words, along with the gained results, it may be argued that CT might be a way to immunize the English university teachers productively in the face of tensions and complexities of the working conditions. In support of this argument, [Wang et al. \(2022\)](#) found the interrelationships of teacher higher order thinking skills, positive emotions, and resilience. Additionally, the findings receive support from the past literature disclosing the noticeable contributions of CT to the efficiency of English teachers (e.g., [Sheybani and Miri, 2019](#); [Sadeghi et al., 2020](#); [Heydarnejad et al., 2021a](#); [Amirian et al., 2022](#)). Furthermore, a part of the findings documented that the relationships between the reflective teaching and burnout were significantly negative. That is, it may be argued that that the more the English teachers might evaluate their teaching processes, the less chronic stress, emotional exhaustion, feeling of ineffectiveness, and lack of accomplishment they might experience. These findings are consistent with those of the previous studies (e.g., [Khodabakhshzadeh et al., 2017](#); [Li et al., 2021](#)), indicating a negative relationship between CT and teacher burnout.

Additionally, the results documented that ER was highly correlated with the English university teachers' immunity. Thus, the second null hypothesis stating that the English university teachers' ER does not predict immunity was rejected. In other words, the findings documented that ER had positive and significant contributions to self-efficacy, resilience, attitude

toward teaching, coping, openness to change, and classroom affectivity (the sub-scales of teacher immunity). Additionally, the results demonstrated that the regulation of the English university teachers' emotions at the workplace decreased the likeliness of burnout. Along with [Wang et al. \(2022\)](#), it can be argued that psychological wellbeing might lead to a productive configuration of immunity among the English university teachers. In a same vein, [Hiver \(2017\)](#) argued that the emotional wellbeing of English teachers would guarantee the development of productive immunity. The findings of the study are in line with those of [Burić et al. \(2020\)](#), reporting that teachers' emotions performed as a filter governing the way efficacy information is interpreted. Additionally, the results are congruent with the findings of [Donker et al. \(2020\)](#). They found that strong ER strategies played a significant role in decreasing teachers' emotional exhaustion and burn out. Furthermore, the gained findings lend support to those of [Shen \(2022\)](#), disclosing the mediator role of teacher ER in managing teachers' burnout, stress, and anxiety among English teachers.

One possible explanation for the findings may be ascribed to the view that the emotion-regulatory strategies might endow a balance in the professional lives of the English university teachers, leading to more enthusiasm and engagement in teaching procedures. Additionally, the findings may be justified from this perspective that ER might contribute to the latency, rise time, magnitude, duration, and offset of emotional responses and immunize university teachers productively. The findings of the current study can be strongly supported by the underpinning theories of CT, ER, as well as immunity. CT stipulated that higher order thinking skills offer stages of conceptualization, analysis, synthesize, reflection, and evaluation ([Dewey, 1933](#); [Paul, 1988](#)). Productive immunity stemmed in self-organization theory is a defensive mechanism act against different experienced problems during the professional life ([Larsen-Freeman, 2012](#); [Hiver, 2015, 2017](#)). This rationale can be put forward that the strategies involved in higher order thinking skill support self-awareness and self-organization lead to productive immunity. Moreover, the model of teacher ER suggests skillful teachers adapt efficient strategies in managing their emotions ([Heydarnejad et al., 2021c](#)). Emotional balance, which is the results of self-evaluation and self-organization fosters productive immunity. In other words, cultivating emotional regulation keeps university teachers' immune system productive. Reciprocally, optimizing immune competence among university teachers fosters efficient instruction ([Hiver and Dörnyei, 2017](#)).

In addition, it can be argued that CT skills and ER might help the English university teachers to achieve a balance in their personal and professional lives. That is, this rationale can be put forward that thinking and evaluation allow university teachers to delve into their behaviors and activities, giving them a strong sense of self-awareness, self-regulation, self-monitoring,

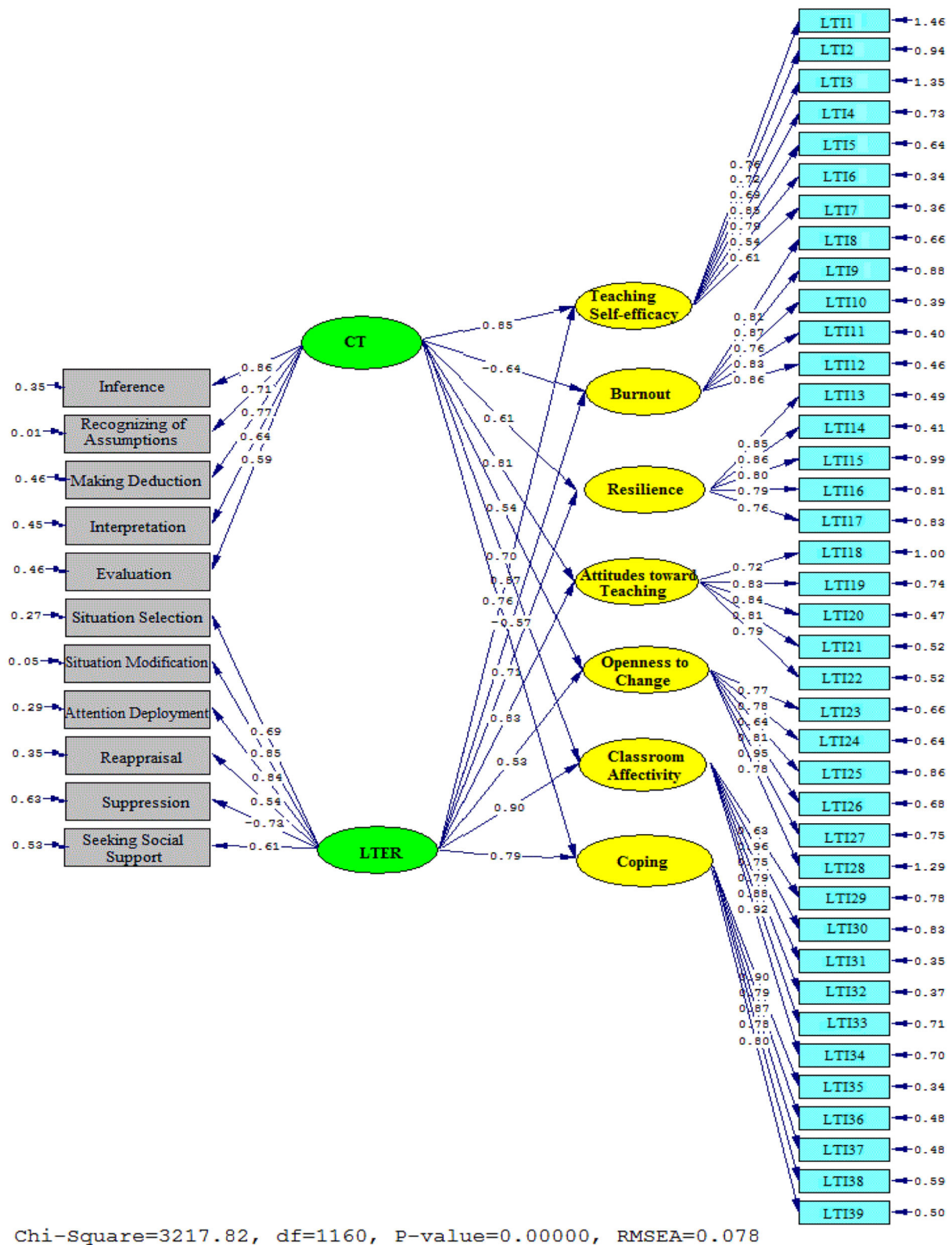


FIGURE 4

Schematic representation of path coefficient values for the influential role of critical thinking and self-efficacy on teaching style' subscales (model 2).

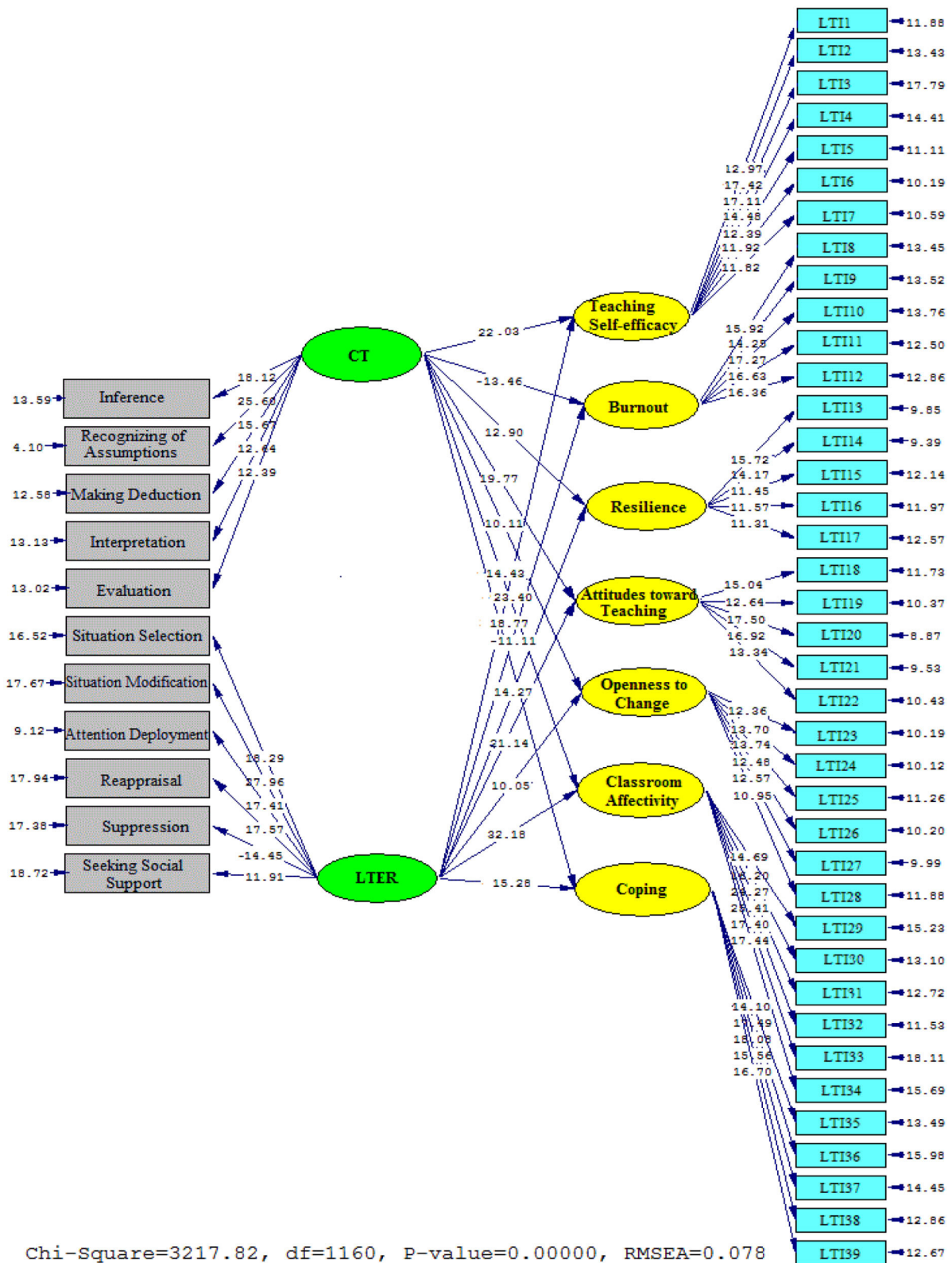


FIGURE 5

The T values for path coefficient significance (model 2).

TABLE 5 The results of the correlation coefficients among the english university teachers' critical thinking, emotion regulation, and immunity.

	Critical thinking	LTERI	Teaching self-efficacy	Burnout	Resilience	Attitudes toward teaching	Openness to change	Classroom affectivity	Coping
Critical thinking	1								
Language Teachers Emotional Regulation Inventory	0.621**	1							
Teaching self-efficacy	0.874**	0.895**	1						
Burnout	−0.679**	−0.589**	−0.644**	1					
Resilience	0.717**	0.773**	0.677**	−0.756**	1				
Attitudes toward teaching	0.852**	0.895**	0.773**	−0.607**	0.646**	1			
Openness to change	0.562**	0.598**	0.650**	−0.443**	0.564**	0.705**	1		
Classroom affectivity	0.723**	0.945**	0.881**	−0.664**	0.611**	0.452**	0.467**	1	
Coping	0.814**	0.845**	0.740**	−0.720**	0.658**	0.624**	0.555**	0.645**	1

**Correlation is significant at the 0.01 level (2-tailed).

and self-assessment in the face of emotional experiences in their personal and professional demands. Furthermore, it can be implied that the more teachers practice reflective teaching, the better they can manage and modify their emotional demands. This finding is congruent with prior studies though limited and quite rare in the EFL context, which focus on the relationship between reflective teaching and teacher emotions (Zembylas, 2014; Bleakley et al., 2020; Gkonou et al., 2020; Song, 2021).

Conclusion

As noted above, the present study explored the role of the English teachers' CT and ER in immunity. The findings revealed that the English teachers' CT and ER contributed significantly to immunity. That is, the English university teachers armed with CT skills and ER strategies might manipulate their practices and align them with the emotional display rules of their profession. This implied that the English university teachers were immunized with CT and ER to handle job obligations.

The implications drawn from the results of the current study may be beneficial for teacher-educators to develop more productive pre-service and in-service programs by incorporating CT and ER in their syllabi. Additionally, teacher preparation programs should consider more practical strategies to enhance CT skills, ER strategies, and higher order thinking skills for pre-service teachers. Considering the centrality of university teachers' affective status in how they deal with reform initiatives, it is hoped that the outcomes of this research help university teachers take practical measures to monitor and manage their emotional states in English education in Iran and in the broader international context. Besides, policymakers are invited to consider these results in order to have a

comprehensive picture of factors that contribute to the success and failure of teachers and programs. Since language teacher immunity is relatively a new construct, educators, teachers, and policymakers need to become aware of its central role in the field. Therefore, studies like the present investigation provide useful insights for those involved in the language teaching profession.

Some limitations imposed on the present study that can be considered as avenues for further research. First, as the participants were chosen through a convenience sampling method, more studies should be conducted in other higher education contexts in the country to increase the generalizability of the obtained findings. Second, as a quantitative method was applied in this study, future studies can use mixed-methods designs to inspect the association between CT, ER, and immunity to present a comprehensive picture of the topic. Third, because the present study was cross-sectional, future longitudinal studies are needed to inspect the long-term contributions of CT and ER to university teachers' immunity. Fourth, because in the present study, demographic variables such as teachers' cultural and socioeconomic background, major, mastery experience, pedagogical training, and other possible explaining variables were not explored. Thus, researchers are recommended to consider university teachers' demographic variables in similar research studies in the future. Fifth, studies conducted within the realm of educational psychology indicated that the performance of the participants with different L1 backgrounds might differ considerably from culture to culture and that the methodological approaches to measure this issue in specific contexts might not be comparable. Therefore, the relationships between ER, CT, and immunity can be the target of future research in other contexts and cultures. Sixth, it is recommended to undertake further research to explore the possible contributions of university teachers' CT tendencies, ER, and immunity to

their learners' academic achievement. As further suggestion, examining the relationships between ER, CT, and immunity with other teacher attributed constructs, such as autonomy, reflective teaching, self-regulation, L2 grit, and work engagement, are recommended. Last but not least, as the present study focused on the role of CT and ER in university teachers' immunity, interested researchers can explore the correlation between teachers' immunity and their job motivation, job satisfaction, and job performance.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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A literature review of the research on students' evaluation of teaching in higher education

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Students' evaluation of teaching is a teaching quality evaluation method and teacher performance evaluation tool commonly used in Chinese and foreign universities, and it is also a controversial hot issue in the field of teaching evaluation. At present, the research results of students' evaluation of teaching in higher education are relatively rich, mainly focusing on reliability, validity and its influencing factors, construction of index system, problems in practical application and improvement strategies. The purpose of this article is to study the relevant research results of the current Chinese and foreign academic circles, in order to provide useful inspiration for the construction of the index system and practical application of the ideological and political theory course evaluation and teaching of Chinese college students.

KEYWORDS

students' evaluation of teaching, review, comments, higher education, indicator systems

Introduction

Students' evaluations of teaching (SET) is an activity for students to evaluate teachers' teaching effect and teaching quality, including the reliability, validity, content, form, organization, and management of teaching evaluation. In the 1920s, the earliest college student evaluation system in the world began in the United States. In 1915, Purdue University in the United States gave birth to the first student evaluation scale, and in 1927 began to use the standardized student evaluation scale to evaluate teachers' teaching, which is considered to be the beginning of the student evaluation system (De Neve, 1991; Theall et al., 2001). After the 1980s, the college student evaluation system began to be introduced into China while it was widely used in famous universities in western countries and became an important part of the western education system (Tu et al., 2019). In 2001, the Ministry of education of the people's Republic of China issued several opinions on Strengthening Undergraduate Teaching in Colleges and universities and improving teaching quality, which clearly pointed out that students should be involved in teaching management. Many colleges and universities across the country responded positively and gradually applied student evaluation to teaching management. Relevant research was gradually enriched, and many suggestions on student evaluation were gradually adopted and implemented by

colleges and universities (Wei and Liu, 2013). This article will systematically analyze the relevant theoretical achievements of the current Chinese and foreign academic circles, especially the European and American World College Students' evaluation of teaching, in order to provide useful enlightenment for the construction of the index system and practical application of the evaluation of Ideological and political theory courses for Chinese college students.

Research methodology: Literature analysis and logical analysis

This article is a literature review, so two main approaches have been adopted: documentary analysis and logical analysis. In terms of literature analysis, a large amount of literature has been consulted in writing this article, and as there is a large body of literature relating to Students' evaluation of teaching in higher education, the authors have followed three principles in selecting literature to read. The first is to look at the time of publication of the literature, with priority given to those published recently; the second is to look at journals and authors, with priority given to well-known journals and authors; the third is to look at citation rates, with priority given to those with high citation rates; and the fourth is to pay particular attention to the two types of articles that hold pro and con views on SET. In terms of logical analysis, this article argues that the three most critical factors associated with SET are the reliability and validity of SET, the indicator system of SET, the problems that arise in the application of SET, and the countermeasures taken. This article argues that, as a review, the four most critical factors related to SET are reliability and validity, indicator systems, problems arising in application and countermeasures to be taken, and evaluation of the above perspectives. Therefore, the logical framework of this article is: an analysis of the reliability and validity of relevant SETs in the existing literature, an analysis of the indicator system, and an analysis of the problems associated with their practical application, an evaluation of the above-mentioned views on relevant SETs, and finally, a conclusion and recommendations.

Research on the reliability and validity of students' evaluation of teaching in higher education

In students' evaluation of teaching, reliability refers to the degree to which students' evaluation of teaching can stably reflect teachers' actual teaching level, which is manifested in the stability or consistency of the evaluation results; Validity refers to whether students' evaluation of teaching can achieve the expected goals and effects (Hong, 2010). Whether, it is reliable and effective is directly related to whether students' teaching evaluation can be applied to teachers' teaching evaluation. According to the current research results of the academic circles, although there are

many doubts about the reliability of College Students' teaching evaluation, the traditional view that its reliability is high has not been overturned. The validity is also controversial (Uttl, 2021). The mainstream view is that it is effective on the whole and has been supported by abundant literature.

Views on the reliability of student's evaluation of teaching in higher education

A skeptical view of the reliability of student's evaluation of teaching

In the early research, due to the limitation of research design and method, scholars mostly used the average score of the class to measure the reliability of students' teaching evaluation. Since this method ignored the differences between individual students, it exaggerated the students' evaluation to a certain extent. Religious reliability (Hoccevar, 1991). With the development and application of statistics and data analysis methods, scholars began to use more scientific measurement tools to conduct empirical research on students' teaching evaluation reliability. Cheng and Zhang (2016) tested the reliability of the samples from three levels: "inter-student reliability," "intra-course consistency" and "inter-item reliability," and concluded that the reliability index inflated due to scoring inertia. It cannot explain the reliability of the teaching evaluation results, but shows that the reliability measurement contains more interference information. Gao et al. (2010) and other scholars used the intraclass correlation coefficient to comprehensively evaluate the reliability of students' teaching evaluation and found that: in various indicators, students' scores on teachers' teaching are relatively consistent, so they can be It is judged that its rater reliability is high.

A favorable view of the reliability of student's evaluation of teaching in higher education

In contrast to Gao et al. (2010) and Morley (2012) and other scholars used the intra class correlation coefficient to comprehensively evaluate the reliability of students' teaching evaluation and found that students' scores of teachers' teaching are relatively consistent in all indicators, so it can be judged that their raters have high reliability also believe that the SET tool used in universities is reasonable, reliable, and effective.

Viewpoints on the validity of student's evaluation of teaching in higher education

View of sufficient effectiveness

He (2017) pointed out in his research that college students, as classroom participants and stakeholders, have the most say in the teaching effect, and have the necessary cognitive and judgment skills, so students' evaluation of teaching is scientific, objective and

accurate. [Li et al. \(2017\)](#) believe that compared with other teaching evaluation models, student evaluation of teaching has a more direct and economical advantage, and establishes a teaching system that is mainly based on student evaluation and supplemented by expert evaluation and peer evaluation. A quality assurance system is available. Foreign studies have also pointed out that, from the long-term practice of the student evaluation system in many colleges and universities, although there are doubts, its effectiveness is worthy of recognition ([Chau, 1997](#)). Numerous colleges and universities in North America, Europe, and Asia are using student evaluations as a valid indicator to measure teaching effectiveness, or as one of the determinants of teacher promotion, tenure, pay-for-performance, or professional development ([Chen and Hoshower, 2003](#)). [Cashin and Downey \(1992\)](#) even argue that student evaluations are more reliable and valid than any other data and can be used to improve teachers' teaching.

View of insufficient effectiveness

[Wang and Guan \(2017\)](#) and [Zhou and Qin \(2018\)](#) believe that students' teaching evaluation is students' subjective value judgment of teachers' teaching. Students may have unclear cognition of teaching evaluation or negative random evaluation, which leads to the deviation of teaching evaluation results and is difficult to truly reflect the problems in teaching practice. [Gu et al. \(2021\)](#) believes that students are still in the process of knowledge accumulation, and the dislocation of teaching evaluation subjects and perspectives caused by students' teaching evaluation makes it difficult for them to accurately grasp the information of teaching activities, resulting in evaluation distortion. [Morley \(2012\)](#), [Spooren et al. \(2013\)](#) and other foreign scholars pointed out that although the methods of measuring the effectiveness of students' teaching evaluation in some typical studies are widely spread, some of them have logical problems, and educators have only reached a consensus on some characteristics of proving the effectiveness of teaching. Based on these characteristics, the effectiveness of students' teaching evaluation cannot be clearly defined. [Galbraith et al. \(2012\)](#) also believes that the existing evidence is insufficient to support the effectiveness of SET as a general indicator to evaluate the teaching effect or student learning effect. This paragraph should be deleted) Wolfgang [Stroebe \(2020\)](#) also thinks that the existing evidence shows that students' evaluation of teaching (sets) can not measure the teaching effect.

Factors affecting the reliability and validity of student's evaluation of teaching in higher education

Since reliability is a necessary condition for validity, the effectiveness of student evaluation of teaching needs to be supported by reliable evaluation results, so the academic circles generally consider the factors affecting reliability and validity comprehensively. According to the current research results, the

influencing factors can be divided into two categories: teaching factors and non-teaching factors. Teaching factors include teaching methods, teaching contents, teaching attitudes, teaching means, etc. Non-teaching factors include students' individual factors, such as grade, gender, specialty, academic achievement, teaching evaluation attitude, etc.; teachers' personal factors, such as teachers' age, gender, professional title, teachers' favorite degree by students ([Dennis, 2022](#)); and curriculum factors, such as course form, course time, course importance, course difficulty, etc. As the teaching factors themselves belong to the content covered by the students' evaluation of teaching, their influence on the evaluation results is positive. Therefore, the discussion of the influencing factors in the academic circles mainly focuses on the non-teaching factors that cause the deviation of the evaluation results.

Chinese scholars' research on the influencing factors of College Students' teaching evaluation is mainly to collect the data of influencing factor assumptions from students through questionnaires and interviews, and combined with the teaching evaluation results of specific colleges and universities, use statistical methods to select appropriate models for data analysis, so as to draw conclusions. [Pan and Zhang \(2016\)](#) concluded through empirical research that students' subjective cognitive factors have a greater impact on the effectiveness of teaching evaluation than objective factors such as grade, gender, academic achievement, and so on. [Li and Meng \(2020\)](#) used the research method of grounded theory to draw a conclusion that students' evaluation of teaching is affected by four factors: students, teachers, schools, and courses. If it is not handled properly, it is prone to adverse selection, which affects the effectiveness of teaching evaluation and the quality of school teaching. [Long \(2019\)](#) pointed out after analyzing the teaching evaluation data of students in Shantou University business school that there is no inevitable positive correlation between the teaching evaluation scores obtained by teachers and students' grades of the course, and the teaching workload of teachers has a significant negative impact on the teaching evaluation scores.

Western scholars' research on the influencing factors of students' teaching evaluation is more comprehensive, systematic, and in-depth than domestic. However, because the influencing factors of students' teaching evaluation are too numerous, and there are certain differences in the survey objects selected by different students, there is no agreement on the degree of influence of each factor. [Gallagher \(2000\)](#), [Ginexi \(2003\)](#), [Heckert et al. \(2006\)](#), and other scholars found through research that students' characteristics (such as gender, personality, expected score of curriculum, emotion toward teachers, grade, learning expectation, major, attitude toward curriculum and teaching evaluation, the proportion of students participating in teaching evaluation in the total number of students, confidence in the effectiveness and influence of their teaching evaluation results, etc.), Teachers' characteristics (such as gender, age, educational background, rank, relationship with students, charm and image, etc.) and curriculum characteristics (such as curriculum time, class size, curriculum nature, assessment form, etc.), and even whether the evaluation of

teaching is anonymous, and whether the evaluated teachers participate in the evaluation process may have varying degrees of impact on the evaluation behavior of college students in a specific way (Kekale, 2000).

Research on the indicators of student's evaluation of teaching in higher education

In the process of college students' teaching evaluation, reasonable teaching evaluation indicators are particularly important. It plays a key role in the accuracy and influence of teaching evaluation results, and is the premise and basis for students' teaching evaluation to help improve teaching quality. The research and analysis of college students' teaching evaluation index includes not only the construction of the specific content of the teaching evaluation index, but also the discussion of the theoretical principles that should be followed in the construction of the index. As the central link of college students' teaching evaluation, the research on teaching evaluation indicators will provide valuable reference for improving students' teaching evaluation system.

Principles of constructing teaching evaluation indicators for college students

According to the current research results, the most common view in the academic circle on the construction principle of teaching evaluation indicators is to adhere to the "student-centered." The view of "student-centered" originated from the "child-centered theory" of American educator and psychologist John Dewey, which emphasizes that the essential purpose of education is to promote the comprehensive and harmonious development of students (Ye, 2000). The student-centered evaluation index system requires that the evaluation scale should be designed from the perspective of students, based on students' cognitive level and actual needs, and based on students' real feelings and gains. Students' development should become the starting point and foothold of building the teaching evaluation index system (Lv, 2014).

In addition to the mainstream views, scholars such as Wu et al. (2015) also believe that the design of the index system of college students' teaching evaluation should at least include the characteristics of orientation, academic, interaction, difference, measurability and growth. Jiang and Xiong (2021) pointed out that after analyzing the evaluation indicators of four national universities in Japan, students' learning behavior and emotional investment should be included in the evaluation index system, and more students' "learning" should be included in the evaluation field. Tsou (2020) proposed to use AHP to integrate student evaluation, expert evaluation, and regular teaching assessment into the teaching evaluation system to form a new method of

"same platform evaluation." Ching (2019) believes that in order to develop relevant and constructive set indicators, the participation of important stakeholders, such as school managers, teachers and students, is essential, and more importantly, the service attributes that students want (power, rich experience and experience) should be taken into account.

Contents of the teaching evaluation indicators of college students

In the specific content design of college students' teaching evaluation indicators, Chinese scholars generally agree with the setting mode of secondary indicators. Yan and Wei (2016) believes that the setting of student evaluation indicators should follow the teaching principles of constructivism theory, highlight the core concept of teacher led and student-centered, design secondary indicators covering six aspects: teaching methods, teaching content, teaching attitude, teacher ethics and style, learning elements, learning effects, and set open questions for students to express their opinions and suggestions. Zhang et al. (2017) started with five first-level indicators of teaching attitude, teaching implementation, Teaching means and methods, teaching ability and level, and teaching effect based on literature research and teaching evaluation experience in colleges and universities. There are 33 secondary evaluation indicators based on learning theory and closely related to teaching quality, covering all aspects of the teaching process. Wu et al. (2015), from the perspective of systems theory, combined teaching evaluation theory, Chinese and other teaching evaluation cases and empirical research results, and designed a comprehensive index covering teaching enthusiasm, teaching organization, learning value, and teacher-student relationship, teaching content, teaching interaction, homework and assessment of 7 single indicators of evaluation index system. It is also worth mentioning that Zhang et al. (2019) optimized the student evaluation index system based on the new era's requirements for higher education teaching quality, and constructed an index system of three levels: general education indicators, subject sharing indicators and school specific indicators, and added the relevant contents of "moral education" and "ideological politics" to the general education indicators.

Universities in some countries such as the United Kingdom, the United States, and Australia have set up special teaching evaluation and development institutions, whose members are composed of experts from different disciplines, and experts collectively discuss and formulate standardized student teaching evaluation scales. The evaluation indicators of the scale mainly refer to D. L. Stufflebeam's CIPP evaluation model (Zhou, 2012). The CIPP model advocates helping managers (the makers of the indicator system) to systematically obtain and use evaluation feedback information in order to meet their needs or to utilize information resources as much as possible. Most of the colleges and universities in Western countries refer to this model, starting from the traditional student evaluation index, and divide it into

three dimensions: background condition, process, and result to design evaluation index to systematically evaluate teacher teaching (Kellaghan and Stufflebeam, 2003; Zhao, 2010). Another SEEQ model has also been praised by foreign universities. The SEEQ evaluation index is composed of four parts: core index, characteristics of students and courses, additional index (supplementary questions) and open evaluation. Among them, the core index requires students to evaluate nine parts of teachers' teaching. These nine parts include Academic, emotional, organizational, collaboration, personal communication, curriculum development, assessment, homework, and overall impression of teachers (Richardson, 2005; Marsh, 2007; Schellhase, 2010). Chinese scholars Jiang and Lu (2019) also found in their research on the students' teaching evaluation system in ten first-class foreign universities that Stanford, MIT, Cornell and other colleges and universities evaluate students' overall experience of the course and achieve the learning goals of the course. The evaluation of the situation and the evaluation of knowledge acquisition and skill development are included in the student evaluation index.

Research on the problems and countermeasures in the practical application of student's evaluation of teaching in higher education

Since the student evaluation system has been widely used in major colleges and universities in the world, it has not only achieved certain results, but also exposed many problems in practical application. The academic circles have abundant research results on the problems and improvement strategies in the practice of college students' teaching evaluation. Although the opinions of various scholars are occasionally lacking, they are generally similar. This article summarizes the main points of view.

Problems existing in the practice of teaching evaluation by college students

First, the function of teaching evaluation is alienated. There is a game between teaching managers, teachers and students in the existing student teaching evaluation system, that is, managers focus more on teachers' "teaching" rather than students' "learning." Exaggerating the degree of teaching evaluation's response to teachers' teaching level weakens its function of teaching improvement (Becker and William, 2000; Jiang et al., 2018; Liang et al., 2020). Second, the evaluation index system is unscientific. According to the existing research, the unscientific aspects of teaching evaluation indicators are mainly reflected in the neglect of the subject status of students in teaching evaluation, the failure to distinguish the evaluation indicators of different professional courses, the too many invalid indicators and the complicated content, and the lack of theoretical guidance for the construction

of the indicator system, etc (Ching, 2019; Sun, 2021). Constantinou and Wijnen-Meijer (2022) also pointed out that students, peers, curriculum managers and self-evaluation should be included in teaching evaluation (Chan, 2019). Third, the use of teaching evaluation results is unreasonable. In many colleges and universities, students' teaching evaluation is a mere formality, only using quantitative scores to evaluate teachers' performance, ignoring the value of qualitative teaching evaluation data; at the same time, the processing of teaching evaluation data is too simplistic, and a reasonable result feedback mechanism has not been formed (Chan, 2019). Fourth, the management system is imperfect. Restricted by subjective and objective conditions, at present, the management of students' teaching evaluation in Colleges and universities at home and abroad is relatively extensive (Li et al., 2019), most of which are implemented by educational administration departments or entrusted to third-party evaluation institutions for operation, and few of them set up special organizations or establish clear rules and regulations to standardize the implementation of teaching evaluation.

Improvement strategies for student's evaluation of teaching in higher education

In view of the problems existing in the actual operation of College Students' teaching evaluation, scholars at home and abroad have given suggestions for improvement from different angles. Sun and Sun (2020) believe that the failure of students' teaching evaluation is caused by various games in teaching evaluation, and the fundamental solution is to change the function from the role of personnel management and summative evaluation of teachers. Tools, transforming into links and means of the ongoing process of diagnosing and developing teacher teaching. Long and Wang (2019) pointed out in their research that the use of the student teaching evaluation system should clarify the value, clarify the standards, and set the rules, and conduct a comprehensive evaluation from the aspects of clarifying the purpose of evaluation, optimizing the evaluation indicators, enriching the evaluation forms, and rationally using the results. It is comprehensively constructed to realize the teaching academic value of students' evaluation of teaching. Xu (2017) believes that timely self-improvement is an important part of the new student teaching evaluation system, so the student teaching evaluation process should be optimized based on the principle of continuous improvement, and a problem tracking and monitoring guarantee mechanism should be established. Through his research, Svinicki (2010) showed that open evaluation plays an important role in students' teaching evaluation. The limitation of pure quantitative evaluation on students' expression should be reduced as much as possible and more open possibilities should be provided in terms of teaching evaluation indicators. Marsh and Herbert (1987) put the perspective on the feedback of teaching evaluation results, and believed that the influence and effectiveness of students' teaching evaluation results can be expanded through three feedback methods:

summary of students' teaching evaluation results, summary materials for each teacher, and teaching expert advice given in combination with students' teaching evaluation results. Hassanein et al. (2012) concluded from a SET study conducted in nursing schools that improving the teaching evaluation process must take into account the diversity of student characteristics, student evaluation goals, teaching methods, and institutional context.

Comments on existing research

Research perspective

The original intention of the student evaluation system is to let students, as the main body of teaching, evaluate teachers' teaching behavior. However, with the popularization and development of the system in colleges and universities around the world, the conflicts of interest among teaching managers, teachers and students in teaching evaluation are gradually revealed. In this game, managers put the focus of students' teaching evaluation on teachers, and take teaching evaluation as a simple and effective tool to measure teachers' performance. In fact, students' expression of teachers' teaching is limited and controllable. In the current research results, scholars at home and abroad have a more profound understanding of the absence of students' evaluation of teaching, generally shifting the research perspective to the concept of "student-centered" evaluation of teaching, and considering "the actual needs of students" and "promoting the all-round development of students" in the research of various parts such as the function, content and results of evaluation of teaching. However, the current research perspective is lack of comprehensiveness, and the seemingly reasonable transformation cannot resolve the contradiction between the three in the student evaluation system. Overemphasizing the student standard will magnify the deviation of the system in the evaluation of teachers' teaching quality, and increase the cost and burden of teaching managers.

Research contents

The academic research on college students' teaching evaluation mainly focuses on reliability, validity and its influencing factors, evaluation indicators, deficiencies in practical application and improvement strategies, among which the research results on the effectiveness of teaching evaluation are the most abundant. With the wide application of the student teaching evaluation system, the research scope of validity has expanded from the initial analysis of rationality to the research on the reliability of students' teaching evaluation results and the final validity of students' teaching evaluation. In terms of influencing factors, although researchers have formed a relatively unified view on its main categories, due to the large number of subtle factors and different research perspectives, the influence results of specific factors are also different, making the research results of this part

complex and full of controversy. In terms of evaluation indicators, the research on the theory of index construction has been relatively complete, and the combination of qualitative and quantitative evaluation can generally be used, which reflects the academic quality of index construction. However, there are still different strengths and weaknesses in the design of specific evaluation indicators, and there is a lack of a comprehensive, systematic and authoritative index design framework, so it is difficult to form a unified opinion and promote its application. In terms of problems and countermeasures in practice, scholars at home and abroad have relatively unanimous opinions on the problems existing in the current teaching evaluation process of college students, and have carried out a relatively comprehensive analysis. However, the countermeasures proposed for the problem are too vague and unconvincing, and it is necessary to further verify and concretize them in the application process to obtain more effective improvement suggestions.

Research methods

At present, scholars' research on students' teaching evaluation system is no longer limited to literature, but more to empirical investigation and statistical analysis. In recent years, in terms of the reliability and validity of students' teaching evaluation and its influencing factors, more and more researchers have used statistical methods such as independence test, multiple regression analysis, ordered regression model (OLM) to analyze the data of students' teaching evaluation. The correct and reasonable use of appropriate data processing methods has significantly improved the scientificity of the research on the effectiveness of students' teaching evaluation. In order to build a scientific and reasonable evaluation index, researchers prefer to use questionnaires, interviews, random sampling and other methods to conduct empirical research on the subjects and cases of teaching evaluation in colleges and universities. However, a good empirical study is extremely difficult to operate, which requires a large sample size and will also cost more time, human resources and other resources. Therefore, the evidence of empirical research in the current results is still relatively shallow, and we can try to combine it with big data and artificial intelligence algorithms to supplement it with diversified research methods.

Research trends

According to the current research trend in academia, first of all, researchers will continue to explore the influencing factors of students' teaching evaluation. The influencing factors of college students' teaching evaluation are extremely complex, but it is extremely important to overcome the negative effects of interfering factors and improve the limitation of students' teaching evaluation. Therefore, the research on this issue in academic circles will continue to deepen. Secondly, the rapid development of the

Internet has innovated the form of students' teaching evaluation, and students' online teaching evaluation has become the current mainstream model. While online teaching evaluation brings convenience to the students' teaching evaluation system, new problems such as the weakening of the realism of the scene and the difficulty of supervising the process have also appeared. In addition, how to solve the shortcomings of the online teaching evaluation system, such as strong subjectivity of students, low teacher participation, and imperfect application of result feedback, is also becoming a problem worth exploring for researchers. Finally, the integrated development of multi-disciplinary and multi-angle will be the key direction of future research on the teaching evaluation system of college students. Scholars have found in their research that the content involved in the student evaluation system is far beyond the field of education, and its scope also covers psychology, sociology, statistics, economics and many other disciplines. Therefore, some researchers have integrated and analyzed student evaluation of teaching with other disciplines. It is foreseeable that in future research, scholars will view the improvement and development of the student evaluation system from a multidisciplinary perspective.

Conclusion and recommendations

In this article, we have provided a more in-depth analysis of the theories and methods of student's evaluation of teaching in higher education in China and abroad, and point out the desirable experiences and shortcomings of them. Firstly, in terms of the reliability and validity of student's evaluation of teaching, the current research has made great progress in terms of validation methods, and some scholars have been able to use appropriate data analysis models to improve the persuasiveness of the results. Secondly, the research on the theory and structure of the evaluation indicators for university students generally revolves around the "student-centered theory" and "secondary indicator structure," the rationality of which has been confirmed; however, the academic circle has not yet formed a unified opinion or standard on the selection of the specific content of the evaluation indicators. However, there is no unified opinion or standard on the selection of the specific content of evaluation indicators, and fewer scholars have paid attention to the differentiation of the indicators for different courses. Finally, regarding the problems and countermeasures in the application of student's evaluation of teaching in higher education, current research has analyzed the process of student's evaluation of teaching from the aspects of purpose, indicator system, application of results and process management in an all-round way and found the shortcomings, however, the scholars' expressions of improvement measures are still abstract and lack of pertinence, making it difficult to carry out concrete operations. In view of the above analysis, this article improves the research on student's evaluation in Western higher education from a Chinese perspective, and at the same time provides a reference for the construction of an indicator system

for student evaluation in Chinese universities, taking into account the actual situation of Chinese universities. The future research will be based on the successful experience of student evaluation in universities, improve the problems, explore the influence mechanism of different factors on student evaluation in universities, optimize the indicator system and management system of student evaluation, especially the indicator system of student evaluation in ideological and political theory courses in Chinese higher education will be constructed in accordance with the characteristics of Chinese ideological and political theory courses, so as to improve the teaching quality of ideological and political theory courses in Chinese higher education. We will make our contribution to improving the teaching quality of ideological and political theory courses in Chinese higher education.

Author contributions

SY: conceptualization, resources, writing-review and editing, and supervision. SY, LZ, and PX: methodology. LZ and PX: formal analysis. LZ and YC: investigation. SY and YC: project administration. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Opinion: Understanding EAP learners' beliefs about language learning from a socio-cultural perspective : A longitudinal study at an EMI context in mainland China

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The recently-published book entitled *Understanding EAP Learners' Beliefs about Language Learning from a Socio-cultural Perspective* by Li (2021) attracted our attention, for its lucid overview in synthesizing the disposition of Chinese EAP learners' beliefs about language learning (BLLs) in an EMI setting within the EFL context in Mainland China as well as the socio-cultural factors shaping and reshaping their beliefs before and after entry into the EMI environment.

This book consists of six chapters. Chapter 1 provides a comprehensive overview of the status quo and challenges of EMI learners' beliefs about English language learning. Chapter 2 first thoroughly reviews the literature on learners' beliefs, and then introduces the basics of socio-cultural theory as well as relevant concepts such as mediation and agency. After that, an analytical framework is proposed for this research. In Chapter 3, the mixed-method research design is described. In Chapter 4, the results yielded from the quantitative and qualitative data are reported. Then, the penultimate Chapter interprets the changes that took place in the participants' beliefs after they had studied EAP for an academic year at the EMI University from the socio-cultural perspective. Chapter 6 summarizes the manuscript regarding the contributions, pedagogical implications and limitations of the study as well as suggestions for future investigation. This captivating book distinguishes itself with its significant theoretical, practical, and methodological strengths.

First and foremost, this book sheds new light on beliefs about language learning from the socio-cultural approach, which breaks the domination of cognition-oriented approach in this field. In recent decades, substantial amount of research has examined Chinese EFL learners' beliefs about language learning (e.g., Zhang and Cui, 2010; Pan and Block, 2011). However, most of these studies are cognition-oriented (Gabillon, 2005).

The cognitive perspective adopts beliefs as a isolated phenomenon and ignores the dynamic and contextualized nature of beliefs which are concerned with socio-cultural contexts (Amuzie and Winke, 2009; Yang and Kim, 2011). Therefore, a socio-cultural approach is much needed for understanding the complex change process of learners' beliefs. This book enriches the scholarship of research on learners' beliefs from a socio-cultural approach.

As for theoretical contribution, this study has made improvements to the previous analytical socio-cultural framework adapted from Layder (1993, 2006), Gao (2010), and Lamb (2013). Specifically, this extended socio-cultural framework integrates agency, mediation, contextual conditions, and their dialectical relationship in a socio-cultural perspective to illuminate the dynamic nature of beliefs. This adapted analytical framework has revealed that changes in contextual conditions are to a large degree responsible for the shifts in the participants' BLLs. It is also validated that learner agency is of practical value in understanding the development of learner variables. In addition, extracurricular activities, material conditions and cultural artifacts are also important factors that might have influenced the participants' BLLs (LaScotte et al., 2022). Lastly, it has been suggested that the interaction between agency and context plays a significant role in learner's BLLs. In other words, learners internalize the influence of contextual realities and accordingly mediate and regulate their BLLs by exercising their agency. We can therefore say that this newly-adapted framework enables us to understand BLLs more properly and comprehensively.

Practically, it is pedagogically implicative for EAP practitioners, educators and administrators to acknowledge that the development of learner BLLs is complex in nature due to the influence of learner agency and context. To better understand the complexity and help EFL learners, it is necessary for EAP practitioners to raise these learners' awareness of a particular learning context. Therefore, they can better exert their agency in terms of strategic learning, micro-political, socio-cultural, and intrapersonal capacity. For example, learners are encouraged to be informed of learning objectives, learning conditions and facilities in the orientations. Moreover, dynamic formative assessment method is advocated due to its strong influence upon the participants' beliefs in learning English. In addition, the book has foregrounded the significance and necessity of paying attention to the interplay between agency and contextual realities. Thus, it is suggested that educators and administrators should take into full consideration the learners' needs to survive in an EMI academic context which exerts great influence on their BLLs when designing the EAP curriculum. They could also provide extracurricular activities and continuing language guidance, support, and encouragement for learners in the development of their beliefs to learning EAP in the EMI context.

Methodologically, this study employs a mixed methods paradigm which reasonably overcomes the limitations of purely

quantitative or qualitative approaches, for instance, being too general or unrepresentative. Specifically, in this study, the questionnaire provides a general understanding of the learners' beliefs, motivation, and strategy use. Then, it is complemented by the semi-structured interviews, offering further detailed and in-depth insights into these learner variables. Therefore, this study is encouraging and valuable for providing an insightful empirical research paradigm that provides reference to future research in this area. In addition, the author conducted large scale longitudinal research, involving 1,935 students in Questionnaire Survey 1 and 2 and 24 students in interviews at two research stages. The sufficient samples and dynamic observation could add to the generalizability and guarantee the credibility of the results.

As previously stated, this manuscript is worthy of being commented on and recommended to more readers. Admittedly, there is some room for improvement in this book. Firstly, the sole source of the research participants is one EMI university. The results yielded from the sampled university could not represent all the kinds of existing EMI institutions in China. Secondly, as for the research design, interviews alone may be inadequate for the triangulation of the quantitative data. Therefore, it is advised that more qualitative data are collected (e.g., self-reports data) to improve the reliability. In addition, the findings will be more robust and comprehensive if inferential analysis (e.g., exploratory factor analysis) is adopted. Thirdly, this study echoes the call for more research with an inclusion of other elements such as learners' motivation and beliefs in learner agency (Gao, 2010). However, changes occur during the investigation of learners beliefs during multilingual contexts (Pirhonen, 2022), which becomes a new norm in language learning studies. It is recommended that future studies can take these issues into consideration to a wider variety of EMI contexts.

Undoubtedly, the strengths of this book far outweigh its shortcomings. The book is informative, insightful and inspirational with its theoretical, practical and methodological values. With thoughtful reading, readers will hopefully gain a deeper understanding of the disposition of learner beliefs among Chinese EFL learners, and acquire a fuller scenario of the interplay between learner agency and context from a critical socio-cultural perspective. Therefore, this book is strongly recommended to a wider readership including academics, administrators, educators and those who have keen interests in learners' belief from a more kaleidoscopic perspective.

Author contributions

LQ drafted the paper. ZS helped LQ to select the commented book and provided insights and suggestions during his writing. SZ did the revision for the text.

All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Chinese English teachers' occupational intention during distance education: The role of burnout and job-related stress

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Since turnover intention has a negative impact on teachers' productivity, a bulk of educational research has studied the personal, organizational, and emotional predictors of this construct. Nevertheless, the predictive function of burnout and job-related stress as two emotional factors has been less attended to by scholars. To address this gap, the current empirical study explored the role of burnout and job-related stress in Chinese English teachers' turnover intention during distance education. In doing so, three pre-designed questionnaires were distributed among 221 Chinese teachers. Having collected the needed data, the researcher analyzed the datasets through the Pearson correlation test and multiple regression analysis. As a result of the correlation test, positive, direct relationships were found between burnout, job-related stress, and teacher turnover intention. Moreover, the results of the regression analysis evinced the significant role of burnout and job-related stress in predicting Chinese English teachers' turnover intention. The implications of the results are thoroughly discussed.

KEYWORDS

job-related stress, English teachers, distance education, China, turnover intention, burnout

Introduction

With the COVID-19 outbreak, educational institutions throughout the world were forced to choose distance education with huge changes in the learning and teaching methods (Derakhshan, 2021; Moser et al., 2021). Likewise, educational institutions in China, including schools, colleges, and universities, were also forced to undergo an immediate transition to remote educational settings in order to mitigate the spread of the Coronavirus among stakeholders (Gao and Zhang, 2020; Hong et al., 2021). The abrupt transition from face-to-face to remote education environments confronted educational institutions with a range of serious challenges (Shahnama et al., 2021; Silva et al., 2021), including increased turnover intention among teachers (Collie, 2022; Matthews et al., 2022). Teachers' turnover intention, also known as teachers' intention to leave, generally pertains to teachers' reluctance to pursue the teaching career (Liu and Onwuegbuzie, 2012).

For McInerney et al. (2015), teachers' turnover intention refers to "teachers' intention to leave the educational institution they are working for or to quit the teaching profession and move to a different career pathway" (p. 11). Teachers' turnover intention is of high importance to educational managers due to the detrimental impact it may have on teachers' productivity, students' learning outcomes, and the educational institution itself (Ronfeldt et al., 2013; Adnot et al., 2017). Owing to the negative effects of teachers' turnover intention on teaching quality and student achievement, identifying and managing the predictors of this construct seems crucial.

As put by Liu and Onwuegbuzie (2012), teachers' turnover intention is subject to different organizational, personal, and emotional factors. Considering this point, many educational scholars have studied various organizational and personal factors as predictors of teachers' turnover intention (e.g., Klassen and Chiu, 2011; You and Conley, 2015; Arnup and Bowles, 2016; De Neve and Devos, 2017; Wang and Hu, 2017; Rothmann and Fouché, 2018; Zhou et al., 2020; Nazari and Alizadeh, 2021, to cite a few). Similarly, several researchers have evaluated the emotional predictors of this construct (e.g., Larkin, 2015; Shah and Jumani, 2015; Imran et al., 2017; Park and Johnson, 2019; Kartika and Purba, 2022, among others). Yet, the predicting role of burnout and job-related stress as two emotional factors has been less attended to by researchers. To respond to this gap, the current investigation seeks to scrutinize the role of burnout and job-related stress in English teachers' turnover intention.

As a probable predictor of turnover intention, burnout generally pertains to a state of emotional, physical, and psychological exhaustion resulting from prolonged engagement in emotionally demanding and stressful activities (Jennett et al., 2003; Schaufeli et al., 2009). With respect to this definition, Kyriacou (2015) characterized teacher burnout as "a syndrome of physical, emotional, and attitudinal exhaustion toward the teaching profession, which results from experiencing stress over a long period" (p. 72). As put forward by Shoji et al. (2016), teachers' burnout may negatively affect their self-efficacy beliefs in that it gradually causes teachers to feel as if they do not have the sufficient personal resources to improve their students' learning outcomes. Teachers' burnout, according to Wong et al. (2017), may also hinder their productivity as it makes them indifferent to students and their academic achievements. Additionally, as noted by Lu and Gursay (2016), burnout discourages teachers from continuing their vocation by leading them toward physical and emotional exhaustion.

Closely related to burnout, job-related stress is another potential determinant of turnover intention that pertains to "the level of pressure and demands made upon an employee in the working environment" (Jepson and Forrest, 2006, p. 185). In the teaching profession, job-related stress deals with teachers' unpleasant emotional states caused by work overload or professional responsibilities (Kyriacou, 2011). Job-related stress is believed to be closely related to teachers' emotional exhaustion, job dissatisfaction, work disengagement, and attrition (Barouch

Gilbert et al., 2014; Reilly et al., 2014; Yu et al., 2015). Furthermore, as pointed out by Skaalvik and Skaalvik (2016), job-related stress has also something to do with teachers' intention to leave the profession. They argued that feeling too much stress in the workplace substantially increases teachers' willingness to quit the teaching profession.

Due to the significant role that burnout and job-related stress play in decreasing teachers' turnover intention (Lu and Gursay, 2016; Skaalvik and Skaalvik, 2016), some educational scholars have empirically studied the function of these two emotional constructs in teachers' turnover intention (Chika et al., 2016; Xu et al., 2017; Jang and Kim, 2019; Lee, 2019; Mingming et al., 2021; Lai et al., 2022). However, few scholars have pursued this line of research in the field of language education. Simply said, there is a dearth of research evaluating the function of burnout and job-related stress in language teachers' turnover intention. Moreover, as the review of previous studies revealed, no inquiry has examined the role of these job-related variables in language teachers' turnover intention in the context of distance education. Therefore, the current research aims to address these lacunas by scrutinizing the potential role of burnout and job-related stress in Chinese English teachers' turnover intention during distance education. To accomplish this, two research questions were formulated:

RQ1. Is there any significant association between burnout, job-related stress, and Chinese teachers' turnover intention?

RQ2. To what extent do burnout and job-related stress significantly predict Chinese English teachers' turnover intention during distance education?

Literature review

Theoretical model

The predictive role of job-related stress and burnout in teachers' turnover intention appears to be justified through the "Job Demands-Resources (JD-R)" model (Bakker and Demerouti, 2007). This model is generally grounded on the idea that each profession has some distinguishing features that can be classified as job resources or job demands (Demerouti et al., 2001; Bakker et al., 2003). These unique characteristics, which are known as job resources and job demands, are believed to greatly influence employees' professional behaviors, such as work engagement and organizational commitment (Crawford et al., 2010). According to Bakker and Demerouti (2007), when job demands exceed job resources, employees may experience occupational stress and job burnout. They also asserted that experiencing occupational stress and job burnout for a long period of time discourages employees from continuing their profession. Simply said, prolonged stress and burnout lead employees to leave their profession. Extending this idea to the teaching profession, it is logical to argue that when

teaching demands surpass teaching resources, teachers will experience stress and burnout that drive them to leave their profession and look for another one.

Burnout

The notion of burnout was primarily conceptualized by [Freudenberger \(1974\)](#) as “a state of physical, emotional, and mental depletion resulting from work overload, and imbalance between expected and real job reward” (p. 160). This concept was further characterized by [Maslach and Leiter \(1999\)](#) as a state of exhaustion or fatigue that arises as a result of work overload and excessive job demands. Taking these definitions into consideration, [Hakanen et al. \(2006\)](#) described teacher burnout as a constant exhaustion that teachers may experience because of long-term occupational stress. As a multi-faceted variable, burnout comprises three key dimensions, namely “emotional exhaustion,” “depersonalization,” and “reduced personal accomplishment” ([Maslach and Jackson, 1981](#)). Emotional exhaustion, according to [Maslach and Leiter \(2016\)](#), pertains to teachers’ sense of emotional emptiness caused by job stressors. As noted by [Leiter and Maslach \(2016\)](#), depersonalization relates to the sense of detachment and indifference that teachers experience in the instructional-learning environments. Finally, as put by [Maslach and Leiter \(2017\)](#), reduced personal accomplishment refers to teachers’ dissatisfaction with their professional performance. In this emotional state, teachers feel that they are not competent enough to positively influence their students’ learning outcomes and lead them toward academic success.

Burned-out teachers, according to [Zhang and Zhang \(2012\)](#), typically demonstrate a higher rate of attrition and turnover intention. They noted that the imbalance that exists between job demands and teachers’ professional capabilities leads them to gradually leave their vocation. In addition, as [Jacobson \(2016\)](#) pointed out, burnout as a debilitating factor noticeably reduces teachers’ productivity at work. The unfavorable consequences of teacher burnout have prompted scholars in the mainstream education and language education domain to explore the internal and external sources of burnout among teachers (e.g., [Ju et al., 2015](#); [Ventura et al., 2015](#); [Seifalian and Derakhshan, 2018](#); [Zhaleh et al., 2018](#); [Bodenheimer and Shuster, 2020](#); [Kim and Burić, 2020](#); [Fathi et al., 2021](#); [Xu and Yang, 2021](#); [Bing et al., 2022](#), to cite a few).

As to the internal sources of teacher burnout, [Ju et al. \(2015\)](#), for instance, assessed the role of emotional intelligence in Chinese teachers’ burnout. For this purpose, 307 school teachers were selected from various schools in China. They were asked to express their ideas regarding the role of emotional intelligence in teacher burnout by answering two reliable questionnaires. The collected answers were analyzed using the structural equation modeling (SEM) approach. Consequently, teachers’ burnout was found to be negatively

predicted by their emotional intelligence. Later, in a similar inquiry, [Zhaleh et al. \(2018\)](#) studied this subject in the context of Iran. To do so, two valid scales, namely “Language Teachers’ Conceptions of Intelligence Scale” and “Maslach Burnout Inventory (MBI),” were handed out to 202 English language teachers. The data analysis demonstrated that intelligence was a significant, negative predictor of teacher burnout. In another research, [Kim and Burić \(2020\)](#) inspected the function of teachers’ self-efficacy in their level of burnout. In doing so, 3,002 teachers from Croatia’s primary, secondary, and middle schools were recruited. Then, all participants were invited to fill out two reliable questionnaires measuring self-efficacy and burnout. Consequently, teachers’ self-efficacy had a significant role in predicting their burnout. Besides, to identify the external sources of teacher burnout, [Xu and Yang \(2021\)](#), for example, evaluated the effect of organizational support on Chinese teachers’ burnout. To accomplish this, 351 teachers were selected from primary and secondary schools at random. Following that, two reliable inventories were employed to obtain the needed information. The examination of obtained data indicated that organizational support had a negative impact on teachers’ burnout.

Job-related stress

The notion of job-related stress has been generally described as a sense of tension threatening one’s wellbeing at work ([Lazarus and Folkman, 1984](#)). In the teaching career, this notion has been characterized as “the experience of unpleasant, negative emotions, such as anger, anxiety, tension, frustration, and depression, resulting from some aspects of their work as a teacher” ([Kyriacou, 2001](#), p. 28). As noted by [Klassen and Chiu \(2011\)](#), job-related stress typically emerges when teachers feel that teaching demands and strains do not correspond with their professional knowledge and skills. Teachers with high levels of job-related stress often demonstrate lower job satisfaction, less organizational commitment, and limited work engagement ([Klassen and Chiu, 2010](#); [Li et al., 2017](#); [Zhang et al., 2019](#)). Given this, identifying the variables that bring about job-related stress in teachers appears critical. To answer this necessity, many scholars have inquired into the role of emotional and environmental factors in teachers’ job-related stress (e.g., [Ghanizadeh and Jalal, 2017](#); [Gonzalez et al., 2017](#); [Troesch and Bauer, 2017](#); [Fathi and Derakhshan, 2019](#); [Alqarni, 2021](#), among others).

[Ghanizadeh and Jalal \(2017\)](#), for instance, probed the role of job satisfaction in predicting job-related stress. For this aim, 134 English teachers working at different universities in Iran were asked to cooperate in this research by filling out two researcher-made scales. Then, using SEM analysis, the predictive role of job satisfaction was evaluated. As a result, job satisfaction was discovered to be the negative predictor of teachers’ job-related stress. By the same token, [Troesch and Bauer \(2017\)](#) examined the function of teachers’ self-efficacy in their job stress. To this end,

400 teachers answered two questionnaires designed to measure teachers' self-efficacy and job stress. The gathered answers were then analyzed through hierarchical regression analysis. The analysis outcomes uncovered that self-efficacy beliefs negatively predicted teachers' stress at work. Likewise, [Fathi and Derakhshan \(2019\)](#) studied the power of teacher self-efficacy in predicting teaching stress. To do so, the "Teachers' Sense of Efficacy Scale" and the "Teacher Stress Inventory (TSI)" were given to 256 Iranian teachers. Teachers' answers to the aforementioned scales indicated that teaching stress was negatively predicted by teachers' self-efficacy.

Turnover intention

The concept of turnover intention, in a general sense, pertains to "one's conscious will to look for a job outside the current organization" ([Tett and Meyer, 1993](#), p. 259). Teachers' turnover intention, in particular, refers to teachers' inclination to quit the teaching career and look for other working opportunities ([Harris and Adams, 2007](#); [Liu and Onwuegbuzie, 2012](#)). As [Watlington et al. \(2010\)](#) mentioned, teachers' withdrawal from the teaching profession may entail some considerable costs for the educational institution they are working for, such as replacement and training costs. Besides these financial costs, an individual teacher's departure from the teaching career may have some devastating effects on his/her students' achievements ([Sorensen and Ladd, 2020](#)). The undesirable impacts of teacher turnover intention have led researchers to study the predictors and determinants of this construct ([Arnup and Bowles, 2016](#); [De Neve and Devos, 2017](#); [Wang and Hu, 2017](#); [Nazari and Alizadeh, 2021](#), to cite a few).

To date, [Arnup and Bowles \(2016\)](#), for example, inquired into the role of resilience in predicting Australian teacher's intention to leave. For this purpose, 160 teachers teaching at different schools in Australia were invited to engage in this study. Close-ended questionnaires were used to collect the required information. The results demonstrated that teachers' resilience was related to their leaving intention. In addition, resilience was discovered to be a strong determinant of teachers' intention to leave. As another example, [De Neve and Devos \(2017\)](#) delved into the role of psychological states in teachers' turnover rates. To do so, the valid measures of autonomy, self-efficacy, and affective commitment were distributed among 272 school teachers. The outcomes indicated that the psychological variables, including autonomy, self-efficacy, and affective commitment, dramatically reduced teachers' turnover intention. Additionally, in a recent inquiry, [Nazari and Alizadeh \(2021\)](#) examined whether teachers' turnover intention is the function of teaching experience. To accomplish this, researchers administered two related questionnaires to 325 novice and experienced teachers. Consequently, experienced teachers displayed lower levels of turnover intention than their novice colleagues.

Previous inquiries into the role of burnout and job-related stress in teachers' turnover intention

To date, some scholars have inquired into the function of burnout and job-related stress in teachers' turnover intention ([Chika et al., 2016](#); [Xu et al., 2017](#); [Jang and Kim, 2019](#); [Lee, 2019](#); [Mingming et al., 2021](#); [Lai et al., 2022](#)). For instance, [Chika et al. \(2016\)](#) studied job-related stress to examine its potential in predicting teachers' turnover intention. To meet this aim, 270 Nigerian teachers were invited to complete two scales. The results of multiple regression analysis unraveled the significant role of job-related stress in increasing teachers' turnover intention. In a similar vein, [Xu et al. \(2017\)](#) explored the impact of occupational stress on teachers' turnover intention. A set of close-ended questionnaires was utilized to examine participants' ($N = 326$ school teachers) attitudes regarding the probable effects of occupational stress on teachers' desire to leave the profession. The results showed that occupational stress directly influenced teachers' turnover intention.

Furthermore, in his study, [Lee \(2019\)](#) assessed the potential power of burnout in enhancing teachers' turnover intention. To this end, the electronic versions of the "Turnover Intention Scale (TIS)" and the "Teacher Burnout Questionnaire" were shared with 613 teachers. The findings demonstrated that burnout made a meaningful change in teachers' turnover rates. Similarly, [Mingming et al. \(2021\)](#) scrutinized the consequences of job burnout for teachers' turnover intention. In doing so, 992 teachers were randomly selected to respond to the "Job Burnout Scale" and the "Turnover Intention Scale." The examination of responses exhibited the important role of job burnout in increasing teachers' turnover intention.

Despite these scholarly endeavors, the research on the role of burnout and job-related stress in teachers' turnover intention is still in its infancy. Simply said, the function of these emotional variables in teachers' turnover intention has remained somehow elusive. Moreover, as existing literature demonstrates, no empirical research has probed the predictive role of burnout and job-related stress in distance education contexts. Against this backdrop, the current study aimed to uncover the role of burnout and job-related stress in Chinese English teachers' turnover intention during distance education.

Materials and methods

Participants

Adopting the convenience sampling approach, a sample of 221 English teachers currently working at different colleges and institutes in China was recruited. The rationale behind using the convenience sampling method is that in this sampling procedure "members of the target population are readily selected based on some practical criteria, such as geographical proximity, availability

at a certain time, or easy accessibility” (Dörnyei and Csizér, 2012, p. 81). It is worth noting that convenience samples are seldom entirely “convenience-based” but rather somewhat purposeful, which implies that, in addition to the availability and ease of accessibility, participants must possess specific qualities that are tied to the objectives of the inquiry (Mackey and Gass, 2005; Dörnyei, 2007).

The sample of participants comprised both female ($N=176$) and male ($N=45$) teachers with various ages (Mean=40.58, $SD=4.65$), ranging from 26 to 58 years old. The teaching experience of participants also varied from 5 to 25 years. The academic degrees of the participants also varied, with 131 teachers holding MA degrees and 90 teachers holding Ph.D. degrees. As to the academic major, participants graduated in three different branches of English, namely linguistics (52%), applied linguistics (33%), and translation (15%). Finally, it should be mentioned that participation in this inquiry was entirely voluntary, and all participants willingly cooperated with scholars in achieving the research purposes.

Instruments

Maslach burnout inventory-educators survey

To measure Chinese English teachers’ burnout, the “Maslach burnout inventory-educators survey (MBI-ES)” was employed. The MBI-ES, designed by Maslach et al. (1996), is a 22-item scale comprising three distinguishing components, namely “reduced personal accomplishment,” “depersonalization,” and “emotional exhaustion.” Participants need to rate these 22 items on a 7-point Likert scale, varying from 0 (never) to 6 (everyday). Sample items involve “I feel used up at the end of the workday” (item 2), “I have become more callous toward people since I took this job” (item 10), “Working with people directly puts too much stress on me” (item 16). A Cronbach alpha reliability coefficient of 0.93 was reported for the MBI-ES in this research.

Teacher stress inventory

In order to assess the participants’ stress at work, the “TSI” validated by Boyle et al. (1995), was utilized. This inventory constitutes 20 items; each was scored on a five-point Likert scale (from 1 = No stress to 5 = Extreme stress). All items commenced with the following question: “As a teacher, how great a source of stress are these factors to you?” The following are three instances of TSI’s items: “Lack of recognition for good teaching” (item 3), “Pupil poor attitude to work” (item 7), and “Shortage of equipment and poor facilities” (item 6). The reliability of this inventory was discovered to be 0.87 in the current study.

Turnover intention scale

The “TIS,” developed by Becker and Billings (1993), was used to evaluate Chinese English teachers’ willingness to turnover. The TIS uses a 7-point Likert-type scale, the answers to its items may range from 1 “very strongly disagree” to 7 “very strongly agree.”

This scale encompasses four items, as follows: “It is likely I will actively look for a new job in the next year” (item 1), “I often think about quitting teaching” (item 2), “It would take very little change in my present circumstances to cause me to leave teaching” (item 3), and “There’s not too much to be gained by sticking with teaching indefinitely” (item 4). In the current research, a reliability index of 0.91 was found for this scale.

Procedure

The process of data collection commenced by administering consent forms to 221 Chinese English teachers. Then, it continued with the distribution of three aforementioned scales (MBI-ES, TSI, and TIS) among the participants. This distribution was virtually performed through the Wenjuanxing platform. Upon distribution of the scales, some instructions regarding the completion of the scales were offered to the respondents. The needed information was entirely collected within 3 weeks.

Having gathered the needed information, they were preprocessed to detect the missing and problematic answers. As a result, no missing or questionable answer was discovered. Then, through Kolmogorov–Smirnov and Shapiro–Wilk tests, the normality of answers was evaluated. Following that, the association between burnout, job-related stress, and turnover intention was calculated using Pearson correlation test. Finally, to inspect the role of burnout and job-related stress in predicting Chinese teachers’ turnover intention, the SEM analysis was conducted through AMOS software (version 24).

Results

To begin, descriptive statistics comprised of central indicators and dispersion of the variables were calculated to offer fundamental information about variables under investigation. The results are evinced in Table 1.

TABLE 1 Central indicators and dispersion of research variables.

		Turnover intention	Burnout	Job-related stress
N	Valid	221	221	221
	Missing	0	0	0
Mean		9.73	66.82	52.26
Std. deviation		6.092	20.815	16.131
Skewness		0.968	−0.195	−0.125
Std. error of skewness		0.164	0.164	0.164
Kurtosis		0.021	−0.691	−0.235
Std. error of kurtosis		0.326	0.326	0.326
Minimum		4	22	20
Maximum		28	114	95

TABLE 2 The outcomes of Shapiro–Wilk and Kolmogorov–Smirnov tests.

	K-S			S-W		
	Statistic	df	Sig.	Statistic	df	Sig.
Turnover intention	0.174	221	0.000	0.860	221	0.000
Burnout	0.059	221	0.056	0.983	221	0.011
Job-related stress	0.069	221	0.013	0.982	221	0.006

TABLE 3 The correlation between burnout, job-related stress, and turnover intention.

		Turnover intention	Burnout	Job-related stress
Turnover intention	Pearson correlation	1	0.601**	0.522**
	Sig. (2-tailed)		0.000	0.000
Burnout	Pearson correlation	0.601**	1	0.499**
	Sig. (2-tailed)	0.000		0.000
Job-related stress	Pearson correlation	0.522**	0.499**	1
	Sig. (2-tailed)	0.000	0.000	
	N	221	221	221

**Association is significant.

TABLE 4 Estimates of regression weights for the variables.

			Weight	S.E.	C.R.	p
Turnover intention	←	Job-related stress	0.158	0.106	1.498	0.000
Turnover intention	←	Burnout	0.898	0.145	6.186	0.000

As depicted in [Table 1](#), the mean of burnout, job-related stress, and turnover intention turned out to be 66.82, 52.26, and 9.73, respectively. Their deviations were also calculated as 20.815, 16.131, and 6.092, respectively. Moreover, the Skewness and Kurtosis indices were found to be in the range of -2 to 2 , implying that the distribution of variables was almost expected. Following the calculation of descriptive statistics, the normality of the collected data was tested using the Shapiro–Wilk and Kolmogorov–Smirnov tests. The outcomes of the tests are displayed hereunder ([Table 2](#)).

As [Table 2](#) indicated, the normality of the data was violated. Yet, it seems acceptable for a sample with more than 200 participants. Having assessed the normality of gathered data, the probable correlation between burnout, job-related stress, and turnover intention was measured through the Pearson correlation test, the results of which are presented in [Table 3](#).

The Pearson correlation test revealed a positive, strong association between burnout and turnover intention ($r=0.601$, $p<0.01$). It also uncovered a direct relationship between job-related stress and turnover intention ($r=0.522$, $p<0.01$). Furthermore, a close link was discovered between burnout and job-related stress ($r=0.499$, $p<0.01$). Following that, through multiple regression method, the role of burnout and job-related stress in predicting teachers' turnover intention was evaluated. Consequently, both burnout and job-related stress made significant contributions to teachers' intention to turnover ([Table 4](#)).

Afterward, to identify which variable contributed more significantly to teachers' turnover intention, standardized regression weights were calculated. As a result, burnout was found to be the stronger predictor of teachers' turnover intention in that it uniquely explained 69 percent of the variance in the teachers' turnover rates ([Table 5](#)).

The role of burnout and job-related stress in predicting teachers' turnover intention was portrayed using SEM analysis. The prediction model with standardized estimates is provided below ([Figure 1](#)).

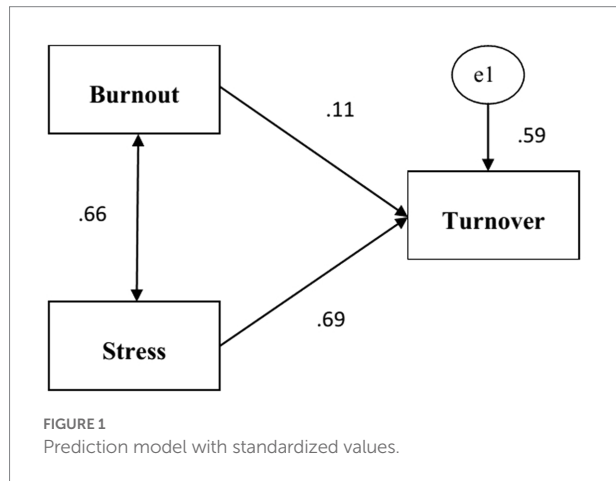
Discussion

The objectives of the current inquiry were, in the first place, to test the associations between burnout, job-related stress, and turnover intention; and in the second place, to probe the role of burnout and job-related stress in predicting Chinese English teachers' turnover intention. As to the first objective of this study, the results of the Pearson test demonstrated that both burnout and job-related stress were closely related to turnover intention. The outcomes of the correlation test uncovered a similar connection between job-related stress and burnout as well. Concerning the second objective, the SEM analysis outcomes revealed that burnout and job-related stress served an undeniable role in increasing Chinese English teachers' turnover intention.

The result of this research concerning the strong link between burnout and turnover intention is in line with those of [Lee \(2019\)](#), who observed a strong link between teachers' burnout and their turnover intention. It also supports the findings of [Mingming et al. \(2021\)](#), who discovered a direct association between burnout and teachers' intention to leave the teaching profession. Moreover, the outcome of the present inquiry about the significant association between job-related stress and turnover intention backs up [Chika et al.'s \(2016\)](#) findings, which demonstrated that teachers' job-related stress is intertwined with their turnover intention. It also resonates with the outcomes of [Xu et al. \(2017\)](#), who reported that teachers' turnover intentions are tied to the prolonged stress they feel at work. Additionally, the present study's outcome regarding the close relationship between burnout and job-related stress is congruent with [Xu and Yang's \(2021\)](#) results, which showed that burnout is tightly associated with job stress.

TABLE 5 Standardized regression weights for the variables.

			Estimate
Turnover intention	←	Job-related stress	0.11
Turnover intention	←	Burnout	0.69



Besides, the results of this investigation on the power of burnout and job-related stress in predicting teachers' turnover intention can be logically justified in light of Bakker and Demerouti's (2007) JD-R model. According to this conceptual model, those employees who experience stress and burnout for a long period of time are more prone to the turnover phenomenon. That is, employees with a high amount of job stress and burnout tend to quit their careers and search for another profession. It is mainly due to the fact that prolonged occupational stress and job burnout substantially reduce employees' motivation, interest, and willingness to continue their current profession (Bakker and Demerouti, 2007). Considering this theoretical model, burned-out and anxious teachers are less inclined to pursue the teaching vocation. It indicates that the higher the teachers' occupational stress and job burnout, the stronger their turnover intention. This result confirms the idea of Lu and Gursoy (2016), who asserted that burnout substantially enhances teachers' intention to turnover. This outcome also supports Skaalvik and Skaalvik's (2016) assertion regarding the predictive role of occupational stress. They claimed that being overwhelmed with occupational stress remarkably decreases teachers' intention to work.

Conclusion, implications, and limitations

This research was undertaken to unravel the association between job-related stress, burnout, and turnover intention and the role of job-related stress and burnout in predicting Chinese English teachers' turnover intention during distance education. The results obtained from correlational and SEM analysis evinced the high potential of job-related stress and burnout in predicting

Chinese English teachers' turnover intention. It indicates that in the absence of job-related stress and burnout, teachers are less likely to quit the teaching career. Simply said, job-related stress and burnout can result in enhanced turnover intention among teachers.

The outcomes of this inquiry might have some valuable implications for language teachers in any educational environment, notably distance education contexts. Given the high potential of job-related stress in predicting teachers' turnover intention, practicing teachers are required to constantly engage in teacher training courses to learn how to deal with job-related stress. For the same reason, they also need to attend professional development programs like workshops and conferences to update their knowledge of coping strategies. The results of the present investigation also appear to be instructive for teacher trainers. Owing to the significant role of job-related stress in increasing teachers' turnover intention, teacher educators are highly expected to teach practicing teachers how to cope with stressful situations at work. Upon equipping teachers with appropriate coping strategies, teacher educators can substantially decrease the rate of turnover among in-service teachers. Additionally, the findings of this research may entail some informative and fruitful implications for educational managers. Considering the direct effects of burnout and job-related stress on teachers' turnover intention, educational managers must provide teachers with a comfortable, stress-free working environment. Simply said, they need to reduce the professional demands and pressures that are made upon teachers in educational contexts. As a result, they can dramatically decrease the amount of turnover among practicing teachers.

It is worth mentioning that the outcomes of the present research should be interpreted in light of three significant limitations. First, the current investigation was entirely performed in China, which is an "English as a Foreign Language (EFL)" country. Hence, the results of this investigation are only transferable to EFL contexts. The educational researchers are thus advised to explore the role of job-related stress and burnout in teachers' turnover intention in an "English as a Second Language" country to find any meaningful changes in the outcomes. Second, the mediating or moderating effects of situational variables like teaching experience on teachers' turnover intention were disregarded in this research. It would be inspiring to measure the effects of these variables in future studies. Third, only close-ended questionnaires were used to elicit participants' viewpoints regarding the interrelationships of the variables under investigation. Other data collection instruments like interviews and open-ended questionnaires would help future studies to gather more comprehensive information.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Zhoukou Normal University Academic Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Exploring the role of content and language integrated learning approach in developing transversal skills in university students with respect to the mediating role of emotional intelligence

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Although a range of studies has explored the effects of the content and language integrated learning (CLIL) approach on students' achievement, its impact on improving university students' transversal skills (TSs) has remained largely unexplored in Iran. Thus, the present study has a two-fold purpose. First, it aims to investigate the role of the CLIL approach in improving Iranian university students' TSs. Second, it purports to explore the mediating role of emotional intelligence (EI) in the relationship between the CLIL approach and TSs. For this purpose, a survey design was used wherein a research-made questionnaire was distributed among 123 university students to gather the required data. Findings disclosed that the CLIL approach had a positive role in developing the university students' TSs. Further, the results indicated that EI positively affected the development of TSs in university students. Moreover, the findings evidenced that EI significantly mediated the relationship between the CLIL approach and the development of the university students' TSs. The study concludes that applying the CLIL approach involves an entirely new paradigm, offering valuable implications for relevant stakeholders.

KEYWORDS

content and language integrated learning approach, emotional intelligence, soft skills, transversal skills, communicative competence

Introduction

Over the last 3 decades, the view of developing transversal skills (TSs) in higher education contexts has received noticeable attention (Ribeiro et al., 2016). According to UNESCO (2013), TSs are defined as the “skills that are typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge and that can be used in a wide variety of situations and work settings (e.g., organizational skills)” (p. 3). As TSs are not specific to particular job duties, sometimes they are called “soft” or “transferrable” skills. The term “transversal” indicates that just like a transversal line in geometry, they cut across different roles and tasks. According to UNESCO (2013), they call fall into six categories, including critical and innovative thinking, intrapersonal skills, interpersonal skills, media and information literacy, global citizenship, and others (i.e., problem-solving, communication, teamwork, and leadership). Such skills are considered highly necessary for reaching the educational objective making students learn them during their study at universities. Moreover, in higher education contexts, explicit learning outcomes have been verified, resulting in the significant improvement of TSs, such as teamwork, communication, and problem-solving (Rakkarnsil and Butsalee, 2022; Veiga, 2022; Zheng, 2022). Additionally, such skills have been linked to the occupation outcomes of higher education students and have been the center of attention for legislators and university officials.

As an example, critical thinking skills are viewed as crucial skills to make correct decisions or solve problems (Liu et al., 2014; Ajmal and Kumar, 2020; Kumar, 2021; Nachbagauer, 2022). Likewise, over the last years, empirical findings have lent support to the need for radical modifications in university syllabuses (Goodwin et al., 2018). They have emphasized the importance of using efficient approaches such as the CLIL approach to assure that students are cultivating a variety of skills, such as collaboration, arbitration, demonstration, and governance (Larraz et al., 2017; Pang et al., 2022; Salomäki et al., 2022).

It is important to note that companies place a premium on personal qualities, such as motivation for working and learning, politeness, dependability, flexibility, punctuality, creativity, and vigor (Larraz et al., 2017; Levine, 2022). Interestingly, the list of TSs favored by companies reveals a preference for individual skills over occupational skills. Companies stress working in a group; the flexibility to organize work autonomously; communication skills; ability to act in the context of the company; recognizing their error; ability to accept criticism; the capacity to act in complex situations; the desire to learn; curiosity; perseverance; politeness; and maintaining a positive attitude (CEDEFOP, 2013, p. 5).

Although TSs have been investigated over the last decade, there are still areas of research that have not been tackled. TSs begin to develop from childhood (Pang et al., 2022; Uygur et al., 2022). According to Carneiro et al. (2007), family and social environment play a significant role in their development. Also, as Ramos et al. (2013) studied, the basics of these skills are established from childhood and they exert a substantial influence on success or

failure in all life dimensions. However, Ramos et al. (2013) underscore that the procedures of modeling and improving these skills through the educational platform have yet to be thoroughly investigated due to the existence of multiple research perspectives. However, taking a quick glance at the available literature reveals that no study has explored yet the effects of the CLIL approach on fostering university students' TSs in the higher education context of Iran. Additionally, the mediating role of emotional intelligence on the effects of the CLIL approach on improving university students' TSs has remained unexplored. Considering these points, the current research aimed to explore the effects of the CLIL approach on improving university students' TSs with respect to the role of emotional intelligence. Probably, the findings of the present study can further the pertinent stakeholders' understanding of the effects of applying the CLIL approach with respect role of emotional intelligence in fostering Iranian university students' TSs.

Literature review

Content language integrated language approach

Content and language integrated learning approach is a dual-focused approach that both language and content receive equal attention (Coyle, 2007; Mehisto et al., 2008; Cenoz et al., 2013; Kuzembayeva et al., 2022). In other words, it is viewed as an educational approach where a foreign language is a medium for teaching curriculum content (Dalton-Puffer, 2011; Vadivel and Beena, 2019; Mahan, 2022). This approach can be implemented as a form of mainstream education at the primary, secondary, and tertiary levels. Lasagabaster and Sierra (2009) verified some of the essential features of the CLIL approach. The first feature is that in the CLIL approach, a foreign language instead of a second language is used, meaning that the students do not encounter the target language outside the classroom. The second feature is that English is the dominant language in the CLIL approach. This is due to the fact that one of the key literacy features around the world is a command of English. The third feature is that the instructors in the CLIL approach are normally non-native speakers of English. They are content experts who aim to instruct content subjects taken from academic/professional disciplines. The fourth feature is that the target language is used to instruct around 50% of the curriculum content. The last feature is that students can attend CLIL classes when they have developed their literacy skills sufficiently in the first language. According to Dalton-Puffer (2011), the CLIL approach can be viewed as “a foreign language enrichment measure packaged into content teaching” (p. 184).

A mass of studies has been conducted on the effects of the CLIL approach on cultivating L2 learning (e.g., Xanthou, 2011; Brevik and Moe, 2012; De Diezmas, 2016). In a study, Xanthou (2011) explored the effects of the CLIL approach on content learning and vocabulary learning among L2 learners. The findings

disclosed that the CLIL approach was fruitful to improve the participants' content learning and vocabulary learning. Besides, [Brevik and Moe \(2012\)](#) examined if the CLIL approach had any effects on Norwegian students' language achievement. The findings demonstrated that regardless of the student's proficiency levels, the CLIL approach was effective to boost their language outcomes at the end of 2-year instruction. Additionally, [Heras and Lasagabaster \(2015\)](#) studied the effectiveness of CLIL on L2 learners' motivation and self-esteem. Also, they inspected the mediating effect of the CLIL approach on gender differences in L2 learning. The results evidenced that the CLIL approach was fruitful to relieve gender differences in motivation. Similarly, they found that the CLIL approach affected positively the participants' vocabulary learning regardless of their genders. Further, [De Diezmas \(2016\)](#) investigated the effectiveness of the CLIL approach in cultivating L2 learners' communicative competence. The findings of CLIL learners and non-CLIL learners enrolled in a 4-year primary education evidenced that the participants who were trained based on the principles and procedures of CLIL outperformed the non-CLIL approach learners.

Some reasons have been presented for these results, including better learning conditions owing to authentic lesson materials, the longer period of exposure, extra EFL lessons, the presence of native speakers, and the generally richer linguistic content of the CLIL classes ([Dalton-Puffer, 2008](#); [Banegas and del Pozo Beamud, 2022](#)). According to [Dalton-Puffer, \(2007\)](#), the CLIL approach is effective to cultivate L2 learning because it creates a real-life situation in which L2 is used for real-life purposes. This offers valued opportunities for L2 learners to process information more deeply. CLIL environments are found promising for better L2 performers, more motivated, and more academically and linguistically talented ([Bruton, 2011](#); [Paran, 2013](#)). In short, as [Küppers and Trautmann \(2013\)](#) suggested, CLIL environments are appropriate for both high-achieving and low-achieving L2 learners.

Development of transversal skills

The issue of TSs has gained noticeable attention over the last years because nobody can gain independence in learning if they lack these essential skills ([Stal and Paliwoda-Pękosz, 2019](#); [Vadivel et al., 2021](#); [Satayev et al., 2022](#)). Previously, different terms such as basic skills, key competencies, employability skills, the 21st-century skills, and transversal competencies have been used interchangeably for TSs (Viska project, 2017; [Ghademarzi and Mohamadi, 2022](#)). In a simple definition, the TSs have been viewed as the skills which can be learned in one area or situation and can be used efficiently in other areas and situations ([AIC, 2016](#)). According to [Whitemore \(2018\)](#), TSs include collaborative problem solving, digital competencies, learning to learn and continue to learn, initiative and independent thinking, adaptability, resilience, cultural awareness, and expression. In another classification proposed by the United Nations, TSs entail communication skills, teamwork, collaboration

skills, planning and organizing, creativity, accountability, commitment to continuous learning, and client orientation. Based on another classification, TSs comprise critical thinking, collaboration skill, communication skill, and creativity and innovation skills ([The Ontario Public Service, 2016](#)). Despite the differences among these classifications of TSs, the central point of the skills is that they are the essential skills that are transferable, reusable, and not specifically connected with a job or discipline ([Liu et al., 2021](#); [Belchior-Rocha et al., 2022](#)).

In spite of the classification differences, four skills shape the central core of the TSs, including critical thinking, collaboration skills, communication skills, and innovation/creativity ([Trilling and Fadel, 2009](#); [Kivunja, 2015](#)). As currently considered the keystone of 21st-century learning, critical thinking is the skill to solve problems ([Stanford Encyclopedia of Philosophy, 2018](#)). In other words, critical thinking is the ability to engage in our own thoughts and do reflection to reach a well-informed conclusion. According to [Kivunja \(2015\)](#), critical thinking is a highly curial skill throughout life in modern-day, which is the age of global technologies and economics. As [Trilling and Fadel \(2009\)](#) studied, collaboration skills are viewed as the intrapersonal and interpersonal abilities to collectively make progress toward a common purpose or solve a common problem. Communication skills are defined as the abilities used to give and receive different kinds of information ([Maguire and Pitceathly, 2002](#); [Sunday Adebayo et al., 2022](#); [Tonekaboni and Nasiri, 2022](#)). Creative thinking skills are defined as the techniques employed to approach an issue from creative and different perspectives, using the right tools to develop a plan and evaluate it ([Basadur et al., 2000](#); [Alnamrouti et al., 2022](#)).

Emotional intelligence

Emotional intelligence (EI) was introduced and supported by [Goleman \(1996\)](#). According to [Goleman \(2021\)](#), EI can be defined as an individual's ability "to be motivated and persevere in front of frustration, to govern one's impulses and to delay personal satisfaction, and to regulate moods and prevent troubles to obscure one's judgment; to be persistent and have hope" (p. 12). In other words, EI can be viewed as "is the ability to understand, use, and manage your own emotions in positive ways to relieve stress, communicate effectively, empathize with others, overcome challenges, and defuse conflict" ([Salovey and Mayer, 2004](#), p. 12). EI includes different emotions, including anger (e.g., resentment, fury, irritability, indignation, exasperation, and animosity), sorrow (e.g., sadness, being upset, melancholy, loneliness, self-pity, and sulk), fear (e.g., nervousness, anxiety, being afraid, terror, concern, worry, horror, and misunderstanding), joy (e.g., relief, happiness, blessing, pride, pleasure, euphoria, satisfaction, amusement, and contentment), love (e.g., friendship, trust, acceptance, commitment, awe, worship, kindness, and affinity), surprise (e.g., wonder, shock), disgust (e.g., contempt, detestation, revulsion,

and repugnance), and shame (e.g., embarrassment, guilt, humiliation, regret, and remorse; Bradberry and Greaves, 2009; Nelson and Low, 2011).

L2 teachers can foster all the dimensions of EI when they are working with learners (Oz, 2015; Li et al., 2021). If they use the appropriate teaching approaches and techniques in the classroom, learners' EI may raise substantially, leading to promising learning achievements. For this valuable purpose, they are supposed to use teaching approaches and techniques to make students aware of their own feelings, express their own emotions, controlling and regulate their own emotions, and be empathetic (Mayer et al., 2000; Köprü and Ayas, 2020; Khasawneh, 2021).

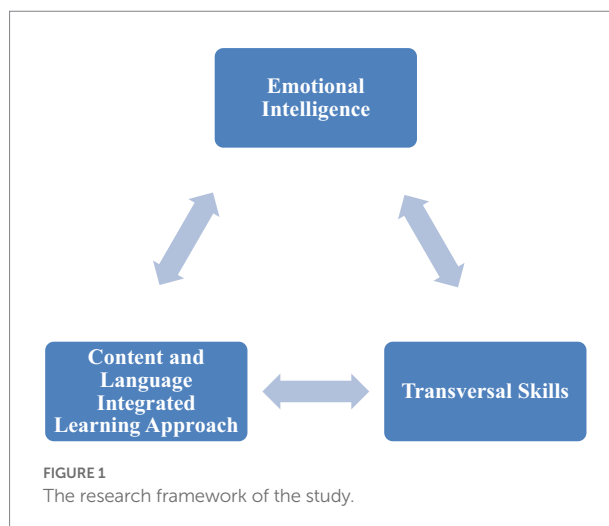
Theoretical framework

Modern problem-solving theories posit that language is one of the major media making thinking possible (Jonassen, 2000). It plays a vital role in group discussions, data presentations, and solution presentations (Ortega, 2020; Kumar et al., 2021). As Mitchell et al. (2019) stress, language acquisition occurs when learners are exposed to sufficient comprehensible input. The collaborating negotiation of meaning encourages productivity variations and increases cognizance of the meaning-carrying perspective of the linguistic edifice. As a result, the teaching approaches prioritizing meaning over form make the way for learners to learn and consolidate the linguistic structures (Tavoosy and Jelveh, 2019). One of the teaching approaches predicated on these assumptions is CLIL. It stresses the integration of content and language in learning activities wherein learners need to understand the problematic situation, discuss the model in both spoken and written forms, and produce a clear and understandable solution. Of particular note is that this perspective toward learning is in line with the sociocultural theory (SCT) of learning. From the perspective of SCT, language is regarded as the primary tool for mediating knowledge construction. In a sense, social interactions revolve around language and are perceived as critical media for knowledge and skills construction (Fang et al., 2019). In addition, activity theory (AT) can be considered a suitable theoretical framework for the CLIL approach because it stresses the interaction of the language and content as an instrument to achieve learning outcomes rather than just language or content (San Isidro and Lasagabaster, 2019).

Research framework

Given the theoretical framework discussed above (Figure 1), the following research hypotheses were put forward:

H1. Content and language integrated learning approach play a positive role in developing university students' transversal skills.



H2. Emotional Intelligence positively affects the development of university students' transversal skills.

H3. Emotional intelligence significantly mediates the relationship between the content and language integrated learning approach and the development of the university students' transversal skills.

Method of the study

Research design

This research adopted a quantitative design for collecting the required data. In exact words, a survey design was used wherein a research-made questionnaire was distributed among 123 university students to gather the required data. The primary purpose was to disclose the kind and amount of the relationship between the CLIL approach and the improvement of the university students' TSs with respect to the mediating role of emotional intelligence. The response rate for the questionnaires is presented in Table 1.

Setting and participants

The present study was conducted at the setting of the University of Ayatollah Ozma Borujerdi, Iran. Representing the major higher education system, state universities in Iran are a type of academic institution to which students need to get a good rank in the national entrance examination (Konkur) to be admitted. Its outstanding features are being free of charge for students, employing high-quality teachers, and following rigorous syllabuses. Using a random sampling method, a total of 150 undergraduate students were selected. As Riazzi (2016) noted, the random sampling method provides an equal chance for the individuals in a population to be selected for a study. The

TABLE 1 Response rate for the questionnaires.

Total	Frequencies/Rate
Total distributed questionnaires	150
Total Returned questionnaires	134
Returned and functional questionnaires	123
Returned and omitted questionnaires	09
Response rate	89.3%
Correct response rate	80.2%

underlying reason for selecting the participants was their easy availability to the Iranian researchers in this study. The participants included both males ($n=52$) and females ($n=98$) and their ages ranged from 18 to 30 years. They have been studying Applied Linguistics and did not have an opportunity to converse in English outside the walls of the institutes. The participants expressed their consent to take part in the study orally and they were free to withdraw from the study as they wished. It should be noted that the researchers ensured the participants that their responses would be kept confidential and they would be informed about the final results at the end of the study.

Instruments

To collect the required data, the researchers used a researcher-made questionnaire. They got through the literature meticulously and found that there was not any instrument available to measure the variables in the study. Therefore, in line with the rigorous phases proposed by Crosswell (2005), they designed and developed a questionnaire to measure the variables of interest. In exact words, they followed a three-phase procedure which included planning, construction, and validation. In the first phase, the researchers identified the target group and the purposes of the study. They assured that there was no instrument available in the literature to measure accurately the variables in interest. In the second phase, they identified the objectives of the instrument and developed a table of specifications. They determined the specifications such that the objectives were narrowed down sufficiently and the content areas were identified. They constructed the items and tried to refine them as much as they could. In the third phase, they administered the instrument to 30 university students to measure its reliability and validity. The results showed that the Cronbach's alpha value was 0.87, indicating that the instrument could readily accept reliability. To measure the validity, the researchers invited two university professors in Applied Linguistics to read and check if the instrument enjoyed a high level of face and content validities. Based on their comments, the researchers modified some of the items in terms of content and language. In general, the questionnaire entailed three sections; the first section consisted of 11 items related to the CLIL approach; the second section included nine questions germane to the development of TSs; the third section contained 12 questions concerning EI. The respondents provided answers on a five-point

Likert scale (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; and 5 = strongly agree).

Data collection procedures

The researchers took some distinct steps to conduct the present study. In the first step, they designed and validated the questionnaire. In the second step, they recruited two experts in translation to translate the questionnaire into the participants' mother tongue (Persian). The primary reason for this was increasing the credibility of the participants' responses. In the third step, they distributed the questionnaire among the participants. In doing so, they got the participants' phone numbers from the managers of the institutes and contacted them. They introduced themselves and explained the objectives of the study and asked if they were willing to take part in it. In general, 150 learners agreed to participate in the study and sent their emails and their WhatsApp IDs to the researchers. The researchers sent a digital format of the questionnaire to the participants. In total, 134 university students completed the questionnaire and 123 cases were filled out appropriately. It should be noted that the participants' responses were stored in a digital database.

Results

The Partial Least Squares Structural Equation Modeling (PLS-SEM) method was used to measure the relationship between the dependent and independent variables. As Pallant (2020) suggested, PLS-SEM is considered for structural equation modeling by researchers to estimate the complex cause-effect relationships in path models with latent variables. TSs were taken as the dependent variable, and CLIL approach was viewed as the independent variable, and EI was considered as the mediating factor between them. After collecting the raw data with the help of the probability sampling method, all the sections of the questionnaire were coded and keyed into SPSS, version 18. Afterward, a reliability test was conducted, and the results are presented in Table 2.

Measurement model

The next stage in the analysis was to examine if the construct items contributed to the hypothesized model as a whole, and for this purpose, the measurement model was examined. Evaluation of the measurement model includes convergent validity assessment (extracted average variance, outer loading, and composite reliability). It is essential to establish the validity of any research to get more accurate and reliable results. Discriminating validity and the extracted average variance (AVE) are two validity criteria evaluations (Hair et al., 2018). Both the dependent variable (TSs) and the independent variable (CLIL approach) were

examined in the measurement model. The model was used to measure the construct and its validity. A confirmatory factor analysis (CFA) was performed using PLS-SEM to compute the discriminant validity of the hypotheses. Table 3 reports that all premises meet this condition, hence signifying the discriminant validity of the model.

By proving the construct validity of the measurement model, it was assumed that the questionnaire results were valid and reliable (Figure 2).

TABLE 2 Results of the reliability test.

Construct	No. of items	Cronbach's Alpha
Transversal Skills	9	0.718
Content and Language	11	0.825
Integrated Learning		
Emotional Intelligence	12	0.783

TABLE 3 Results of the discriminant validity.

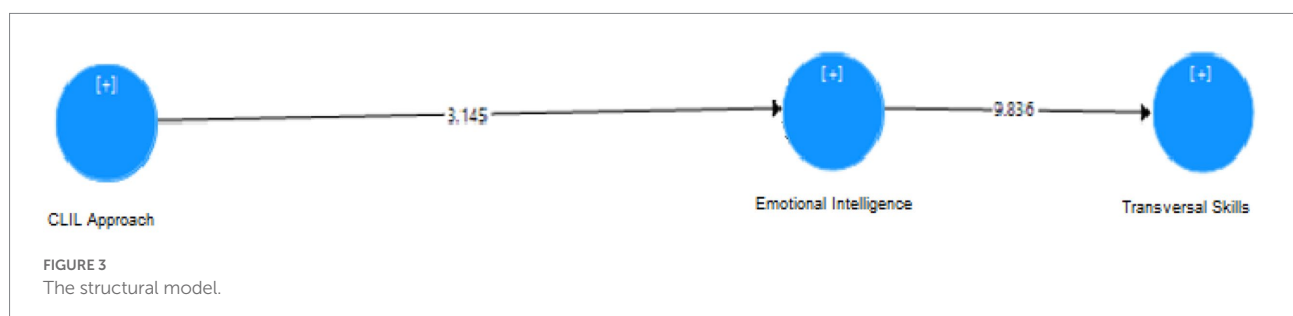
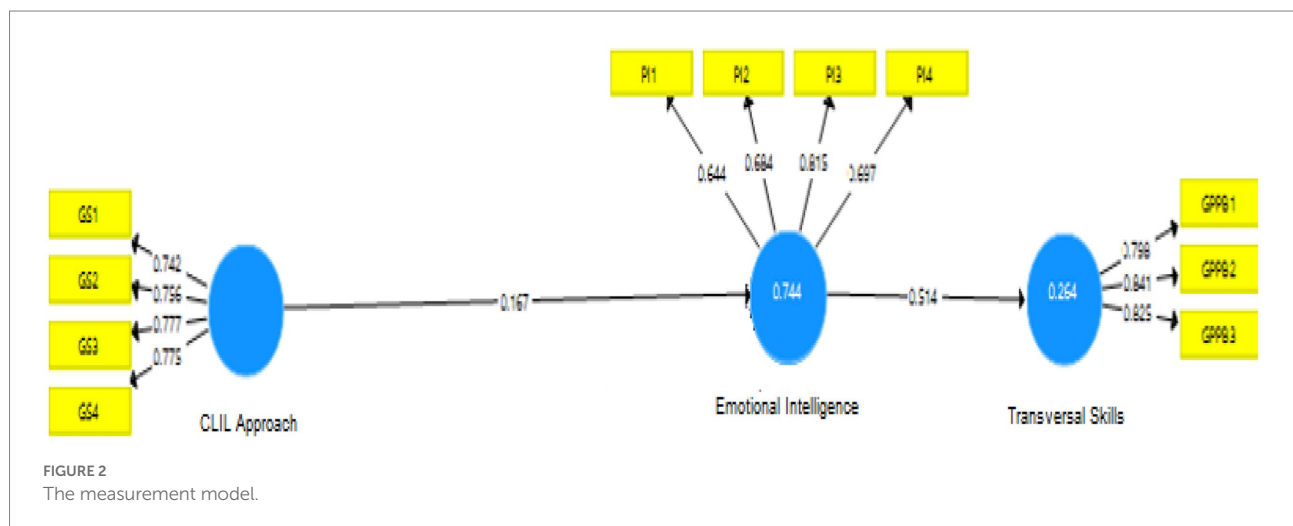
	CLIL	EI	TVS
CLIL	0.84		
EI	0.57	0.82	
TVS	0.58	0.68	0.83

Structural model

After ensuring that the measurement model was reliable and valid, the structural model was evaluated in the succeeding step. The structural model or inner model assessed the predictive abilities and the relationship between latent constructs. Analysis of the model's predictive ability and interactions between different components are part of this stage (Hair et al., 2018). The structural model measured the predictive skills and the relationship between latent constructs. After considering multi-collinearity in the previous step, it was proven that there is no multi-collinearity issue among the exogenous variables (Figure 3).

Coefficient of determination (R^2)

This research employed Smart PLS to evaluate the structural model, including coefficients for the right direction and values for R^2 . The path coefficients are standardized regression coefficients used to explain the direction of variables' relationships. R^2 values represent the structural explanatory power and represent the proportion of variation in endogenous variables (Hsiao and Bomhold, 2013). With higher descriptive power levels, the R^2 ranges from 0 to 1. R^2 values of 0.75, 0.50, and 0.25 are used as guidelines for substance, moderation, and weakness, respectively (Hair et al., 2019).



Effect size (f^2)

The impact size indicates the relative effect on a specific exogenous latent variable's endogenous latent variable with R-square adjustments (Avkiran, 2018). The external structure is critical in explaining the endogenous structure as a static measurement. The effect size (f^2) is utilized in analysis to assess whether the removed construct has a substantial effect on the endogenous constructs, and the effect size may be calculated by comparing the rise in R^2 to the percentage of the variance of the remaining unexplained endogenous latent variable. As a rule of thumb, 0.02–0.14, 0.15–0.34, and greater than 0.35 are defined by Cohen (2013) as minimal, moderate, and high effects, respectively.

Path coefficients

Partial Least Squares Structural Equation Modeling uses the path coefficient to evaluate the power and significance of the latent construct's hypothesized relations. Estimates are derived with a coefficient closer to +1, indicating a strong positive link and a coefficient closer to −1, showing a strong negative relationship and structural model associations with constant values between −1 and +1.

Direct and mediating relationships

Assessment of the structural model started with the exploration of the direct relation between the CLIL approach and TSs. The PLS-SEM algorithm was employed to inspect the size of path coefficients, while the significance of the relationship between variables was observed using PLS-SEM bootstrapping technique. The first model consisted of studying the direct relationship among variables H1 and H2 (Table 4). After that, the second model introduced a mediating variable, and the relationship between the independent and mediator variable H3 was examined (Table 5).

TABLE 4 Results of hypotheses testing (Direct relationships).

Theorized Path	Path coefficient	Standard Error	<i>t</i> value	<i>p</i> value	Decision
H1: CLIL -> TVS	0.348	0.116	2.703	0.007	Accepted
H2: EI -> TVS	0.878	0.122	6.623	0.000	Accepted

TABLE 5 Results of mediating tests.

	Hypothesized path	Path coefficient	Standard Error (STERR)	<i>t</i> value	<i>p</i> value	Decision
H3	CLIL -> EI -> TVS	0.305	0.108	2.343	0.02*	Supported

* $p < 0.05$.

As shown in Table 4, the claim of the hypotheses H1 (e.g., CLIL approach has a role in developing the university students' TSs) and the claim of H2 (e.g., EI has a role in developing the university students' TSs) were supported. Similarly, as presented in Table 5, the claim of H3 (e.g., EI mediates the relationship between the CLIL approach and TSs) was also supported.

Discussion

As noted above, this study purported to explore the role of the CLIL approach in developing university students' TSs in the higher education in Iran. Additionally, it aimed to disclose the mediating role of EI on the relationship between the CLIL approach and the university students' TSs. For these purposes, three hypotheses were formulated. The first hypothesis posited that the CLIL approach plays a positive role in developing university students' TSs. This hypothesis was accepted because, as reported above, the Path coefficient for CLIL > TVS was 0.348, while the *t* value was 2.703 in the structural model's results. The hypothesis had a *p* of 0.007, more significant than the value of $t > 1.96$, which had a $p < 0.05$. The second hypothesis stated that EI positively affects the development of TSs in university students. This hypothesis was also accepted because, as reported above, the Path coefficient for EI > TVS was 0.878, and the *t* value was 6.623; as evidenced by the results of the structural models. The hypothesis had a value of *p* was 0.000, which was more than the threshold value of $t > 1.96$, which had $p < 0.05$. The third hypothesis stated that EI significantly mediates the relationship between the CLIL approach and the development of the university students' TSs. This hypothesis was accepted because, as reported above, the Path coefficient for CLIL > EI > TVS was 0.305, while the *t* value was 2.343 in the structural model's results. The hypothesis had a value of *p* of 0.002, more significant than the threshold value of $t > 1.96$ ($p < 0.05$).

The findings of the study are in line with those of Xanthou (2011), reporting that CLIL was fruitful to improve the participants' content learning and vocabulary learning. Besides, the results of the study are consistent with those of Brevik and Moe (2012), revealing that regardless of the proficiency levels in students, the CLIL approach was effective to boost their language outcomes at the end of 2-year instruction. Additionally, the findings of this research lend support to the results of Heras and Lasagabaster (2015). They found that the CLIL approach was fruitful to relieve gender differences in motivation. Similarly, they found that the CLIL approach affected positively the participants' vocabulary learning

regardless of their genders. Moreover, in agreement with the results of this study, [De Diezmas \(2016\)](#) found that the participants who were trained based on the principles and procedures of CLIL outperformed the non-CLIL learners.

Based on the findings, it can be argued that the university students' TSs could develop substantially because they were instructed based on the principles and procedures of the CLIL approach. In other words, the results of the study can be discussed from this perspective that when the university students' attention was drawn to both the content and language simultaneously, they might have had better opportunities to foster their TSs, such as critical skills, collaborative skills, communication skills, and creative skills. In addition, aligned with the findings of the study, it can be argued that EI had a substantial mediating role in the relationship between the CLIL approach and the development of the TSs. The results are in line with those of the previous studies (e.g., [Jonassen and Rohrer-Murphy, 1999](#); [Kolb et al., 2001](#); [Coupal, 2004](#); [Asal and Kratoville, 2013](#); [Olusegun and Bada, 2015](#)), reporting that EI is an influential factor in developing students' learning skills. In line with the results of the study, it may be argued that a high level of EI increased the students' chances to develop TSs, which, accordingly, might have led to more promising learning achievements among university students. Along with [Nagahi et al. \(2020\)](#), it may be argued that the CLIL approach with its didactical procedures, using active methods, and integration awareness training in learning, integrating the content and language might have offered ample opportunities for university students to develop TSs.

Furthermore, another line of discussion for the findings may be ascribed to the fact that because the attention of university students was directed toward content provision and acquisition rather than chances for general competence, they might have been in a better position to reconsider their subject's objectives and learning goals to attain them. The findings of the study are congruent with those of [Macianskiene \(2016\)](#), revealing that the CLIL approach was found to be effective in developing TSs among university students in Lithuania. The findings were ascribed to this reason that the CLIL approach could offer opportunities to study meaningful content in English, allow the participants to join authentic communication, let them compare the newly-acquired information with that already acquired, and set the scene for them to use English to critically think to solve their learning problems. Additionally, aligned with [Macianskiene \(2016\)](#), it may be argued that since the CLIL approach might create an educational environment in which the university students could develop collaborative skills and communication skills, their cognitive skills might have developed, their creativity might have raised, conditions for developing their personality might have set, their cultural awareness might have cultivated, and their expression might have fostered leading to the fostering of TSs.

To discuss the findings of the study, it may be argued that as the CLIL approach was a cohesive method to increase the

exposure to the target language and contents without the need to double the amount of time they spent in conventional classes, it might have been found useful to foster the participants' TSs. In other words, as university students might learn new concepts, they might have increased their time spent in English learning ([Lung-Guang, 2019](#)). Moreover, another reason for the results of this study may be attributed to the fact that instead of forcing the university students to focus on the forms of language, the CLIL approach might have directed the university students' attention to the meanings. That is, the university students' use of English might have become more contextualized, genuine, and meaningful due to the instruction on topic matters in English. Additionally, as the CLIL approach could provide real-world tasks, the English language might have become natural and much more relevant for the university students, increasing their motivation to think critically, seek innovative ways of learning, and find more chances to communicate and collaborate with others ([Injadat et al., 2020](#); [Lyken-Segosebe et al., 2020](#)). The next line of discussion for the results of the study is that as the development of TSs might have been complex, the university student might have been obliged to pay more attention to the learning motivation, formative evaluation, and interactive learning processes ([El Ajraoui et al., 2019](#)). These all useful conditions might have been created properly by implementing the CLIL approach.

The other reason for the findings of the study may be lined with this view that the CLIL approach might cope with the lack of relevance of L2 teachings, such as vocabulary and grammar. In a sense, it may be argued that the participants' motivation might have increased because the CLIL approach might create a naturalistic learning setting. This environment might have motivated the participants to use language, learn content, foster cognitive development, develop communication skills, learn the culture, and encourage their creativity ([Harrop, 2012](#)). Put it in a nutshell, the implementation of the CLIL approach might serve the university students' needs and wants.

To discuss the other part of the findings, which reveal that EI had an effective mediating role in the development of the university students' TSs, it may be argued that the university students with higher EI levels might have been more tolerant in learning environments that looked like real-life situations wherein English was put to real use. This, in turn, might have offered opportunities for university students to process and internalize the information more efficiently ([Dalton-Puffer, 2007](#)). Thus, it is reasonable to argue that higher the EI, the more critical, innovative, and efficient communicator, and collaborator. Besides, the results of the study may be argued from this view that the participants with a higher level of motivation might have had the capabilities in inspiring themselves to develop their TSs ([Trilling and Fadel, 2009](#)). In other words, it may be argued that because the students with high levels of EI could manage their motivation efficiently, might have been exposed to more activities to foster TSs. The final reason for the findings may be ascribed to this view that the university students who enjoyed high levels of EI might

have been more consistent. This consistency might have been related not only to the classroom environment, but it might have emphasized the significance of lifelong learning, leading to the development of further development and application of TSs throughout life.

Conclusion and implications

As noted above, the findings disclosed that the CLIL approach played a positive role in developing the TSs of university students. Further, the results indicated that EI positively affected the development of university students' TSs. Moreover, the findings evidenced that EI significantly mediated the relationship between the CLIL approach and the development of the university students' TSs. Based on the findings of the study, it may be concluded that the CLIL approach can be implemented to foster TSs which occupy the central place in the lifelong context. The findings gave the conclusion that EI can be cultivated so as to play a positive role in improving TSs. TSs, regardless of job and discipline, are characterized by relevance, necessity, reusability, and transformation (Larraz et al., 2017).

In line with the results of the study, a range of implications are presented for different stakeholders. The first implication is for educational policy-makers to reconsider the positive role of the CLIL approach and EI in fostering students' TSs. As a result, they should take urgent steps so that this approach and EI can be accommodated in the education system. The second implication is for teacher trainers. They are required to hold pre-service and in-service training workshops to make L2 teachers familiar with the principles and procedures of the CLIL approach and allow them to gain a comprehensive understanding of the significance of EI in second language education. In these training workshops, they should be educated on the theoretical tenets and the practical activities such that they could implement the CLIL approach and EI efficiently in their classes. The third implication is for material developers. For this, they are suggested to design and develop the educational materials in line with the principles of the CLIL approach and EI such that they can cultivate the students' TSs substantially. The fourth implication is for language teachers. If they are to develop students' TSs, they need to implement the CLIL approach in their classes with respect to using activities that raise students' EI. The fifth implication of the findings is for language learners who aim to improve their TSs. To do so, they are supposed to join courses that are run based on the principles and procedures of the CLIL approach, and EI is given enough attention. The last implication is for L2 learners' parents. They can register their children in courses that integrate the learning of language and content together.

Due to time and resource constraints, the current research suffered from some limitations. These limitations might pave the way for further studies in the future. First, as this study relied on the data collected from undergraduate students in

Iran; thus, the results are only applicable to the Iranian higher education contexts, future research can replicate the present study in other parts of the world to generalize the credibility of the findings. Second, as the collected data were quantitative, further studies can be conducted using qualitative designs to disclose how the CLIL approach improves students' TSs. Third, since the present study was cross-sectional, interested researchers can carry out longitudinal studies to disclose how the CLIL approach affects the development of TSs over a period of time. Fourth, as the current research was conducted in the setting of higher education, interested researchers can further explore the effects of the CLIL approach on improving high school students' TSs. Last but not least, because the current study focused on the impact of the CLIL approach on the improvement of TSs with respect to the mediating role of EI, future research can expand the spectrum by including more variables in the research analysis.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Unpacking the interaction between foreign language learners' emotion, cognition, and activity in the flipped classroom in higher education: A *perezhivanie* perspective

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Few studies have investigated learners' emotional experiences and the interactions between emotion, cognition, and activity in the flipped foreign language classroom (i.e., a mixed teaching mode that combines in-class teaching and off-class self-directed learning). This study, from the perspective of *perezhivanie* (a concept from sociocultural theory), addressed these research gaps by exercising a longitudinal narrative study on a total of 32 Chinese-as-the-first-language university students of English who attended a 15-week English course with this teaching design. Among them, eight focal students were randomly selected for further evidence of the characteristics of the interactions between emotion, cognition, and activity. The results showed that the participants experienced more of positive emotions than negative emotions in the flipped classroom (FC) context, which supports the efficacy of the pedagogy. But most importantly, complex interactions between emotion, cognition, and activity were revealed. Generally, (negative) positive emotion, cognition, and activity were interconnected; however, what is also evident is that learners' emotions either promoted or inhibited their cognitive functions, and positive and negative emotions did not necessarily correspond to positive and negative activities, respectively. This is due to the presence of dynamic, developmental, and historical sociocultural mediators in learners' *perezhivaniya*, be it teacher, peers, technology, teaching materials, teaching activities in an FC, or the learners' previous English learning anecdotes, etc.

KEYWORDS

perezhivanie, emotion-cognition-activity, dramas, sociocultural theory, flipped classroom

Introduction

All the learning processes unify cognition and emotion including second-language learning. However, researchers in the field of second-language acquisition (SLA) have primarily focused on learners' cognitive performance, leaving their emotional experiences less explored (Swain, 2013; Dewaele and Li, 2018). Among the limited number of research addressing learners' emotions in the field, a large majority of them targeted only a single emotion, such as anxiety, enjoyment, burnout, and boredom (Dewaele and MacIntyre, 2014; Jin and Zhang, 2019, 2021; Derakhshan et al., 2021; Li, 2022), despite the facts that second-language learning is a rather complex process whereby many positive and negative emotions can be experienced even in the same time window and that it is the positive or negative emotionality that motivates or demotivates learners over a long learning trajectory. Methodologically, research on emotions has heavily relied on using Likert-type scales. Albeit warranting a large dataset (Jiang and Dewaele, 2019; Li, 2021, 2022), the downsides of this research paradigm are the dichotomy of emotions into either positive or negative (Wang et al., 2021), and only a single form of emotional manifestation is attended to. Therefore, qualitative data are needed with its advantages of including the characteristics of typicality, complexity, and integrity, although the sample size is small.

In addition, though FC teaching as an alternative to replace teacher-led instruction in varying educational settings (van Alten et al., 2019), particularly in the second-language (L2) domain (Mehring and Leis, 2018), has advantages such as more frequent inter-student interactions before and after class (Roehl et al., 2013), flexibility (Buechler et al., 2014), and increased student engagement (Chetcuti et al., 2014; Malik et al., 2018), it also imposes new challenges on teachers and students alike. For example, the use of information technology in FC teaching can make learners feel difficult to concentrate (Qin et al., 2022). They also face greater pressure to engage in more interactive activities in the in-person part of the FC teaching (Malik et al., 2018). All new challenges are likely to influence foreign language learners' emotions; consequently, it is necessary to conduct a more in-depth discussion on learners' emotional experiences and influencing factors of learners' emotion in FC teaching of foreign languages.

By far, scarce studies have explored how learners' emotions form and develop in the FC from a *perezhivanie* (unity of emotion, cognition, and social activities from SCT) perspective to understand how learners interpret and emotionally relate to the teaching environment, which may shed some light on relevant studies. Thus, this study aims to explore the developmental process of learners' emotions in the context of the FC through the lens of *perezhivanie*. To achieve this goal, we adopted a multi-dimensional narrative approach (Patton, 1990) to triangulate

the findings by deploying written narratives at two time points (at the beginning and end of the semester), as well as on a longitudinal weekly basis lasting for 15 weeks. The synchronic and diachronic narrative data provided evidence not only on learners' emotional states and its dynamic changes but also on the dialectical interactions between learners' emotion, cognition, and activities in the FC context.

Literature review

This section provides interpretations of related concepts such as sociocultural theory, *perezhivanie* and drama, as well as a brief overview of existing research on learner emotion.

Sociocultural theory

Sociocultural theory (SCT) rooted in cultural-historical psychology established by Vygotsky and his colleagues (Lantolf and Thorne, 2006). Although SCT literally includes "social" and "cultural," it is a theory of neither society nor culture, but one of mind that explains the laws of human beings' mental functioning developed from social relationships and cultural artifacts (Qin et al., 2019; Qin, 2021, 2022; Qin and Ren, 2021). The philosophical origins of SCT are from the 18th and 19th centuries by Germany philosophers Kant's and Hegel's dialectics, as well as Marx and Engels' works on sociology and economics critically drawing on Feuerbach's tenets of materialism (Lantolf and Thorne, 2006).

Traditional psychology theories are keen to separate cognition from emotion (Vygotsky, 1987). However, SCT advocates their integrated and interactive contributions to the development of mental functioning by proposing the concept of *perezhivanie*. Originating from the Russian word *perezhivat*, *perezhivanie* refers to "how an individual is aware of, interprets, and affectively relates to a certain event" (Vygotsky, 1994, p. 341). It continuously develops in a dynamic manner since a very young age as individuals gain lived experiences in the real world. *Perezhivanie* thus implies the effect of the immediate and past sociocultural environment on individuals, more specifically social relationships and social activities (Vygotsky, 1994). Having said that, it must be noted that not all social relationships and social activities influence individuals' development according to SCT but only those "dramatic" ones (also known as dramas) that cause one's internal emotional conflicts and create critical *perezhivaniya* (Lantolf and Swain, 2019). Research from an SCT perspective typically uses critical *perezhivaniya* (plural form, or *perezhivaniya*) as units of analysis, which automatically attends to tripartite interactions among emotion, cognition, and social environment

(Roth and Jornet, 2013) and combines the past, the present, and the future (Veresov, 2017).

Perezhivanie

Perezhivanie refers to an individual's lived or emotional experience, which is subjective thinking and feeling of the environment, that is, "how the individual is aware of, interprets, and affectively relates to a certain event" (Vygotsky, 1994, p. 341). As a unit of analysis, *perezhivanie* represents the dialectical unity of emotion and cognition. An individual's *perezhivanie* exerts effects on the individual's social activity and eventually builds the trajectory of development (Vygotsky, 1987; Golombek and Doran, 2014). Therefore, *perezhivanie* covers both objective environmental characteristics and subjective personal characteristics. The difference between *experience* and *perezhivanie* is that the former is a complete discrete event that can be divided according to time and be recalled through memories, while the latter is the ongoing conversion of social activities from the social to the individual. It is a dynamic and continuously updated unit that involves the interaction between situations, cognition, and emotions relative to the individual (Roth and Jornet, 2013). Vygotsky (1998) believes that the concept of *perezhivanie* can be used to analyze the influence of the social and cultural environment on the process of individual development. In short, individuals experience the current environment through their past *perezhivaniya* and then form their new *perezhivaniya*, and the current *perezhivaniya* will have an impact on how individuals experience the new environment in future.

Drama

Vygotsky (1997) believed that researchers need to trace the individual history, that is, their past experience. Veresov (2017, p. 59) pointed out that social relations in the individual's past experience would bring individual development, and not every social relation can be developed into individual psychological functions but only those "dramatic" social relations can. That is to say, only those social relations that influence the individual's emotions can be used as the source of development (Lantolf and Swain, 2019). In a word, dramas are those events that cause the individual's internal emotional conflicts, which is in line with the genetic law. The relationship between drama, *perezhivanie*, and development is that drama which brings rich emotions forms an individual's critical *perezhivanie*, thus influencing the individual's trajectory of development (Fleer et al., 2017). From a *perezhivanie* perspective, despite the same environment, some would feel it dramatic, thus gaining the opportunity to develop, while others may not feel the environment special to personal development.

Learners' emotion in sociocultural theory

Previous learners' emotion research from psychological perspectives would focus on specific types of emotion and attempt to explore the relation between emotional variables and other quantifiable variables (Khajavy et al., 2018; Li et al., 2020; Pawlak et al., 2020). However, emotion research from the SCT perspective does not delve into the constituent variables of emotion but records and describes emotional experience, traces the process of emotional development, and explores the interaction between learners and the sociocultural environment from a holistic view. For example, Swain et al. (2015) used narrative interviews to build a multilingual learning history of a participant, Grace and constructed a developmental trajectory by understanding her lived emotional experience (*perezhivanie*). Sampson (2020) followed 47 Japanese first-year college students and asked them to write down their feelings during English class every week. After quantifying the qualitative data, it was found that the sources of positive and negative emotions are mainly classroom activities, classmates, identity, teacher, and lesson. This kind of diachronic tracking of emotions and feelings of a group can record learners' emotional states and sources of fluctuations and have important reference value for emotion research in SLA.

Learners' emotion studies in flipped classroom

An FC is commonly referred to as the process of flipping what is traditionally carried out in the classroom to an independent homework activity before class. As such, lessons involve problem-solving and higher order thinking tasks, which are traditionally assigned to subsequent homework activities (Mehring, 2016, 2018; Låg and Sæle, 2019). Vitta and Al-Hoorie (2020) defined FC as "... involves presentation of new content to learners to be independently studied before class, and then class time is devoted to reinforcing and engaging with the 'flipped' content." In other words, in the FC, the in-person time aims to help students solve problems and to engage students in collaborative and hands-on activities (Bergmann and Sams, 2014; Mehring, 2018). The online time, an extension of in-class learning, makes use of digital resources to support students' learning linguistic knowledge and intercultural knowledge (Hung, 2015, 2017; Chen Hsieh et al., 2017). In the traditional classroom, teachers inculcate knowledge in students, who often learn in a passive way. Instead, within the pedagogical framework of the FC, teachers assist in and guide learners through their learning process and thus allow greater learner autonomy (Evseeva and Solozhenko, 2015; Adnan, 2017).

The FC indeed can provoke both positive and negative learners' emotions; however, so far, little research in EFL

teaching has focused on both dimensions of emotions. Only Kruk and Pawlak (2022) discussed this systematically in second-language virtual classrooms, but mainly from a dualistic perspective, dividing positive and negative emotions into two non-interfering dimensions and only described characteristics of each, respectively. In the existing research on both sides of learners' emotions in the FC, most of it has been teaching and learning in science classrooms. For example, Jeong et al. (2016) conducted a study in a general science course with sophomores in a university in Spain and concluded that students' perception toward an FC included both negative (boredom and fear) and positive (fun and enthusiasm) emotions. González-Gómez et al. (2017) performed a comparative study between the traditional classroom (TC) and FC in a general science classroom with undergraduate students and concluded that in contrast to the TC, the FC aroused more of positive emotions than negative ones. However, in EFL classrooms, there are more studies focusing on one dimension of learners' emotion in the FC, be it positive or negative. For example, Pan et al. (2022) inspected the effect of Massive Open Online Course (MOOC) and FC on EFL learners' foreign language-speaking anxiety and attitude toward English learning and concluded that participants in both groups had positive attitudes toward technological-based instructional environments. Gok et al. (2021), however, did not find the FC triggered significantly higher anxiety, suggesting the complexity of the antecedents of emotions, and many factors might moderate the effect of pedagogical approaches on learners' emotions.

Another strand of research focused on the effect of participating in classroom activities on emotions in the FC context. For example, Gok et al. (2021) found that pre-class preparation and in-class group work could alleviate learners' anxiety. Abdullah et al. (2020) found that participating in the well-designed in-class and out-of-class activities provided students many opportunities to improve their self-confidence and significantly reduced their anxiety due to a creative, safe, comfortable, and encouraging learning environment forged by the teaching approach. Malik et al. (2018) evaluated the effectiveness of the FC approach by examining the relationship between the FC and student engagement at physical, behavioral, and emotional levels. The findings indicate that the FC improves learners' physical and cognitive engagement; however, no improvement in their emotional engagement was observed.

Above all, we note that from an SCT perspective, the interaction between emotion, cognition, and activity should be examined if deeper understanding of learners' emotion in the FC is to be achieved. More importantly, the cognitive, affective, and social interactions of individuals should be integrated as a whole. Although studies on neurosciences have proved the link and inseparability between cognition, emotion, and human behaviors due to mental trauma (Sarr-Jansman and Rowberry, 2018; Malaei et al., 2022; Quadt et al., 2022), and researchers from education (Yob, 1997) and psychology (Greenberg and

Safran, 1987; Eich and Schooler, 2000; Schnitzspahn and Phillips, 2016; Belkhir, 2020) also noted the gap, only a few studies found this trend in SLA. However, most previous studies discussing the three components in one study in SLA were on second-language teacher education. For example, Tasker et al. (2010), Golombek and Doran (2014), Johnson and Worden (2014), Golombek (2015), Johnson and Golombek (2016), Johnson (2018, 2021), Agnoletto et al. (2021), discussed novice language teachers' development due to emotional and cognitive dissonance during the practices of learning to teach. Even fewer studies focused on the interaction between the second-language learner's emotion, cognition, and activities in a holistic way (unity of individuals and society). Only Moeller (2021) discussed about the significance of integrating feeling and thinking to optimize language learning, claiming that if positive emotions are activated, learners would put more efforts to language learning and show greater sense of efficacy. However, by far, no empirical studies on the interaction of the three components of *perezhivanie* have been found implemented among second-language learners in the FC.

In line with the previous discussion, the concept of *perezhivanie* views individuals' emotions, cognitions, and activities (social activities engaged in) as inseparable and also as a unity of the dialectical relationship between the three (Swain, 2013; Lantolf and Swain, 2019). Furthermore, we note that existing research rarely describes the dynamic changes over time in learners' emotions in the FC. Therefore, we argue that in this context, there is a need for a longitudinal study on learners' emotions from a *perezhivanie* perspective. Based on this argument, the present study is guided by the following questions:

- (1) What are learners' emotional experiences in the context of the FC?
- (2) In what ways are learners' emotion, cognition, and activity combined in the context of the FC?
- (3) What are the dramas (unit of analysis for *perezhivanie*) that cause the interaction between emotion, cognition, and activity?

Methodology

Context

The study was carried out in an EFL lesson using an FC approach at a Northeastern China university. The teacher for this lesson was a novice teacher with no prior experience in foreign language teaching in higher education. The classes for this lesson lasted 17 weeks. Review and final examination were conducted in weeks 16 and 17, and we only collected data from week 1 to week 15. In each

week, students had one face-to-face session (90 mins), either *integrated* or *listening and speaking class* (two modules of EFL), supplemented by self-directed online learning through a platform called Unipus (90 mins). In addition, the students could communicate with the teacher through WeChat, a real-time communication tool like Facebook Messenger and email, if they had any questions.

Participants

The total participants were 32 sophomore undergraduates in semester 4, majoring in a foreign language other than English, but all took English as a foreign language course at a Northeast China university. There were 28 female and four male students, with an average age of 19.6 ($SD = 1.1$) years, who consented to participate in a written narrative task in weeks 1 and 15, respectively (weeks 16 and 17 were not included in the research because they were the time for review and final examination). Among them, eight students were randomly extracted from low-, medium-, and high-English level subgroups of the total sample achieved by allotting the 32 students to the three groups in terms of their scores in a national-level English examination. These focal students, representing different foreign language backgrounds and different levels of English proficiency, additionally accomplished narrative journals on a weekly basis over 15 weeks of the semester. We present the narrative diary data of the eight focal students after their consent. **Table 1** reports in details the demographic information of eight focal students who consented the narratives to be included in the study anonymously.

Instruments and procedures

Narrative is a way of using language and other signs (images, gestures, etc.) to produce a coherent account that

posits an interconnection between the past, the present, and the future events (Dick et al., 2017). Emotion and cognition are both developed from social activities (Gorbatkov, 2002; Golombek and Doran, 2014); therefore, cognition, emotion, and activity are inevitably unified in their narratives. Narrative analysis is interested in broader interpretive frameworks used by both the participant and the researcher to make sense of particular incidents in the individual's lives, which is compatible to the "drama," unit of analysis for *perezhivanie*, meaning the "dramatic social relations or events" that caused individual development (Fleer et al., 2017, p. 59). Researchers use narrative analysis to understand how participants construct stories from their own personal experiences, which contain the interaction of emotion, cognition, and activity, suiting for the current study. Johnson and Golombek (2002, p. 4) proposed that "the conceptualization of narrative inquiry in Dewey's (1916, 1920, 1933) educational philosophy, which, at its core, argues that we are all knowers who reflect on experience, confront the unknown, make sense of it, and take actions.

A written narrative was adopted in this study. The total of 32 participants performed written narrative tasks in their native language, Chinese (minimally 200 words), in weeks 1 and 15, respectively. In week 1, they reported their language learning experiences prior to the current semester, including pre-college experiences. In week 15, they reported their emotional experiences in in-class learning, including the emotions experienced at the time points of presenting, answering questions, discussing, participating in other activities, and independent learning (watching online courses, etc.). In other words, the purposes of the narrative study on the participants were to understand their English learning experiences prior to, at the beginning of, and during FC learning, respectively (question 1). In total, 17,783 Chinese characters were collected.

To investigate the interaction between emotion, cognition, and activity (question 2) and locate the dramas that caused the change of *perezhivaniya* or interaction of the three elements

TABLE 1 Participants' demographic information.

Pseudo name	Gender	Major language	English learning duration	CET 4 ¹ grade	English proficiency subgroup
Rita	Female	Russian	12 years	548	High
Jenny	Female	Japanese	11 years	528	High
Linda	Female	Japanese	11 years	517	Medium
Ryan	Female	Spanish	14 years	502	Medium
Zoey	Female	Arabic	13 years	449	Low
Vicky	Female	Russian	11 years	485	Low
Jim	Male	Japanese	11 years	489	Low
Jack	Male	Spanish	15 years	414	Low

¹A national-level English test in China called College English Test. Its equivalence to other international tests is illustrated at: <https://ucsantabarbaraextension.zendesk.com/hc/en-us/articles/360001614547-English-Language-Requirements-for-International-Programs>. 550 + is nearly equivalent to IELTS 6.5. 425 is a threshold of passing grade which is roughly equivalent to IELTS 4.5. An introduction to College English Test in China can be found at <https://wenr.wes.org/2018/08/an-introduction-to-chinas-college-english-test-cet>.

(question 3) in the FC context, weekly written narrative reports were collected from eight focal participants who consented to submit their reports. The contents pertained to pre-class online learning experiences, in-class activities, and after-class activities (see Table 2). In total, 29,319 Chinese characters were collected from this weekly narrative task.

Data analysis

Data analysis was conducted on NVivo 12 plus. The purposes were to elicit the participants' emotional experiences in the FC context and the co-concurrences of emotion, cognition, and activities (or actions taken). For the former, we not only coded the emotions explicitly expressed by the participants in their self-narratives but also those hidden in the lines. For the latter, we adopted *perezhivanie* as the unit of analysis, that is, we identified the episodes in the participants' self-narratives that contain dramas causing the interaction of emotion (E), cognition (C), and activity (A) and tried to make sense of the ways in which they co-existed. The first and the second authors independently analyzed the data. They achieved a high inter-rater consensus (90%). The two researchers discussed to solve the disagreements that occurred between them.

As shown in Table 3, we coded narrative data based on the three compositional elements of *perezhivanie*—emotion, cognition, and activity. As *perezhivanie* is historical and developmental as discussed before, we also coded learners' language learning dramas or dramatic events that caused learners' *perezhivaniya* to change, either in the history (before college), prior to the term of the current study, or during the process of the term (in college). To get a clearer picture of FC teaching, we also traced those dramas that happened both in face-to-face classes, where the teacher presented in-person, and outside of the classroom where learners self-guided their learning with the help of assigned online digital resources, where the teacher presented through online support. In addition, we intended to clarify that the coding of emotion, cognition, and activities, respectively, are specifically justified, as given in the following text.

TABLE 2 Aspects to be covered in eight focal students' written narratives.

Situations	Narrative aspects
Before class: video watching, self-directed learning on UNIPUS, learning the resources shared by the teacher or peers or found by the participants themselves, etc.	Emotions and cognition in ongoing events
In class: interactions with the teacher and peers, classroom activities, etc.	
After class: review, homework, peer interactions, and other activities etc.	

Coding of learners' emotions toward flipped classroom

As discussed earlier regarding learners' emotion from the SCT perspective, the researchers do not specify positive or negative emotions. Therefore, for learners' emotion in this study, we coded all kinds that emerged out of the data, including positive emotions and negative emotions (for details, see Table 4).

Coding of learner cognition toward flipped classroom

Belkhir (2020, p. 3) stated that the term "cognition" refers to "the process by which knowledge and understanding are developed in the mind." The adjectival form "cognitive" means "connected with thinking or conscious mental processes." Cognitive psychologist Matlin (2005, p. 2) defined "cognition" as a mental activity with various cognitive processes. In her view, cognition includes a wide range of mental processes, such as perception, memory, imagery, language, problem-solving, reasoning, and decision-making. She further described the cognitive approach as a theoretical stance that focuses mostly on people's knowledge and their mental processes. However, for (L2) development from the SCT perspective, social interaction is not just a facilitative mechanism; cognition itself is social (Lantolf and Thorne, 2007). Speech (e.g., the written narrative in the present study), which is, of course, central in SCT, is regarded as an effective tool for thought and action during interaction with either the self and the others (Lantolf and Thorne, 2006). According to Vygotsky's theory of cognitive development, cognitive abilities are acquired through social instruction and construction, and therefore, learners need to engage in social interactions for L2 development (Vygotsky, 1978). Therefore, in this study, we hold that how the learner perceives a teaching activity or the design of a task in the FC (which is certainly a social activity) renders the "teacher–task–learner" interaction. If a learner recorded his or her perceptions of FC in the narrative (a form of speech), it was regarded as the learner's cognition toward FC, since perception reflects the individual's thinking (mental process) of an activity or an event (a social interaction) as discussed above.

Coding of learners' activities in flipped classroom

The coding of learners' activities is only concerned with those activities that the learners participated in and recorded in the narratives, including in and out of the in-person classes both online and offline.

TABLE 3 Coding scheme of the analysis of learners' written narratives.

Time and space	Dramatic events/Dramas and examples	<i>Perezhivanie</i> (definitions for the three elements as seen in the paragraph below)
Before College	English learning histories or historical <i>dramas</i> that caused change of learner <i>perezhivanie</i> , i.e., learners' interactions with teachers, classmates, friends, parents, technology etc.	<p>Emotion Such as positive emotions including enjoyment, gratitude, interest, and excitement; negative emotions fear, anxiety, embarrassment, sense of difficulty, and boredom etc.</p> <p>Cognition As defined in Vygotsky (1978), Belkhir (2020), cognition of English learning in this study means how a learner believes an activity or task (as social interactions) as a mediator to English learning.</p> <p>Activity English learning activities that learners participated in.</p>
In College	<p>Out-of-class: English learning stories or <i>dramas</i> that caused change of learner <i>perezhivanie</i>, i.e., learners' interaction with video watching, autonomous learning, the content of video, time management, the use of technology, etc.</p> <p>In-class: English learning stories or <i>dramas</i> that caused change of learner <i>perezhivanie</i>, i.e., learners' interaction with teachers, classmates, friends, parents etc., including sociocultural mediators such as group discussion, group presentation, error correction, assessment, the use of technology, etc.</p>	

Results

Learners' emotion characteristics and changes in flipped classroom

This section is composed of three subsections that present the participants' emotional profile at the beginning of and during FC teaching as well as the interaction between emotion, cognition, and activity with the participants' self-narrative excerpts. (The excerpts are italicized, and pseudonyms are used for the participants).

Emotional profile at the beginning of flipped classroom teaching

The participants reported experiencing 13 emotions in online and offline mixed FC classes at the beginning of the semester, including five positive-valence emotions and eight negative-valence emotions (see Figures 1, 2 for details). Positive emotions accounted for 35% of all the emotions reported and negative emotions 65%. Among the positive emotions, enjoyment was dominant and was mentioned in 25% of the entries; among the negative emotions, nervousness (22% of the entries), followed by boredom (18%) and anxiety (11%).

Emotional experiences in the process of flipped classroom teaching

The participants reported a larger portion of positive emotions than negative emotions during the process of FC teaching, although the total number of positive and negative emotions remained unchanged, in comparison to the beginning of this teaching mode (see Figures 1, 2). The dominant positive emotions included enjoyment, gratitude, interest, and excitement; negative emotions included fear, nervousness, embarrassment, sense of difficulty, and boredom. It is worth noticing that boredom decreased from 18% to 10% after FC pedagogy was adopted. Nervousness and anxiety occurred less frequently (see Figure 2). Many new positive emotions like gratitude, excitement, surprise, self-confidence, and sense of fulfillment appeared by the end of the research semester, proving the facilitative function of the FC in positivizing learners' emotions.

The unity of learners' emotion, cognition, and activity

The participants' self-narratives highlight the unity of learners' emotion, cognition, and activity, which features both linearity and non-linearity. One way of their combination is

TABLE 4 Coding scheme of varieties of learners' emotions emerged in narrative data.

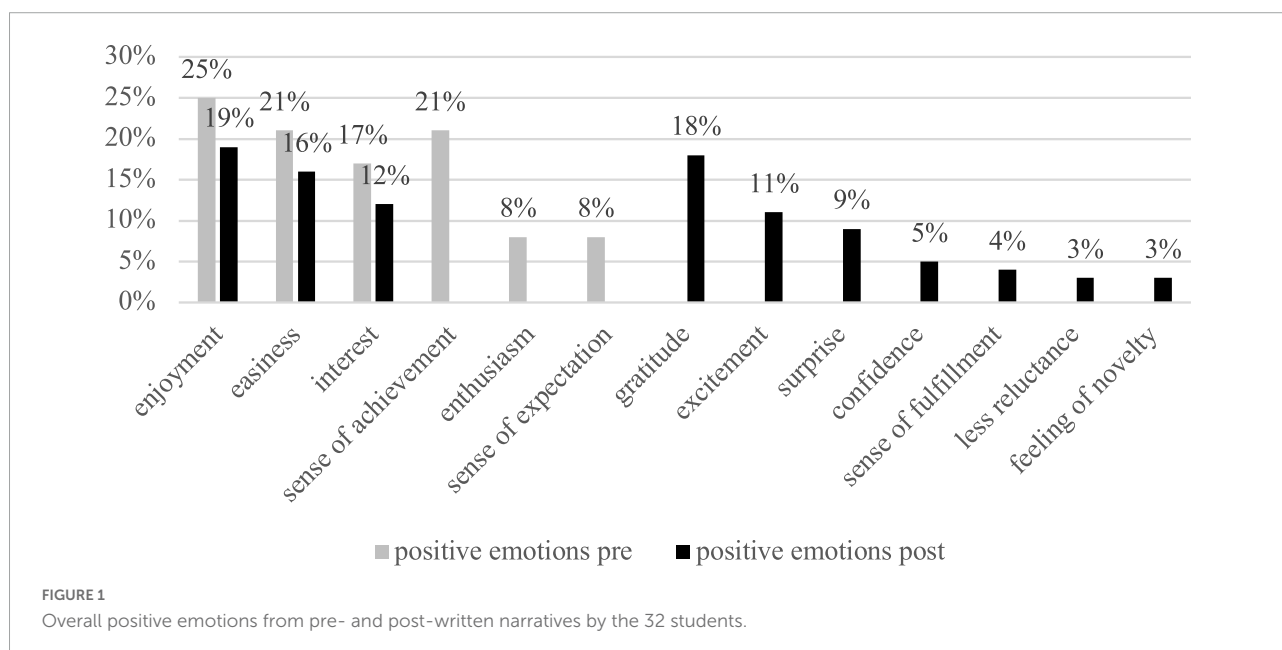
Level 2 code	Level 1 code	Definition and example
Positive emotions	enjoyment	when a learner recorded feeling a positive, activating emotion arising from ongoing learning activities or tasks (Dewaele, 2021; Li et al., 2021), i.e., "I enjoyed watching videos at face-to-face class."
	easiness	When a learner recorded feeling comfortable or relaxed, or free from worry or pain in learning something or participating in a task (Cambridge Dictionary Online), i.e., "The teacher made extensive use of multimedia in the class, creating a relaxed learning atmosphere."
	interest	Foreign language learning interest is a state of wanting to learn or know something out of curiosity. Interest is feeling and commitment to something or activity without command (Shanty, 2019), i.e., "I think the videos we watched in the class were quite interesting."
	Sense of achievement	English learning achievement is defined as the perceived and assessed part of a learner's mastery of abilities and subject materials as estimated with legitimate and valid tests (Joe et al., 2014), i.e., "The process of preparing for the presentation and presenting it in class made me feel great."
	enthusiasm	When a learner recorded a feeling of energetic interest in English or activity and a desire to be involved in learning English (Yusriyah et al., 2021), i.e., "I'm always passionate about learning English."
	Sense of expectation	When a learner recorded the feeling that good things are going to happen in the future in English learning (Leal et al., 2017), i.e., "I was looking forward to taking English classes every week."
	gratitude	when the learner feels obliged to do something out of gratefulness to the teacher's timely support (Wilang, 2022), i.e., "I am very grateful to the teacher for her encouragement before the CET 6 exam."
	excitement	When a learner recorded feeling excited to do something in learning English (Cambridge Dictionary Online), i.e., "The teacher said 'very good', which made me excited and happy for the whole class."
	surprise	When a learner recorded feeling surprised to do something in learning English (Cambridge Dictionary Online), i.e., "I was surprised to hear the different ideas I was exposed to."
	Self Confidence	Learner's self-confidence in using the L2, operationally defined in terms of low anxious affect and high self-perceptions of L2 competence (Clément et al., 1994; Listyani and Tananuraksakul, 2019), i.e., "After I finished the presentation, the teacher encouraged me and affirmed my English pronunciation and Mandarin, which made me feel more confident about myself."
	Sense of fulfillment	When a learner recorded feeling happiness because of doing what he/she intended to do in language learning (Cambridge Dictionary Online), i.e., "The learning methods and the English videos shared by the teacher in Wechat group are very useful. I have a full sense of gain."
	Less reluctance	When a learner recorded feeling more willingness than reluctance to participate in English learning activity (grounded theory), i.e., "Compared to last semester, at least in this semester I was less reluctant when I completed my study tasks."
	Feeling of novelty	When a learner recorded feeling happiness with learning something new about English (Mather and Plunkett, 2012), i.e., "I felt that the teacher was particularly enthusiastic, and the teaching contents she used were more novel and fresher compared to my previous English teachers."
Negative emotions	Nervousness ¹	when the learner recorded feeling nervous of answering questions in class (Weitof and Rosén, 2005; Hishikawa et al., 2019), i.e., "I was nervous when the teacher asked questions."
	Boredom	When a learner recorded feeling bored as a negative, deactivating emotion arising from ongoing learning activities or tasks, and anxiety as a negative, activating emotion evoked by envisioned results related to future learning outcome or performance (Li et al., 2021), i.e., "I think it's a bit boring to learn contents on UNIPUS."
	Anxiety	when a learner stated feeling a negative, activating emotion evoked by envisioned results related to future learning outcome or performance (Jin et al., 2021; Li et al., 2021), i.e., "Sometimes I also felt anxious, like when I was about to take an exam, but I haven't started to review or I did not know anything yet."
	Sense of difficulty	when a learner recorded feeling difficult of doing some tasks or learning something, i.e., "Doing presentation in class is quite difficult to me."
	Embarrassment	When a learner recorded some feeling embarrassed moments in or outside of classrooms, i.e., "It would be a little embarrassing for me to take the initiative to answer questions."
	Fear	When a learner recorded feeling faced with uncertain or unfavorable conditions and being afraid of negative outcomes which stemmed from personality or pressure (Rahmat, 2020), i.e., "I felt frightened when I was asked a question by the teacher."

(Continued)

TABLE 4 (Continued)

Level 2 code	Level 1 code	Definition and example
	Indifference	When a learner recorded feeling almost nothing toward any tasks or activities in FC, i.e., “For online classes and exercises in <i>UNIPUS</i> , the most frequent emotion I experienced was indifference.”
	Disappointment	When a learner recorded feeling disappointed with some teaching design, activity or task, i.e., “The effect of the <i>UNIPUS</i> is really poor.”
	Frustration	When a learner recorded the feeling of being upset or annoyed, especially because of inability to change or achieve something in English learning (Cambridge Dictionary Online), i.e., “I want to learn English well, but I can’t do it.”
	Guilt	When a learner recorded attention toward his or her behavior, negatively scrutinize every aspect of it, and carefully examine ways to undo it, such as ‘if and only if I had [not] done such-and-such’ (Teimouri, 2018), i.e., “I also felt guilty and ashamed when I was distracted and couldn’t answer the question.”

¹Some scholars use anxiety and nervousness interchangeably, such as Weitoft and Rosén (2005), while others distinguish between the two terms (Hishikawa et al., 2019). Nervousness is a temporary feeling of insecurity associated with specific worries about a stressful situation. These worries usually disappear after someone is successful enough to manage it. Anxiety, on the other hand, is more debilitating and persistent, reflecting recurrent thoughts, as well as negative expectations of events and an inability to tolerate uncertainty. They may be associated with general or specific fears that do not go away despite positive experiences of successfully overcoming them.



that negative emotions led to negative cognition to further negative behaviors. As the case of Vicky, her lower confidence in listening and speaking abilities (cognition) led to her denial of the usefulness of classroom presentation (emotion). Eventually she refused to do the presentation part in the classroom (activity)¹:

As my personal speaking and listening are not very good (C), I may not like the presentation part very much (E),

¹ In this session, the sentences showing activity, emotion or cognition are marked with: (A) represents lines of “activities,” (C) represents “cognition,” (E) represents emotion.

and I don’t know if this thing improves learning (C). I only participated in power point file editing (A). (Excerpt from Vicky’s narrative in week 1).

Another student, Linda, felt difficulty in learning English well, so she did not take the online course seriously and did not believe in the value of the online lesson. Thus, negative emotion (*I would not take online classes very seriously*) triggered both negative cognition (*I don’t think online lessons can help much for me*) and activity (*Instead of doing homework on the Internet, I prefer paper*) at the same time. In what follows, both negative cognition and negative emotion caused negative behavior. For example, Linda did not understand the words taught by her teacher and felt troublesome to find out their

meaning in the dictionary, so she did not pay attention to the online class:

I am very busy with my major studies (C). I want to learn English very well, but I feel so difficult to do it well (C). I would not take online classes very seriously (E). And, I don't think online lessons can help much for me (C). Instead of doing homework on the Internet, I prefer paper (A). It is very convenient to mark it (C). Sometimes when I don't understand the words taught by online teachers and it is troublesome to look it up in the dictionary (E), I would not watch online classes carefully and seriously (E). In general, I really don't like online classes (E). (Excerpt from Linda's narrative in week 15).

Jenny's data showed that negative emotions could bring positive actions (or activities participated in) and cognition. She felt anxious because of a heavy workload with her major and did not feel satisfactory with her course grades. Both anxiety (emotion) and dissatisfaction (cognition) led to her increased self-planning behaviors (activity) and positive self-concept of planning ability (cognition):

Due to the heavy work from my major language courses, there may be delays in time plan (C). Before I took English class I concentrated on a lot of things, so I got anxious sometimes (E). After studying English this semester, I feel that I have improved a lot in terms of autonomous learning (C). When I was preparing for the CET 4 exam last semester, I didn't really study down to earth because I was too ambitious to complete too many tasks at the same time (E). The final grade was not very satisfactory (C). This semester I was preparing for the CET 6 exam, I have set up a daily plan according to my own situation, and memorized words carefully every day (A). Although I don't know whether my final grades will satisfy me, my self-planning ability has been improved (C). (Excerpt from Jenny's narrative in week 15).

There was evidence showing that positive actions contribute to positive emotions and positive cognition. The student, Ryan, answered her teacher's question well (activity) and was praised by the teacher, leading to her happiness (emotion) and greater engagement (activity) in the English class. Eventually, she believed that even if she would pass the important English test of CET 6 for college students in China and was determined to make more efforts to learn the language (cognition).

In a Listening and Speaking class, I answered a question very well (A). The teacher said 'very good', which made me very excited and happy for the whole class (E). When I felt the homework is boring (E), the teacher still examined our homework with passion and gave us feedback on WeChat

group on time (A). I was often ashamed of being called to answer questions (E) because I didn't preview the contents of the class in time before class (A), but the teacher kept waiting for my reply, reminded me and encourage me (A). So I am willing to learning English and take classes seriously (E). Even if I pass the CET 6, English learning is not over (C). (Excerpt from Ryan's narrative in week 15).

There was a non-linear flow from positive cognition to positive cognition through positive action and positive emotion. In the case of Ryan, she recognized the teacher's efforts in preparing the course (activity) and thus took each lesson carefully and was willing to complete homework (emotion). In the end, she thought doing homework was a great training for listening and writing (cognition).

I understand teacher took a lot of effort in preparing lessons (A), so I take each class very attentively (E). The teacher made me discover the joy of learning English (E). I am willing to complete my homework carefully after class (E). The seemingly boring transcribing homework (E) is actually a great training for listening and writing (C). (Excerpt from Ryan's narrative in week 15).

Dramas accounted for the interaction between cognition, emotion, and activities in flipped classroom teaching

As discussed before, drama is the unit of analysis of a learner's *perezhivanie*, which refers to "dramatic events" that cause conflicts or change of the learner's *perezhivanie*—unity of cognition, emotion, and activities. Digging into the data, we found some typical dramas, mentioned later, some of which are common among students, and others are of individual characteristics.

Dramas of classroom activities

Among a variety of interactive activities, such as "textual structure analysis," "sentence meaning induction," and "passage theme extraction," the participants particularly welcomed those which offered them a chance to be exposed to novel out-of-textbook knowledge, for example, watching movies and book recommendation. All the students perceive these activities helpful and beneficial to English learning (cognition, dramas 1 and 2). The underlined lines in the excerpt of drama 1, "learning English by watching an excerpt from the classic movie *The Devil Wears Prada*" attracted more attention from the learners and added more fun, and their *perezhivaniya* or the interaction between activities, emotion, and cognition surely

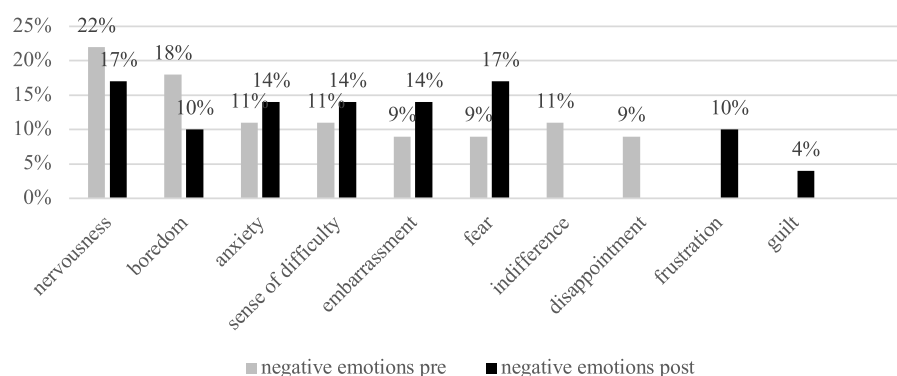


FIGURE 2

Overall negative emotions from pre- and post-written narratives by the 32 students.

improved their learning motivation. In addition, drama 2 is the classroom activity of “recommending an interesting book.” Jim was extremely interested and serious in this activity. His *perezhivanie* even extended to future improvement of the presentation skills in other courses. Certainly, drama 2 is a very crucial social event in Jim’s learning experience.

Drama 1² :

In face-to-face classes, there are many interactions between the teacher and students (A), which can mobilize my attention (C). One of the most impressive scenes in this semester is learning English by watching an excerpt from the classic movie ‘The Devil Wears Prada’ (A-Drama). I feel that it adds some fun (E) to combine the boring content of the lesson with the movie clips. (Excerpt from Jenny’s narrative in week 15, June 29, 2021).

Drama 2:

When it came to the lesson about reading, the teacher asked the whole class to bring a book they like, write down the reasons to recommend it in English (A-Drama), and then the whole class randomly exchanged their books (A), which is very interesting (E). The teacher also participated and got my book. I was so happy (E). So, when preparing for the presentation, I was quite serious about it (A). It was a relatively smooth presentation for the first time, and I didn’t get stuck (A). Although there will be no English classes in the future, and there will be no English presentations, there will still be presentations in other courses, so it is better to prepare well (C). (Excerpt from Jim’s narrative in week 15, June 29, 2021).

² In this session, the sentences showing dramas are annotated with underlines; (A) represents lines of “activities,” (C) represents “cognition,” (E) represents “emotion.”

Dramas of the teacher contribution

The teacher plays a crucial role in determining learners’ emotional experiences. By selecting well-designed tasks and interesting learning materials, teachers can highly promote their students’ positive emotions. In addition, their emotional support to students, including positive feedback following students’ performance, recognition, and encouragement, provides students a safe psychological environment wherein positive emotions are nurtured. In the case of Ryan, for example, the “dramatic events” related to her *perezhivanie* development is attributed to the responsible teacher who made her discover the joy of learning in the FC because the teacher would prepare “*unique and carefully selected*” materials and videos that she would use in class, which made her learn English more attentively out of interest (see drama 3). Rita had a similar experience of having a good responsible teacher (in previous learning history in the middle school) who led to the change of her *perezhivanie*, which means her learning activities, emotion, and cognition all changed toward positivity because of the teacher (see drama 4).

Drama 3:

Ryan: “Our teacher is cheerful and full of positive energy, sometimes quite humorous. Her classes have very rich content, from which I have always learned a lot of knowledge (C). The materials and videos prepared in each Listening and Speaking class are unique and carefully selected (A-Drama), not just those materials in the textbook. I understand teacher took a lot of effort in preparing lessons, so I take each class very attentively (C). . . Whenever I felt the homework is boring (E), I found the teacher still examined our homework with passion (E) and gave us feedback on WeChat group on time (A).” (Excerpt from Ryan’s narrative in week 15, June 28, 2021).

Drama 4:

Rita: My English was only 60/100 at a very low level when I was in the primary school, but in the middle school I met a terrific teacher who was very helpful and cared about me very much (A-Drama). . . I liked him (E) and I think I want to learn English well (C), so I started to like English (A), even now I still enjoy learning English very much (E). (Excerpt from Rita's 2nd verbal narrative in week 15, July 1, 2021).

Drama 6:

Jack: In high school, I studied science (A). Chinese and English have always been drags for me (E-Drama), but after college entrance examination, I came to this university to learn language by mistake. At the beginning, I tried (A), but then I didn't understand it at all (C). I have been learning Spanish (A), so I have almost forgotten English (C). Now I'm a little bit self-defeating (E). (Excerpt from Jack's narrative in week 15, June 29, 2021).

Dramas of peer contribution

Active peer dynamics in the classroom was conducive to the participants' positive emotions. They reported that getting new knowledge shared by peers during the time of oral presentation (drama) led to their surprise and enjoyment, which is another drama. By listening to others' presentation allowed the participants to know their classmates better and thus build inter-personal cohesion, which, in turn, contributed to their positive emotions of a good surprising gain in the class (as shown in drama 5).

Drama 5:

Jenny: When discussing everyone's fashion choices (A), I found that everyone has different ideas (C-Drama). I was surprised (E) because I was exposed to different concepts, and I felt that it was also an opportunity to get to know others (C). (Excerpt from Jenny's narrative in week 15, June 29, 2021).

However, Zoey, on the opposite, was a bit unlucky. Once teased by peers on her "strange" English accent turned out to be her drama, which made her puzzled and feared speaking up again in class. To make things even worse, she was confused about the value of classroom learning because some boys in the class would love to make fun of her accent.

Drama 7:

Zoey: There was a semester in Grade One, every time when I was asked to speak up in the classroom (A), my peers would laugh at my accent (A-Drama). . . I don't know why (C), maybe because there were too many boy classmates in the class and they loved to make fun of my accent (A). . . So ever since then I feared speaking up in class (E & A). . . (Excerpt from Zoey's 2nd verbal narrative in week 15, July 1, 2021).

In a word, learners experienced an array of dramas in the FC, which could be emotional, cognitive, or behavioral "dramatic events" that aroused the interaction of the learner's emotion, cognition, and activities or (actions taken), hence causing the dynamics of *perezhivanie*.

Dramas of previous English learning history

Individual difference plays an important role here (Wang and Derakhshan, 2021). Learners' levels of language proficiency determine to what extent they take part in classroom activities. Some of the current participants felt interested in their peer classmates' presentations because their language capability allowed them to understand what was said. On the contrary, those low language proficiency tended to have negative feelings like boredom, apathy, and even helplessness because they neither could personally get involved in class activities nor understood others. Jack's past English learning history shows he was learning science in high school and his self-awareness of his low proficiency made him lack self-confidence, which led to his disbelief in this class learning helpfulness.

Discussion

Interplay of learners' emotion, cognition, and actions (or activities)

This study intended to investigate learners' emotional experiences in the FC and explore the different ways in which emotion, cognition, and action co-exist in this pedagogical context. Regarding the first question, the results showed that the participants experienced both positive and negative emotions in the FC, mirroring the findings in Li et al.'s (2020), Sampson (2020), and Kruk and Pawlak (2022). In comparison to negative emotions, more positive emotions were reported by the participants, particularly enjoyment, interest, confidence, surprise, and gratitude, showing that the FC can lead to emotional positivity, that is, a high ratio of positive to negative emotions (Jeong et al., 2016; González-Gómez et al., 2017).

MacIntyre and Vincze (2017) revealed that positivity led to stronger language learning motivation. Thus, the teacher's goal is never to erase learners' negative emotions, which is also impossible, as negative emotions are inevitable part of learning. Instead, they should find ways to limit learners' negative emotions to the point that negative emotions do not overwhelm the positive ones (Jin et al., 2021). To this end, exercising the FC pedagogy seems to be effective.

Narrative analysis also showed that emotion, cognition, and activity did not stand alone but united in a dramatic event (Greenberg and Safran, 1987; Vygotsky, 1994; Lantolf and Swain, 2019; Agnoletto et al., 2021). This finding reflects the construct of *perezhivanie* and suggests that sociocultural theory is a useful theoretical framework to research into emotion, cognition, or activity (Tasker et al., 2010; Golombek and Doran, 2014; Johnson and Worden, 2014; Golombek, 2015; Veresov, 2017; Johnson, 2018, 2021; Johnson and Golombek, 2018). Regarding the pattern of their combination, it was often shown in the qualitative data that negative (positive) emotion, cognition, and activity were interlocked, but occasionally negative emotions can also lead to positive cognition and actions, showing dialectical relations between the three (Vygotsky, 1994). As the case of Jenny, she felt anxious and dissatisfying with course grade, which made her improve self-planning ability and then forge a positive self-concept about herself. The implication is that negative emotions should not terrify learners and teachers (Li et al., 2020; Li, 2021, 2022). The key point is to find ways to manage negative emotions, which thus do not paralyze thinking and behaviors (Jiang and Dewaele, 2019; Jin et al., 2021), but bring positive outcomes to language learning. On this point, students can make use of their own agency to self-regulate their negative emotions, highlighting the importance of developing learners' proper cognition of negative emotions and training their self-regulatory strategies of emotions.

Drama as an effective lens to observe the learners' *Perezhivaniya* displaying both historical and developmental characteristics

For the study of the development of individual higher mental functioning, Vygotsky (1997) believed that *perezhivanie* is historical. Accordingly, in this study, we traced participants' English learning history in the far past (before college), near past (before the present term), and weekly data. We found that dramas that aroused the change of *perezhivaniya* can be relative to learners' past history, present events, or social relations (Swain, 2013; Ng, 2021). In the narrative, Zoey's drama of being ridiculed by peers because of her accent is similar to the findings in the study by Jiang and Dewaele (2019) in which they found Chinese students have higher levels of foreign language anxiety,

which may be attributable to Chinese educational background. This was also in contrast to Grace's experience in the study by Swain et al. (2015). Instead of being inspired by the experience of being ridiculed like Grace, Zoey in the present study became afraid of speaking English. Golombek and Doran (2014) also claimed that how individuals interpret the lived experience would influence the way they interpret and react to the current situation.

Drama is also developmental over time. For example, a good teacher in the previous learning history exerted its effect on how students get along with English studies in college (narrative of Rita). In addition, drama also arouses future expected experience with learning, such as Jim who believes that the presentation skills learned in English class can be applicable to other subjects. Drama and *perezhivanie* are two essential concepts for understanding how the general genetic law of development works and how the social becomes the individual (Fleer et al., 2017). To be specific, drama brings rich emotions, forming individual's critical *perezhivanie*, thus influencing individuals' trajectory of development.

Implications

This study holds important implications for both research and teaching. This study shows that emotion does not occur alone but is closely combined with cognition and activity in a certain sociocultural context. Therefore, rather than encouraging isolationism, this study indeed advances a systematic perspective to emotion, cognition, and behavior studies incorporating social and relational factors. In this way, the ever-present cognitive approach to foreign language teaching (Swain, 2013) and the newly emerging emotional turn in language development studies (MacIntyre and Gregersen, 2012; Jin and Zhang, 2019, 2021) finally have a common ground on which they can work. In addition, in this study, although negative emotions were reported by the participants with their FC experiences, positive emotions took hold. This suggests that the FC in general is welcomed by the participants. With its mixed teaching modes that combined in-class teaching and out-of-class learning, the FC indeed can bring a brand new teaching and learning ecology in which learners are given more autonomy to explore after class, and teachers serve as a guide to solve the problems encountered by students during their explorations. Nevertheless, we must also note that the negative emotions that the participants reported should not be ignored since they might signal the disadvantages of the FC, which should be addressed by teachers in specific instructional contexts. Gregersen and MacIntyre (2014), inspired by the positive psychology movement, explained that negative emotions are not always bad as they can help learners to eliminate an obstacle, but

they can be paralyzing if not properly dealt with during the teaching and learning process (Dewaele, 2015). Finally, what further emerged from the data was that learners prefer some activities specifically designed for the FC, which required them to prepare before class and present in class with all their research. Most of the participants positively commented on the activities they emotionally enjoyed during the in-class time, and this brings more implications to EFL teachers who are working in the FC mode. It is for sure worthwhile to organize more workshops working out more innovative designs compatible with the FC teaching design as it is of great difference to previous traditional classroom teaching (Gao et al., 2022).

Conclusion

This study established that the FC could effectively improve learners' positive emotions in foreign language learning, although they might also experience negative emotions under this teaching mode. With no exception, all teaching approaches and methods have their own pros and cons and thus should be tailored to particular groups of students when applied. In addition, this study suggests that an SCT approach to language psychology gives deeper insights into emotions by providing a very useful analytic tool, *perezhivanie*, that sheds light on the complex interactions between emotion, cognition, and activity. Future studies might continue with the current study design but consider exploring in-depth what accounts for the complex interactions between emotion, cognition, and action in both learners and teachers, and in what ways learners and teachers can make these interactions beneficial.

Limitations and suggestions

This study has limitations. First, this study was only conducted on one class from a university. The number of participants were limited, and there was a lack of heterogeneity among the samples in many aspects like age, gender, and English learning experiences. Therefore, although the findings are quite inspiring, researchers are encouraged to interpret the findings with caution. Second, this study relied on purely the participants' self-reports regarding their emotional experiences in the FC, based on which the efficacy of the FC was investigated, thus lacking of field observation to triangulate the narrative findings. In addition, the teacher was not included in this study. Thus, the pros and cons of FC teaching could not be viewed from the teacher's perspective. Last but not least, we developed robust coding systems for meaning units emerged from the narratives on various kinds of emotions, cognition, and activities; the

coding, though of referential value, still needs more shaping for future studies.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving human participants were reviewed and approved by the Dalian University of Foreign Languages. The patients/participants provided their written informed consent to participate in this study.

Author contributions

LQ contributed to the draft writing and data organization. LY collected the data and organized the data. YJ wrote the draft. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

1. *Direction for pre-semester narrative for all the participants:*

Please describe your previous experience of English learning before college and what you have experienced in college in the flipped classroom. You may talk about events, persons, or any special artifacts that you can remember. Please write minimally 200 words.

2. *Direction for post-semester narrative for all the participants:*

Please describe your experience of English learning in the flipped classroom during this semester. You may talk about events, persons, or any special artifacts that you can remember. Please write minimally 200 words.

3. *Direction for weekly narrative for 8 focal students*

Please describe your experience of English learning in the flipped classroom during this week. You may talk about events, persons, or any special artifacts that you can remember. Please write minimally 200 words.



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Delving into the relationship between teacher emotion regulation, self-efficacy, engagement, and anger: A focus on English as a foreign language teachers

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Due to the potent role of teachers' emotion regulation in effective teaching, it seems essential to see how emotion regulation can contribute to other relevant teaching constructs. In this regard, the present study is intended to probe into the causal relationship among teacher emotion regulation, self-efficacy beliefs, engagement, and anger. In so doing, the Language Teacher Emotion Regulation Inventory (LTERI), The Teacher Sense of Efficacy Scale (TSES), The Engaged Teacher Scale (ETS), and The Teacher Anger Scale (TAS) were administered to 581 English as a Foreign Language (EFL) teachers in Iran. To gauge the causal relationships among the variables, confirmatory factor analysis (CFA) and structural equation modeling (SEM) using LISREL 8.80 were conducted. The results indicated that language teacher emotion regulation could positively and significantly predict teachers' self-efficacy beliefs and engagement at work. Moreover, the influence of language teacher emotion regulation on the teacher's anger is significantly negative. That is, the stronger emotion regulation is implemented the better teachers can manage their anger. The implications of this study may uncover new prospects for effective teaching, especially during the COVID-19 pandemic.

KEYWORDS

teacher emotion regulation, teacher self-efficacy beliefs, teacher engagement, teacher anger, EFL teachers

Introduction

Emotions are an inevitable part of teaching. Considering the indisputable relevance of emotions experienced in the workplace for teachers' effectiveness, it is important that teachers employ effective strategies in order to regulate such emotions. Through the lens of emotion regulation, teachers are able to evaluate and modify the intensity and duration of the emotional experiences in the workplace (Chang and Taxer, 2021). Moreover, due to the potent role of teachers' emotion regulation in effective teaching, it seems essential to see how emotion regulation can contribute to other relevant teaching constructs.

Self-efficacy as a prominent teacher-related construct affects every area of individuals' endeavors. As voiced by Bandura (1997), self-efficacy is the individuals' evaluation of their potential to adjust and structure activities to achieve their ultimate objectives. In the realm of teaching, self-efficacy beliefs shape how teachers approach goals, challenges, and class activities (Lazarides and Warner, 2020; Liu F. et al., 2021). In Chen's words (2018), efficacious and positive teachers are more successful. Efficacious teachers show more job satisfaction and deal with students' misbehavior and demotivation more efficiently (Burić and Kim, 2020; Vadiel et al., 2021). In contrast, teachers with a low sense of self-efficacy are apt to lose faith in their abilities (Barni et al., 2019). The research history on teacher self-efficacy shines back on the reciprocal relationships between self-efficacy and an array of positive teacher and student-related issues (Martin and Mulvihill, 2019; Amirian et al., 2022; Ma, 2022; Zheng et al., 2022).

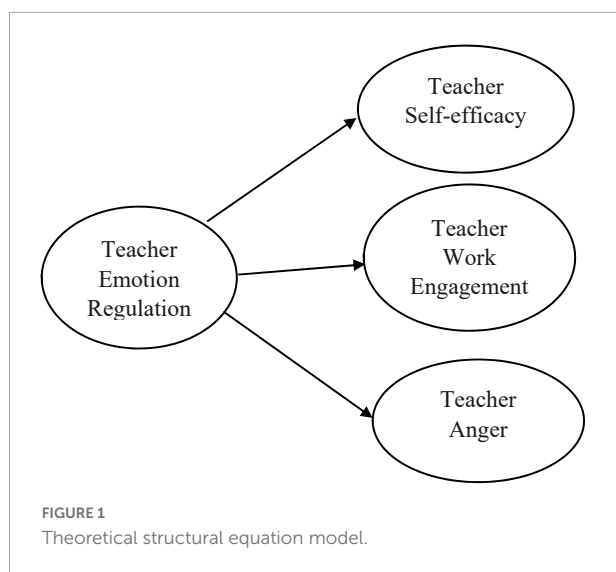
In recent years, studies on the associations between teacher self-efficacy and work engagement have been quite rosy (Li et al., 2019; Zeng, 2020; Rezai et al., 2022). For instance, recent studies indicate that teachers with higher perceived self-efficacy are more engaged in their work activities (Burić and Macuka, 2017; Li et al., 2019; Xu et al., 2022). Engaged teachers show high levels of dedication and commitment to educational objectives; they are completely immersed in the class activities and attentive to their students' needs (Klassen et al., 2013; Burić and Macuka, 2017; Addimando, 2019; Vadiel and Beena, 2019). Today's continuously challenging environment, in particular, the current outbreak of the COVID-19 pandemic, calls for engaged teachers who regulate their emotions. Among the primary emotions of human beings, anger is repeatedly used, and it is one of the six emotions with noticeable facial expressions across cultures, along with fear, sadness, surprise, disgust, and joy (Ekman, 1992; Namaziandost and Çakmak, 2020).

Based on the existing literature on teachers' emotions, the most prominent experienced positive emotion is happiness, while anger is the most prominent experienced negative emotion in teachers' professional lives (Chang, 2013; Frenzel, 2014; Burić and Frenzel, 2019; Azizi et al., 2022). The main potential stimuli triggering teachers' anger in their professional

lives are disciplinary issues and lack of student commitment to tasks and homework (Khajavy et al., 2018), uncooperative colleagues and parents' misbehavior (Sutton and Wheatley, 2003), blocked academic goals and students' inappropriate manners (Sutton, 2007), as well as educational policies and school organization (Burić and Frenzel, 2019). Other potential sources of teacher anger include the COVID-19 pandemic and lockdown, as well as remote online teaching and uncertainty about the future. Based on the existing literature on teacher's anger, it is positively correlated with teachers' burnout (Chang, 2013; Tilwani et al., 2022) and emotional exhaustion (Burić and Moè, 2020). In contrast, the interplay between teachers' anger and their job satisfaction (Burić and Frenzel, 2019), wellbeing, and self-efficacy beliefs is negative (Burić and Kim, 2020). In response to the challenges of the twenty-first century, arming teachers with self-aid constructs that target effective teaching should be considered at the forefront of education policies. Language teachers and university professors are by no means an exception, and their significant role in effective language teaching cannot be overlooked.

What emerges from the review of the related literature is that the associations among language teacher emotion regulation, perceived self-efficacy beliefs, work engagement, and anger have not been brought to the foreground of research foci (Gross and Thompson, 2007; Burić et al., 2017; Abdollahi et al., 2022), particularly in the EFL context (Chahkandi et al., 2016; Fathi and Derakhshan, 2019; Chang, 2020; Chang and Taxer, 2021; Li and Liu, 2021; Liu F. et al., 2021). Therefore, the dearth of research in this domain calls for more studies that put forward a clear picture of the influence of emotion regulation on teachers' sense of self-efficacy, work engagement, and anger. More precisely, how emotional regulation serves as underlying principles that form teachers' efficacy beliefs, work engagement, and anger management in the context of Iran, where English is taught as a foreign language. Thus, to delve into the construct of language teacher emotion regulation in the Iranian EFL context, the present study puts forward the need to examine the association of language teachers' emotion regulation with their efficacy beliefs, work engagement, as well as anger (see Figure 1). The outcome of such an exploration is significant in the teacher's effectiveness as it could illuminate how emotion regulation as an important skill empowers language teachers to modify and manage themselves efficaciously and to be engaged even in emotion-provoking situations at the workplace. This study set out to fill in this educational gap by answering the following research questions:

1. To what extent could EFL teachers' emotion regulation predict their self-efficacy beliefs in the workplace?
2. To what extent could EFL teachers' emotion regulation predict their engagement in the workplace?
3. To what extent could EFL teachers' emotion regulation predict their anger in the workplace?



In this regard, the following null hypotheses could be formulated:

HO1. EFL teachers' emotion regulation has no impact on their self-efficacy beliefs in the workplace.

HO2. EFL teachers' emotion regulation has no impact on their engagement in the workplace.

HO3. EFL teachers' emotion regulation has no impact on their anger in the workplace.

Literature review

In the following sections, an overview of the relevant literature on emotion regulation, self-efficacy, work engagement, and anger is provided.

Emotion regulation

Emotion regulation can be defined as physiological, behavioral, and cognitive processes that individuals employ to effectively manage and respond to emotional experiences (Gross, 1998; Gross and John, 2003; Gross and Thompson, 2007). That is, emotion regulation shapes which emotions people have, when they have them, and how they experience or express them (Gross, 1998; Kolganov et al., 2022). Similar to other types of self-regulation and self-management skills, experienced emotions are modulated to fulfill educational objectives; and, to do so, various strategies may be applied, which are defined as emotion regulation strategies (Taxer and Gross, 2018; Taylor et al., 2020; Alipour et al., 2021; Li and Liu, 2021). In the classroom, both teachers and students are exposed to different emotional experiences. The teachers, as the center of the classroom are expected to establish an optimal

emotional climate; they should manage their own emotions and their learners' emotions (Taxer and Gross, 2018). Simply put, emotion regulation empowers both teachers and students to strengthen pleasant emotions and weaken unpleasant emotions (Fried, 2011).

Previous studies in the realm of emotion regulation have documented the predominance and significant contributions of teacher emotion regulation to effective teaching. For instance, Taxer and Gross (2018) studied the aim and quality of emotion regulation in classes. They concluded that teachers with instrumental and hedonic emotion regulation goals tried to manage their own and their learners' emotions. Similarly, Morris and King (2018) investigated the effective role of emotion regulatory strategies in managing the in-class frustration experienced by university language teachers. According to their findings, language university teachers employed contextually dependent emotion regulation behaviors that help them to increase levels of confidence and control over the stressors.

In a recent study by Chang and Taxer (2021), teacher emotion regulation strategies in response to classroom misbehavior were investigated. They concluded that teachers who usually reappraise are less likely to experience unpleasant emotions in the face of students' misbehavior and express fewer suppression experiences when negative emotions are felt. The implemented strategies to regulate emotions were classified as reappraisal or suppression. The researchers of this study suggested further study to inspect the effectiveness of other strategies used to regulate emotions. In the same token, Chang (2020) explored the association between teachers' beliefs about emotional display rules in the class, their attitudes toward emotion regulation strategies, and feelings of burnout. This study concluded that display rules affect expressive suppression and burnout. Likewise, Morris and King (2018) conducted a series of semi-structured interviews, classroom observations, and corresponding stimulated-recall sessions among seven EFL teachers at a university in Japan. Based on the data analysis, a major mechanism for reducing the experienced frustrations among EFL university teachers is emotion regulation.

In light of the undeniable importance that teachers' emotions and emotion regulation have for effective teaching and learning, Jiang et al. (2016) carried out a mixed-method study. In so doing, the students' perceptions of their teachers' emotions and emotion regulation while teaching were explored. The results of the students' survey and teachers' interviews indicated that antecedent-focused emotion regulation appeared more preferable than response-focused emotion regulation. Moreover, reappraisal was more effective than suppression in increasing positive-emotion expression and decreasing negative-emotion expression. In like manner, Fathi et al. (2021) explored a structural model of teacher reflection, self-efficacy, burnout, and emotion regulation among Iranian EFL instructors. They found that teacher self-efficacy and reflection

were positively correlated with emotion regulation. Also, their findings revealed that teacher emotion regulation was negatively correlated with burnout.

Self-efficacy

The concept of self-efficacy, rooted in Albert Bandura's social-cognitive theory of behavioral change, is conceptualized as individuals' confidence in their abilities to implement the courses of action necessary to produce a given accomplishment (Bandura, 1997, 1986). This definition highlights that people with higher degrees of confidence in their capabilities could have greater chances of achieving the desired outcomes due mainly to a clearer sense of purpose and a stronger will to surmount the obstacles in a given task. Bandura (1986) believed this metacognitive capability is manifested through self-regulatory processes, which connect thought to action and include self-monitoring, performing self-guidance through personal standards, and corrective self-reactions. Bandura's agentic socio-cognitive theory (1986) also emphasized the individual's ability to reflect on themselves, their thoughts, and actions.

Self-efficacy mirrored individuals' potential to organize and perform the requirements of an action to fulfill an achievement (Bandura, 1997). It affects individuals' thinking, their future actions, their coping strategies while facing emotional demands, and the attempts they put forth in a given endeavor (Bandura, 2012). Self-efficacy is both a personal and social construct because each person functions individually and collectively. Individuals' concerns about their collective efficacy influence what they choose to do as a group, how much attempt they make to perform it, their persistence and tolerance, and their probability of success (Bandura, 1997; Schunk and Pajares, 2002).

Self-efficacy is one of the important factors that influence adjusting teaching tone, which leads to beneficial outcomes in learning and cyclically increases teacher efficacy. This specific form of efficacy is known as teacher efficacy. Simply put, teachers' faith in their ability can influence their attitude, commitment, motivation, willingness, and effectiveness (Barni et al., 2019) and support students' outcomes (Martin and Mulvihill, 2019). Efficacy beliefs influence teachers' instructional practices, inter- and intra-teacher relationships (Martin and Mulvihill, 2019), and their passion for teaching (Moè, 2016). Furthermore, teachers' efficacy is associated with learners' motivation, achievement, and efficacy (Tschannen-Moran et al., 1998). High-efficacy teachers experience lower stress levels and less burnout than low-efficacy teachers (Chen, 2018). It is noteworthy that academic and theoretical knowledge of language teaching by no means guarantees a teacher's level of self-efficacy.

In a recent study by Burić and Kim (2020), the positive effect of teacher self-efficacy on three aspects of instructional quality, namely classroom management, cognitive activation, and supportive climate, was concluded. Furthermore, the negative relationships between teacher self-efficacy and anger were supported by Burić and Frenzel (2019). In another recent investigation, the predictive impact of teachers' work engagement on their self-efficacy was determined (Li et al., 2019). In the same line of inquiry, the role of teachers' motivations in determining the strength of the relationships between teacher self-efficacy, openness to change, and self-transcendence was endorsed (Barni et al., 2019).

In an attempt to further clarify the predictive role of EFL teachers' self-efficacy and collective teacher efficacy in affecting the psychological wellbeing in the Iranian context, a survey was conducted by Fathi et al. (2020), in which they concluded that teacher self-efficacy was a stronger predictor of psychological wellbeing than collective teacher efficacy. Likewise, Zheng et al. (2022) investigated the contributions of self-efficacy and emotion regulation to L2 teacher grit. Their findings suggest that self-efficacy and emotion regulation are major determinants of university professors' L2 grit. Furthermore, the results of this study highlighted the critical role of self-efficacy beliefs in fostering emotion regulation among university professors. Taking a similar path, Li et al. (2022) concluded that emotion regulation and critical thinking could predict immunity in higher education.

Work engagement

Work engagement offers a royal road to professional development. This is an affective-motivational construct with an emphasis on willingness and involvement at work (Silva et al., 2020). It is generally considered to be associated with job involvement (Lawler and Hall, 1970), job commitment (Mowday, 1998), and job empowerment (Thomas and Velthouse, 1990). The first conceptualization of work engagement originated from Kahn (1990), who defined this concept as the absorbing emotionally, cognitively, and physically into one's job responsibilities. As an affective-motivational construct, work engagement reflects individuals' desire for involvement in and gratification in the job (Van Beek et al., 2011). In other words, work engagement is the allotment of an individual's resources to do their best at work (Christian et al., 2011; Wang et al., 2022). Schaufeli and Salanova (2011) viewed work engagement as a work-related state of mind established by vigor, dedication, and absorption. Vigor is physical or mental energy and determination to do work activities. Dedication refers to one's willingness and enthusiasm for his/her work. Absorption means completely engrossed and preoccupied with one's work (Schaufeli and Bakker, 2004).

Different variables influence how individuals perceive themselves, their work, and the relationships between the two. As Kahn (1990) stipulated, individuals present varying degrees of their selves, physically, cognitively, and emotionally, in the roles they perform. In this regard, Kahn (1990) utilized the concept of self-in-role and assumed that individuals show different depths of their selves while performing different activities during their work days.

Due to different conceptualizations and various definitions of the concept of work engagement, inconsistencies developed in the way it was assessed (Schaufeli and Salanova, 2011; Klassen et al., 2013; Kuok and Taormina, 2017; Shu, 2022). In this study, the Engaged Teacher Scale (ETS) was utilized, which was developed and validated by Klassen et al. (2013). ETS is a multi-dimensional measure of work engagement that is specifically targeted at the work carried out by teachers in classrooms and schools. Cognitive-physical engagement, emotional engagement, social engagement among students, and social engagement among colleagues are the four components of this scale. Cognitive-physical engagement is the extent to which teachers cognitively and physically devote their time, energy, and attention to teaching tasks. Emotional engagement refers to teachers' positive emotional responses to different activities at work. The distinguishing feature of this model is that it adds a dimension for assessing social engagement (energy devoted to establishing relationships) and its causal explanations among teachers. Recent studies by Silva et al. (2020), Topchyan and Woehler (2020), and Shu (2022) confirmed and supported the good psychometric qualities of the ETS in educational settings.

Teaching is influenced by teachers' social relationships with students and colleagues, and these reciprocal relationships play mediating roles in enhancing student engagement and positive student outcomes (Oga-Baldwin and Nakata, 2020). Effective teachers are those who are socially engaged with their students (Jennings and Greenberg, 2009; Wang et al., 2022). Research on teacher work engagement seems to be scarce. However, the previous studies on teacher work engagement highlighted teacher-related variables that affect or are affected by work engagement. To be more specific, the existing literature highlighted the close relationships between work engagement and other positive teacher-related outcomes. For instance, Zeng et al. (2019) examined the interplay among growth mindset, work engagement, perseverance of effort, and wellbeing for teachers in China. The data analysis indicated that growth mindset, wellbeing, and perseverance of effort could all predict work engagement. In another study by Oga-Baldwin and Nakata (2020), the influence of engaging teacher practices was explored, and their results indicated that students are more responsive and active in classes with engaged teachers.

Likewise, Topchyan and Woehler (2020) investigated the effects of teacher status (full-time vs. substitute) and its interaction with demographic information on the teacher's job satisfaction and work engagement. Based on the findings

of this survey, both status and gender influence teachers' job satisfaction and work engagement. Furthermore, female teachers were more engaged with students and the length of teaching experience did not affect job satisfaction or work engagement. In a cross-contextual analysis, the role of emotion regulation and psychological wellbeing as predictors of work engagement was explored (Greenier et al., 2021), and concluded that emotion regulation and psychological wellbeing lead to work engagement among British and Iranian teachers. Nevertheless, psychological wellbeing displayed a stronger prediction of work engagement than emotion regulation. Also, it was found out that the association between psychological wellbeing and work engagement was stronger for British teachers.

Anger

Anger is an instinctive reaction to circumstances where a person feels offended or wronged, which is usually activated by external factors such as injustice, humiliation, physical conditions or illnesses, etc. (Harmon-Jones and Harmon-Jones, 2016). Anger physiologically causes the release of stress hormones, increases heart rate, blood pressure, heavy breathing, and body temperature (Hall, 1899). The review of the literature on anger conceptualizations demonstrated that, for centuries, anger was regarded as a sin, a weakness, or as a madness; thus, it was to be avoided or controlled (Thomas, 1990). Then, the Western view of anger began to change, partly due to the misinterpretation of Freud's work (Thomas, 1990). Furthermore, this shift of interpretation is owed to Darwinian evolutionary theory and the research of ethologists such as Konrad Lorenz (Thomas, 1990). Following this stage, Americans came to believe that it is not always possible to control this powerful emotion. This standpoint may account for a sharp increase in violent crimes in America in comparison to Japan, where people believe anger should be controlled (Harmon-Jones and Harmon-Jones, 2016). However, the theory of innate aggression was rejected because there was no scientific basis to support the notion that humans are instinctively aggressive (Kuppens et al., 2003).

According to Burić and Frenzel (2019), teacher anger, like other human emotions, is a complex and multifaceted construct, consisting of various distinguishable emotional components (subjective, cognitive, motivational, expressive, and physiological). Among the potential stimuli triggering teachers' anger at work could be uncooperative colleagues, parents' misbehavior (Sutton and Wheatley, 2003), blocked academic goals and students' inappropriate manners (Sutton, 2007), as well as educational policies and school organization (Burić and Frenzel, 2019). Thus, teacher anger is triggered not only because of their students, but also because of their colleagues, students' parents, and the educational system (Burić and Frenzel, 2019).

Furthermore, Jacob et al. (2017) asserted, based on the reciprocal model on the causes and effects of teacher emotions, that situations and events that teachers perceive as impeding their goals, as well as appraisals of responsibility for this goal impediment, trigger their anger.

An overview of the literature on teacher anger shows that it is positively correlated with teachers' burnout (Chang, 2009; Liu and Chu, 2022), surface acting (Taxer and Frenzel, 2015), and emotional exhaustion (Chang, 2013; Burić and Moè, 2020). By contrast, the relationships between teacher anger and their wellbeing (Burić et al., 2020) as well as job satisfaction (Macdonald, 1999) are proved to be negative. In a similar vein, the relationships among teacher anger, emotional labor, wellbeing, and teachers' self-efficacy were examined by Burić and Frenzel (2019). The data analysis indicated that all facets of teacher anger were positively correlated with surface acting and deep acting was unrelated to teacher anger. Moreover, teachers who attempt more to really experience and show the expected emotions tend to experience less anger in relation to their students.

Theoretical framework

To explain emotion regulation, the process-oriented model of emotion regulation with five temporal points (i.e., situation selection, situation modification, attention deployment, cognitive change, and response modulation) is proposed by Gross (1998). By extensive review of the existing literature, the theoretical conceptualizations on the emotion regulation in general, and teacher emotion regulation in particular, a new model for language teacher emotion regulation was introduced by Heydarnejad et al. (2021b). This model includes six dimensions, i.e., situation selection, situation modification, attention deployment, reappraisal, suppression, and seeking social support. The three dimensions of situation selection, situation modification, and attention deployment were rooted in Gross's process-oriented model of emotion regulation (1998). Reappraisal and suppression were based on Gross and John's conceptualization (2003), and seeking social support as the last dimension was inspired by Jennings and Greenberg (2009) as well as Taxer and Gross (2018).

In the teaching context, Bandura's self-efficacy theory reflected teachers' beliefs about their abilities to engage their learners effectively and to achieve educational objectives efficiently (Tschannen-Moran et al., 1998; Heydarnejad et al., 2021a; Sudina et al., 2021). Bandura (1997) introduced sources of efficacy beliefs as mastery experience, vicarious experience, social or verbal persuasion, and physiological or affective states. Among these factors, mastery experience has the most influential role in self-efficacy beliefs. The next step is observing a successful performance by other similar people (Tompson and Dass, 2000). The third source of

self-efficacy is originated from social or verbal persuasion. Successful persuasion fosters people's perceptions of their abilities and future accomplishments (Schunk and Pajares, 2002). Psychological and affective states as the last source highlight the role of positive factors in boosting individuals' efficacy beliefs (Bandura, 1997).

The concept of work engagement is theoretically supported by self-determination theory (SDT) (Bakker et al., 2011; Zeng et al., 2019). As SDT suggests, individuals who are engaged in their work are encouraged to bring improved presentation, perseverance, and inventiveness to their work (Oga-Baldwin and Nakata, 2020). To define teacher engagement, Klassen et al. (2013) developed a model including three dimensions: cognitive-physical engagement, emotional engagement, social engagement with students, and social engagement with colleagues. Cognitive-physical engagement is the cognitive and physical devotion of teachers to their teaching. Emotional engagement refers to teachers' enjoyment and entertainment aligned with instruction (Han and Wang, 2021). Social engagement with students and social engagement with colleagues are the last two dimensions of this model, which focus on the social dimension of teachers' jobs (Jennings and Greenberg, 2009; Oga-Baldwin and Nakata, 2020).

Various schools of thought conceptualize anger from different perspectives. Psychoanalytic orientations theorize that emotions are drive-related, and suppression of these powerful drives is deemed unhealthy (Thomas, 1990). Behavioral orientations conceptualized anger as a reaction to the blocking of a goal (Thomas, 1990). Furthermore, the Skinnerian behavioral conceptualization believes that anger is a learned response to environmental stimuli (Skinner, 1953). Sociocultural theories focus on the interpersonal nature of anger. According to this theory, if the expectations of individuals are not met, it may cause anger (Sullivan, 1953). Contemporary social/psychological perspectives also emphasize that most angry episodes are social events (Thomas, 1990). From the humanistic orientation, emotion is neither an expression of instincts nor a learned response. In the current study, the Teacher Anger Scale (TAS) was employed (Burić and Frenzel, 2019), which was designed based on the above-mentioned theories.

Materials and methods

Participants

A sample of 581 teachers (283 male and 298 female) participated in this research, who were teaching English as a foreign language at different private language institutes and at different levels of English proficiency in Iran. To be able to achieve generalizability, the following criteria in selecting the participants were considered: variability in age groups, years of

teaching experience, genders, and cities where teachers work. The age range of participants in this phase was between 23 and 53 ($M = 40.300$, $SD = 9.207$) with 1–30 years of teaching experience ($M = 18.233$, $SD = 9.115$). They majored in different branches of English: English Teaching (295), English Literature (94), English Translation (151), and also linguistics (41). Among the participants, 42 teachers were Ph.D. candidates, and 294 teachers held MA degrees; the rest of the teachers were BA.

Procedure

The data collection for this study started in November 2021 and ended in February 2022 through a web-based platform. That is, the participants received an electronic survey form including the Language Teacher Emotion Regulation Inventory (LTERI), the Teacher Sense of Efficacy Scale (TSES), the ETS, and the TAS through Google Forms. Since all teachers were qualified enough in English, the language of all four scales was English and, in this way, a construct-irrelevant factor was avoided. Conducting the electronic survey enables researchers to collect data from different regions with varying age groups and teaching experiences. Altogether, 581 forms were received with an 84.5% return rate. On account of the design of the electronic survey (each part in the electronic survey form was designed to be necessarily linked), no data were missed.

Instruments

The language teacher emotion regulation inventory

The LTERI ([Supplementary Appendix 1](#)), designed and validated by [Heydarnejad et al. \(2021b\)](#), is based on the process model of emotion regulation ([Gross, 1998, 2014; Gross and Thompson, 2007](#)) and semi-structured interviews with EFL high school teachers and university professors. This scale requires the language teachers to think about similar situations from their teaching experiences and rate the statements in the light of their employed emotion regulation strategies. The LTERI contains 27 items on a five-point Likert scale anchored by 1 (“never”) and 5 (“always”) with six components, i.e., situation selection, situation modification, attention deployment, reappraisal, suppression, and seeking social support. [Heydarnejad et al. \(2021b\)](#) reported acceptable reliability for all sub-scales of the LTERI (ranging from 0.718 to 0.814). In the present study, the results of Cronbach’s alpha test were acceptable (ranging from 0.715 to 0.801).

The teacher sense of efficacy scale

To determine teachers’ self-efficacy beliefs, the Teachers’ Sense of Efficacy Scale (long form) ([Supplementary Appendix 2](#)) developed and validated by [Tschannen-Moran](#)

[et al. \(1998\)](#) was employed. This scale consists of 24 items on a 9-point Likert scale with three sections: (1) efficacy in student engagement, (2) efficacy in instructional strategies, and (3) efficacy in classroom management. The total reliability and reliability of each factor reported by [Tschannen-Moran et al. \(1998\)](#) were satisfactory. In this study, the reliability of the TSES estimated through Cronbach’s alpha was acceptable (ranging from 0.796 to 0.870).

The engaged teacher scale

Teachers’ engagement at work was assessed using the Engaged Teacher Scale (ETS) ([Supplementary Appendix 3](#)) by [Klassen et al. \(2013\)](#). This instrument includes 16 items, using a seven-point Likert scale (1 = Strongly disagree; 7 = Strongly agree), with four subscales that represent the underlying dimensions of teacher engagement at work: cognitive engagement, emotional engagement, social engagement with students, as well as social engagement with colleagues. In a quantitative study by [Azari Noughabi et al. \(2020\)](#), the reliability of the scale was reported as satisfactory (Cronbach’s alpha = 0.89). In the current study, the reliability of the scale estimated *via* Cronbach’s alpha was acceptable for all sub-components of ETS (ranging from 0.796 to 0.898).

The teacher anger scale

To assess teacher anger, the TAS ([Supplementary Appendix 4](#)), designed and validated by [Burić and Frenzel \(2019\)](#), was employed. It contains 16 items on a five-point Likert scale (1 = never, 5 = always) and four facets of teacher anger: (1) students-related, (2) parents-related, (3) colleagues-related, and 4) system-related. The reported reliability indices in the study of [Burić and Frenzel \(2019\)](#) were acceptable (ranging from 0.77 to 0.82). In the present study, the reliability of the TAS was estimated *via* Cronbach’s alpha, and the result was satisfactory (ranging from 0.713 to 0.865).

Data analysis

To analyze the data, CFA and SEM using LISREL 8.80 were conducted. SEM is a robust multivariate procedure used to take a confirmatory hypothesis-testing approach for the proposed structural theory ([Schreiber et al., 2006](#)). An SEM model involves two parts: the measurement model and the structural model. The measurement model is used to examine the relationships between the observed variables and latent variables ([Hair et al., 1998](#)). The structural model is used to gauge the relationships between the latent variables.

Results

The results of the statistical analysis computed by the collected data are reported in this section.

The descriptive statistics of EFL in-service teachers' emotion regulation strategies, self-efficacy beliefs, work engagement, and anger were displayed in the following table.

Based on **Table 1**, among language teacher emotion regulation strategies, situation selection ($M = 4.109$, $SD = 0.672$) and situation modification ($M = 3.806$, $SD = 0.532$) got the highest mean scores, whereas the mean score of suppression was the least ($M = 2.883$, $SD = 0.767$). Furthermore, among the components of self-efficacy beliefs, instructional strategies ($M = 6.941$, $SD = 0.857$) displayed the highest mean scores. Student engagement ($M = 6.835$, $SD = 0.776$) and classroom management ($M = 6.816$, $SD = 0.712$) were the subsequent subscales of self-efficacy beliefs endorsed by EFL in-service teachers.

Among the subscales of teacher engagement, emotional engagement presented the highest mean scores ($M = 6.361$, $SD = 0.665$). The mean scores of the subsequent sub-scales were as follows: cognitive engagement ($M = 6.228$, $SD = 0.953$), social engagement: students ($M = 6.176$, $SD = 0.806$), and social engagement: colleagues ($M = 5.618$, $SD = 0.800$). Regarding teacher anger subscales, student-related anger ($M = 3.296$, $SD = 0.628$) was the main cause of Iranian EFL in-service teachers' anger at the workplace. Colleagues-related ($M = 2.835$, $SD = 0.834$), system-related ($M = 2.704$, $SD = 0.947$), and parents-related anger ($M = 2.401$, $SD = 0.884$) were the subsequent triggers of Iranian EFL in-service teachers' anger at the workplace.

The Kolmogorov-Smirnov Test was utilized to inspect the normality distributions of the data and, consequently, to decide on employing a suitable statistical method for the current study. In the following table, the result of the Kolmogorov-Smirnov test is provided.

As **Table 2** displayed, the data were normally distributed because the sig value for all the instruments and their subcomponents was higher than 0.05. To examine the structural relations, the proposed model was tested using the LISREL 8.80 statistical package. To gauge the model fit, the following fit indices were used: the chi-square magnitude, the Root Mean Square Error of Approximation (RMSEA), the comparative fit index (CFI), and the normed fit index (NFI). According to **Jöreskog (1990)**, the chi-square should be non-significant and the chi-square/df ratio should be lower than 3. Also, the root mean square error of approximation (RMSEA) should be lower than 0.1 (**Jöreskog, 1990**). The NFI with the cut value greater than 0.90, GFI with the cut value greater than 0.90, and CFI with the cut value greater than 0.90 indicates a good fit (**Jöreskog, 1990**). As **Table 3** presents, the chi-square/df ratio (2.833) and the RMSEA (0.056) reached the acceptable fit thresholds. The other three fit indices, GFI (0.972), NFI (0.921), and CFI (0.932) were also acceptable.

The t -values and standardized estimates were inspected to gauge the strength of the causal relationships among the variables. As **Figures 2, 3** illustrate, language teacher emotion

regulation affects teachers' sense of efficacy beliefs ($\beta = 0.81$, $t = 20.35$) and engagement ($\beta = 0.84$, $t = 22.05$) significantly and positively; the t -value was greater than 1.96. The effect of language teacher emotion regulation on teacher anger was significantly negative ($\beta = -0.77$, $t = -16.89$) and the t -value was lower than -1.96 .

Table 4 also displays the acceptable criteria for fit indices in the second model (phase 4). That is, the chi-square/df ratio (2.730) and the RMSEA (0.055) reached the acceptable fit thresholds. Moreover, GFI (0.912), NFI (0.962), and CFI (0.922) were acceptable.

Figures 4, 5 (Model 2) demonstrate that language teacher emotion regulation influenced all sub-components of teacher self-efficacy beliefs significantly and positively, as follows: student engagement ($\beta = 0.84$, $t = 19.01$), instructional strategies ($\beta = 0.88$, $t = 18.77$), classroom management ($\beta = 0.80$, $t = 17.42$). The same holds true for the sub-components of the Engaged Teacher Scale. That is, language teacher emotion regulation influenced cognitive engagement ($\beta = 0.89$, $t = 22.03$), emotional engagement ($\beta = 0.94$, $t = 19.39$), social engagement: students ($\beta = 0.84$, $t = 19.77$), and social engagement: colleagues ($\beta = 0.80$, $t = 12.70$) significantly and positively. Moreover, the significantly negative effects of language teacher emotion regulation on the sub-components of teacher anger were illustrated as follows: students-related ($\beta = -0.87$, $t = -22.89$), parents-related ($\beta = -0.77$, $t = -14.20$), colleagues-related ($\beta = -0.81$, $t = -14.31$), and system-related ($\beta = -0.73$, $t = -13.03$).

A Pearson product-moment correlation was run to examine the relationships among the variables.

As indicated in **Table 5**, there are significant relationships among the LTERI and student engagement ($r = 0.619$, $p < 0.01$), instructional strategies ($r = 0.640$, $p < 0.01$), and classroom management ($r = 0.599$, $p < 0.01$). Considering the correlations among the LTERI and the sub-components of engaged teacher scale, the results are as follows: cognitive engagement ($r = 0.461$, $p < 0.01$), emotional engagement ($r = 0.536$, $p < 0.01$), social engagement: student ($r = 0.520$, $p < 0.01$), and social engagement: colleagues ($r = 0.432$, $p < 0.01$). In addition, the relationships among the LTERI and the subcategories of the TAS are as follows: students-related ($r = -0.587$, $p < 0.01$), parents-related ($r = -0.298$, $p < 0.05$), colleagues-related ($r = -0.361$, $p < 0.01$), and system-related ($r = -0.202$, $p < 0.05$).

Discussion

This study was an attempt to uncover the interrelatedness of language teacher emotion regulation, self-efficacy, engagement, and anger. This aim was accomplished by utilizing a structural equation modeling approach targeted at building a causal structural model by which the contribution of each of the aforementioned constructs can be estimated.

TABLE 1 Descriptive statistics.

Inventory	N	Minimum	Maximum	Mean	Std. deviation
Situation selection	581	1.00	5.00	4.109	0.672
Situation modification	581	1.00	4.40	3.806	0.532
Attention deployment	581	1.00	4.25	3.337	0.638
Reappraisal	581	1.00	4.20	3.405	0.586
Suppression	581	1.00	4.00	2.883	0.767
Seeking social support	581	1.50	4.50	3.477	0.654
Student engagement	581	5.00	8.38	6.835	0.776
Instructional strategies	581	4.25	9.00	6.941	0.857
Classroom management	581	5.00	9.00	6.816	0.712
Cognitive engagement	581	3.25	7.00	6.228	0.953
Emotional engagement	581	4.00	7.00	6.361	0.665
Social engagement: students	581	3.50	7.00	6.176	0.806
Social engagement: colleagues	581	2.50	7.00	5.618	0.800
Students-related	581	2.25	5.00	3.296	0.628
Parents-related	581	1.50	5.00	2.401	0.884
Colleagues-related	581	1.75	5.00	2.835	0.834
System-related	581	1.00	5.00	2.704	0.947

TABLE 2 The results of Kolmogorov-Smirnov test.

Inventory	Sub-scales	N	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
The language teacher emotion regulation inventory	Situation selection situation	581	1.205	0.110
	modification attention	581	1.315	0.063
	Deployment	581	1.252	0.087
	Reappraisal	581	0.840	0.481
	Suppression	581	1.209	0.107
	Seeking social support	581	0.903	0.388
Total		581	1.081	0.193
The teachers' sense of efficacy scale	Student engagement	581	1.280	0.075
	Instructional strategies	581	0.570	0.901
	Classroom management	581	0.946	0.332
Total		581	0.881	0.419
The engaged teacher scale	Cognitive engagement	581	0.946	0.333
	Emotional engagement	581	1.320	0.065
	Social engagement: Students	581	1.317	0.061
	Social engagement: Colleagues	581	0.855	0.458
		581	1.155	0.139
The Teacher Anger Scale	Students-related	581	0.882	0.417
	Parents-related	581	1.180	0.123
	Colleagues-related	581	0.948	0.330
	System-related	581	0.527	0.944
Total		581	0.892	0.404

Data analyses indicated that the EFL teachers' emotion regulation predicts their self-efficacy skills and engagement in a positive direction. In contrast, the effect of the EFL teachers' emotion regulation on their feelings of anger is in a negative direction.

Emotion regulation strategies offer teachers ways to control their emotions and act effectively. The more teachers practice emotion regulation, the better they can manage and modify the emotional demands. This capacity offers the self-measurement of teachers' emotional experiences and gives

TABLE 3 Model fit indices.

Fitting indexes	χ^2	df	χ^2/df	RMSEA	GFI	NFI	CFI
Cut value			<3	<0.1	>0.9	>0.9	>0.9
The first model	328.69	116	2.833	0.056	0.972	0.921	0.932

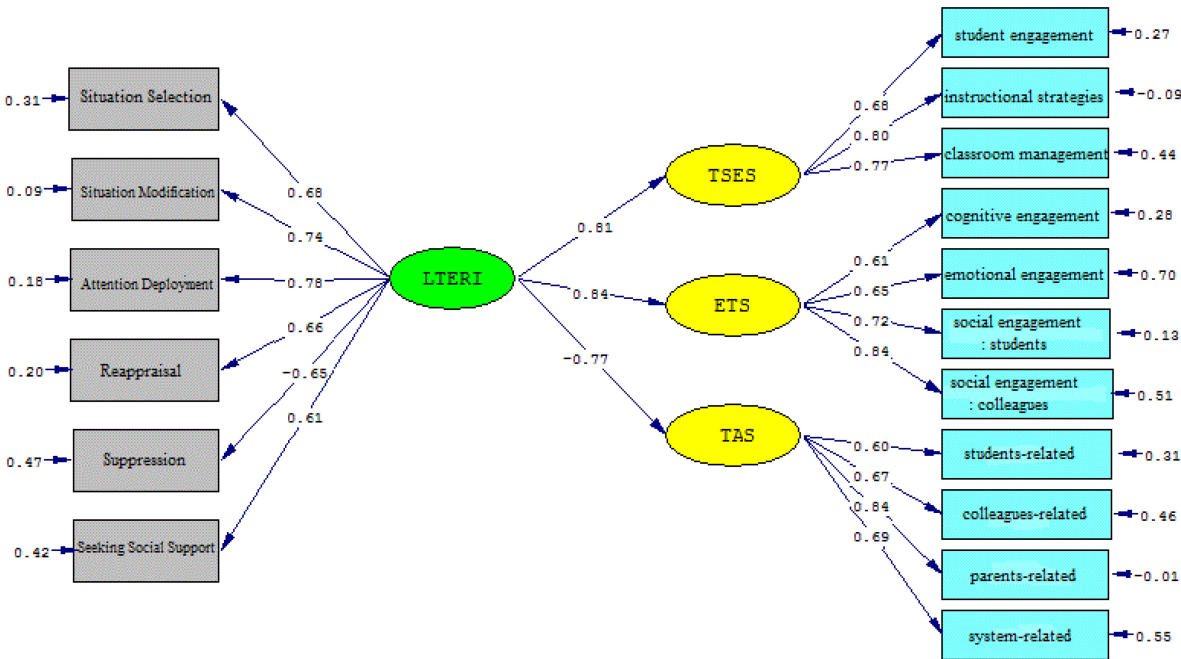


FIGURE 2
The schematic representation of path coefficient values (Model 1).

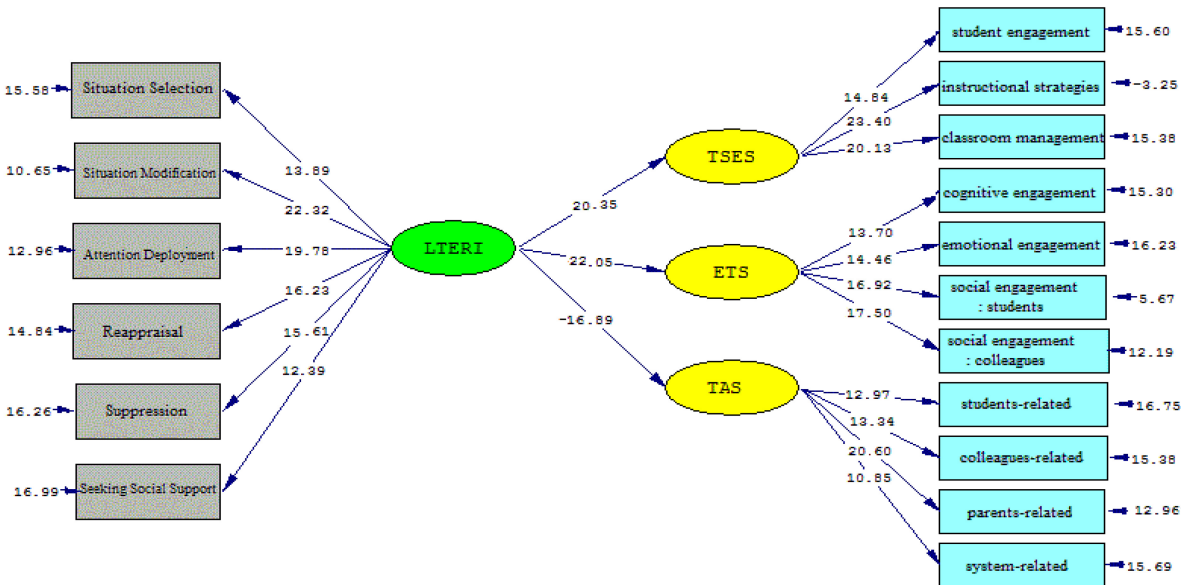


FIGURE 3
T-values for path coefficient significance (Model 1).

TABLE 4 Model fit indices.

Fitting indexes	χ^2	df	χ^2/df	RMSEA	GFI	NFI	CFI
Cut value			<3	<0.1	>0.9	>0.9	>0.9
The second model	4963.76	1818	2.730	0.055	0.912	0.962	0.922

directions to their professional wellbeing. The findings of the present study revealed a close relationship between the language teachers' emotion regulation and their self-efficacy belief (see Model 1). Therefore, the first null hypothesis of the study (H01. EFL teachers' emotion regulation has no impact on their self-efficacy beliefs in the workplace) was rejected. A detailed inspection of the results indicated emotion regulation influences the teacher self-efficacy sub-components (student engagement, instructional strategies, and classroom management) significantly (see Model 2). Scrutinizing the relevant literature on teacher emotion and teacher self-efficacy beliefs echoes a growing body of research that illuminates the intertwined relationship between teacher emotion and their efficacy (Burić et al., 2017; Burić and Macuka, 2017; Burić et al., 2020; Liu H. et al., 2021; Chen and Cheng, 2022). In this regard, Burić and Moè (2020) acknowledged the interrelationships of teacher self-efficacy, positive emotions, and teacher wellbeing, which affect teacher enthusiasm. Similarly, Chen (2018) confirmed that teacher efficacy is positively associated with their emotions. This finding is in accord with those of Fathi et al. (2020), Heydarnejad et al. (2021a), Liu H. et al. (2021), and Amirian et al. (2022) as well as Xiyun et al. (2022). Additionally, Cansoy et al. (2020) and Zheng et al. (2022) confirmed that teacher emotional wellbeing and self-efficacy beliefs are interrelated. According to the LTER model (Heydarnejad et al., 2021b), emotion regulation is the output of appraisal, attention deployment, situation modification, seeking social support, situation selection, and suppression. When teachers use effective emotion regulation strategies, the better they can manage and modify their emotional experiences (Li et al., 2022; Zheng et al., 2022). Effective emotion regulation can affect teachers' sense of efficacy. Based on Bandura's self-efficacy theory (Bandura, 1982), efficacious teachers implement mastery experiences and use social experiences for successful achievement. Furthermore, it is implied that the psychological and affective states as sources of teacher self-efficacy can be regulated *via* emotion regulation and help their cognitive development.

The predictive power of language teacher emotion regulation on their work engagement, as another objective of this study, was confirmed by the results of the present study (see Model 1). Thus, the second null hypothesis of the study (H02. EFL teachers' emotion regulation has no impact on their engagement at the workplace) was rejected. In detail, language teacher emotion regulation significantly and positively

influenced cognitive engagement, emotional engagement, social engagement (students), and social engagement (colleagues) (see Model 2). It implies that emotion-regulatory strategies provide a balance in the professional lives of language teachers. In such a situation, language teachers feel more enthusiasm and engagement in teaching activities. From these findings, it can also be inferred that a language teacher's emotion regulation maximizes social engagement with students and colleagues. Therefore, for teachers, emotion regulation pinpoints the effective path for raising teachers' social commitment and enhancing their personal and job accomplishments. This result can be supported by the underpinning premises of the LTER model and SDT (Mulyani et al., 2021; Wang et al., 2022). That is, implementing each of the emotion regulatory strategies enhances the emotional balance of teachers' professional lives and can result in teachers' engagement. Additionally, this outcome reconciles with prior studies, though limited and quite rare in the EFL context, which focus on the relationship between teachers' emotions and their engagement in the workplace (Zeng et al., 2019; Lazarides and Warner, 2020; Topchyany and Woehler, 2020; Liu and Chu, 2022).

Moreover, the results of the present study shed more light on the impact of teacher emotion regulation on their anger. As it was concluded, the influence of emotion regulation on teacher anger was significantly negative (see Model 1); thus, the third null hypothesis (H03. EFL school teachers' emotion regulation has no impact on their anger management at the workplace) was rejected. To be precise, the data analysis indicated that the main cause of Iranian EFL teachers' display of anger is student-related. Following student-related anger, colleagues-related anger, system-related anger, and parents-related anger, respectively, trigger Iranian EFL teachers' anger, which necessitates the role of emotion regulation (see Model 2). This outcome seems plausible, both theoretically and experimentally, given that language teachers spend most of their time dealing with their students and then colleagues (Burić and Frenzel, 2019). Teaching is under the influence of teachers' social relationships with students and colleagues and any inconsistencies in these reciprocal relationships may trigger a language teacher's anger. In such situations, teachers need to manipulate their expressions of anger and align them with the emotional display rules of their profession. Therefore, one of the overriding influences of emotion regulation is the efficient handling of everyday problems and affairs. Furthermore, it can be implied that language teachers with

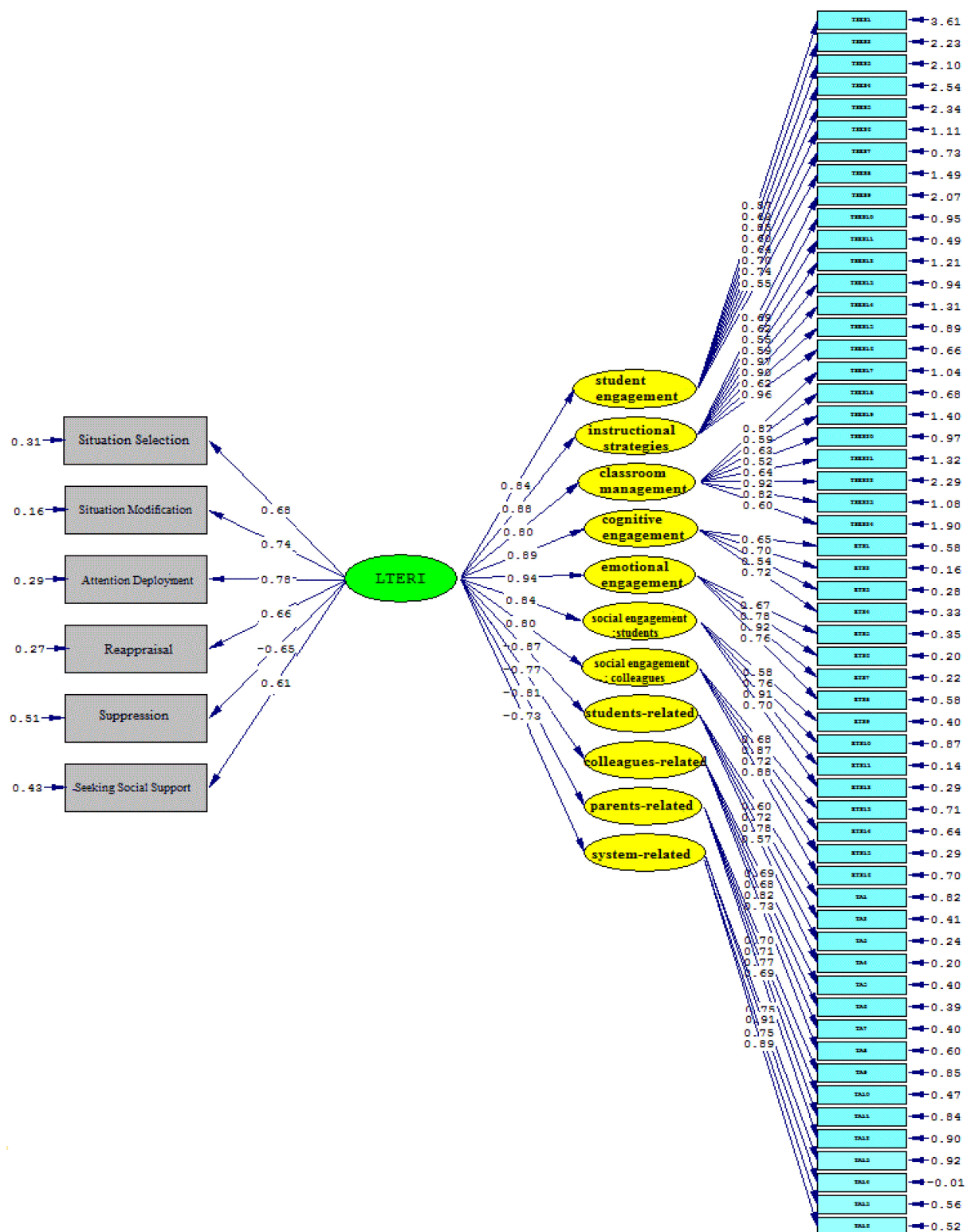
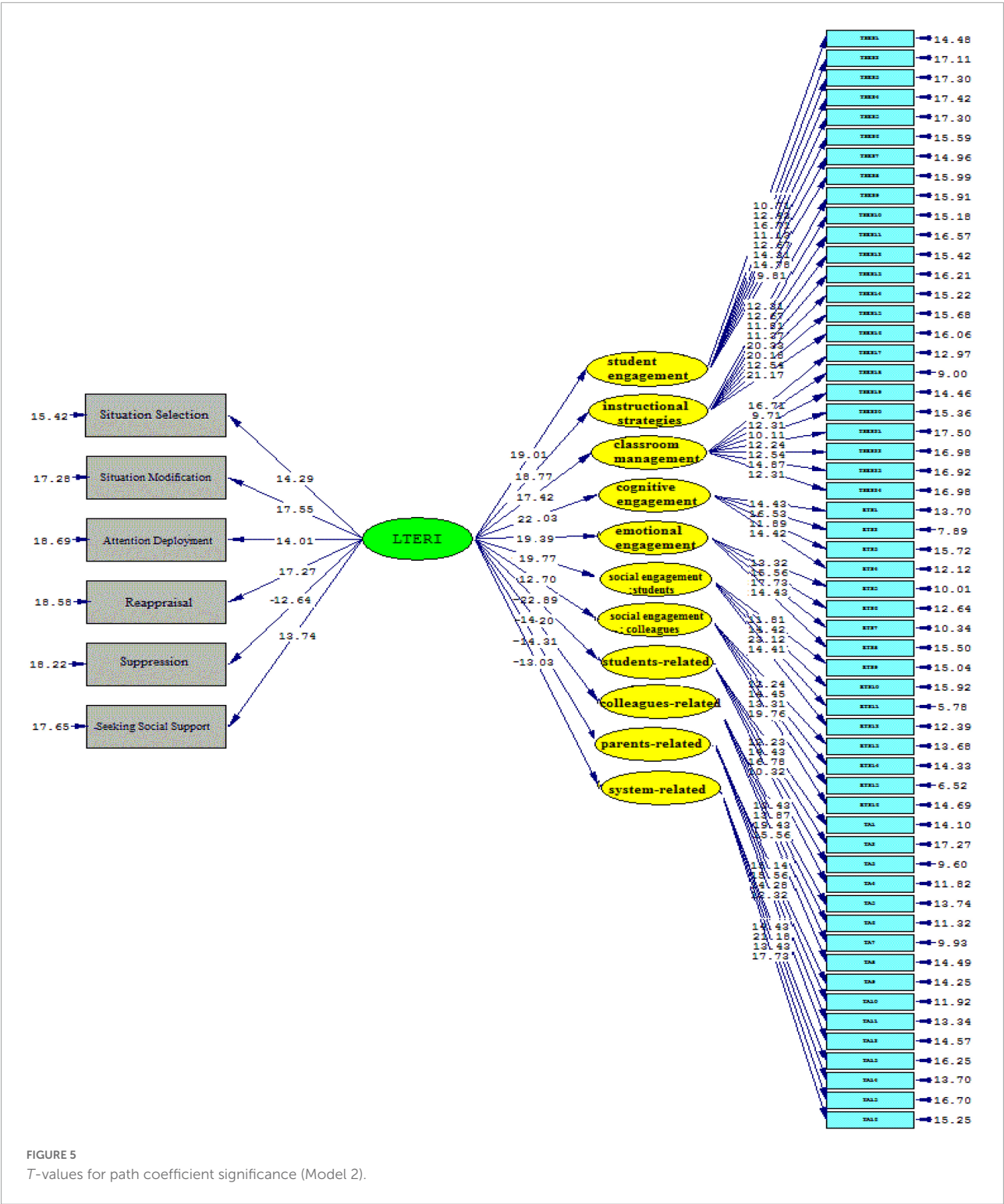


FIGURE 4
The schematic representation of path coefficient values (Model 2).



high emotion regulation are inclined toward playing safe and relinquishing in the face of challenges and difficulties (Liu et al., 2022).

Furthermore, there were an increasing number of sources of teacher anger, particularly during the coronavirus pandemic

with its severe disruption of normal everyday life and unpredictability for the future. In such conflicts, emotion regulation helps teachers navigate the contingencies of the workplace and a new set of challenges caused by the coronavirus pandemic, which have been added to the causes

TABLE 5 The correlation coefficients among language teacher emotion regulation and the sub-components of self-efficacy beliefs, engagement, and anger.

	LTERI	Student engagement	Instructional strategies	Classroom management	Cognitive engagement	Emotional engagement	Social engagement: students	Social engagement: colleagues	Students-related	Parents-related	Colleagues-related	System-related
LTERI	1											
Student engagement	0.619**	1										
Instructional strategies	0.640**	0.770**	1									
Classroom management	0.599**	0.686**	0.780**	1								
Cognitive engagement	0.461**	0.518**	0.712**	0.593**	1							
Emotional engagement	0.536**	0.425**	0.485**	0.446**	0.466**	1						
Social engagement: students	0.520**	0.414**	0.467**	0.620**	0.530**	0.587**	1					
Social engagement: colleagues	0.432**	0.469**	0.402**	0.668**	0.395**	0.534**	0.511**	1				
Students-related	-0.587**	-0.686**	-0.539**	-0.548**	-0.425**	-0.546**	-0.522**	-0.594**	1			
Parents-related	-0.298*	-0.317*	-0.307*	-0.341**	-0.377**	-0.440**	-0.418**	-0.370**	0.473**	1		
Colleagues-related	-0.361**	-0.385*	-0.437**	-0.507**	-0.288*	-0.359**	-0.417**	-0.333**	0.579**	0.650**	1	
System-related	-0.202*	-0.316*	-0.233*	-0.390**	-0.317*	-0.247**	-0.273*	-0.331**	0.437**	0.501**	0.628**	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

of teacher anger in the last 2 years. In the heat of the moment, teachers need to heal the maladaptive anger and aggression, and this can be plausible by practicing emotion regulation strategies (Burić et al., 2017; Chang and Taxer, 2021).

Conclusion and implications

Overall, the contextual triggers of language emotion regulation and its significant relationship with teacher's self-efficacy, engagement, and anger in the Iranian EFL context were inferred in the current research. More precisely, the hypothesized predictive power of language teacher emotion regulation in improving the teacher's self-efficacy, engagement, and control of anger was verified. The implications drawn from the current study assist language teacher educators in developing more productive pre-service and in-service programs by incorporating these findings into their studies. EFL teacher preparation programs should concentrate on teaching helpful strategies to enhance efficacy beliefs, emotion regulation, and reflection for pre-service teachers. Furthermore, policymakers are invited to consider these results in order to have a comprehensive picture of the factors that contribute to

the success and failure of teachers and educational programs. Last but not least, the results of this study could be of importance to any of the educational field's stakeholders, particularly language teaching, as the challenges brought by the Covid-19 pandemic are still not over, and a coherent human resources strategy should continue to be developed and improved. Furthermore, adding the implications of the current research into pre-service and in-service teacher training programs can pave the way for triggering self-aid skills, which are of great help, especially during the global crisis of the COVID-19 pandemic. These programs are anticipated to pinpoint the most effective path for enhancing their effective teaching.

The findings of this study suggest some pedagogical implications for teacher trainers and EFL teachers. Learning more about situational and personality determinants of the effectiveness of specific emotion regulation strategies can be achieved by doing some particular training programs and informing teachers of the importance of emotions. Such training programs should concentrate on practicing the broad repertoire of strategies and showing the conditions under which they are effective or not. Moreover, training should focus on reflecting more on language teachers' own traits and preferences that may influence the effectiveness of their employed emotion regulation

strategies. This also serves to provoke teachers to alter or modify their employed emotion regulation strategies to more positive ones, which are in turn expected to facilitate their effectiveness.

Limitations and suggestions for further research

This research, as is the case with other studies in the realm of education, has some limitations. Given that this study is one of the first endeavors in EFL literature, it can be deemed as a prelude to initiating other studies. Undoubtedly, the research agenda in this area is essential to capture the broad aspects and issues pertaining to EFL teachers' effectiveness. Further experimental studies are suggested in which different emotion regulation strategies are experimentally induced and personality traits are measured. For instance, future longitudinal studies are recommended to investigate the long-term effects of applying certain strategies by teachers, in particular language teachers with specific personality characteristics. Additionally, future studies are suggested to explore the mediating role of personality characteristics of teachers on the effectiveness of different strategies in different situations and settings.

If the debate is to be moved forward, future investigations can take more mixed-method approaches to inspect the studied association here. This could be a fruitful endeavor since the present study lacks a qualitative, data-driven conceptualization of teachers' and educators' perspectives. In this study, the relationships between teachers' years of teaching experience, educational levels, age, and gender and their preferred emotion regulation strategies, self-efficacy beliefs, work engagement, and anger management were not considered. Thus, researchers are recommended to consider these factors in similar research studies in the future. Furthermore, it is recommended to undertake further research to investigate whether language teacher emotion regulation affects language learners' emotion regulation. As a future perspective, the possible interplay among teacher emotion regulation, self-efficacy, engagement, and anger can be inspected in other educational contexts.

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Data availability statement

The original contributions presented in this study are included in the article/**Supplementary material**, further inquiries can be directed to the corresponding author/s.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1019984/full#supplementary-material>

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Perspectives of EFL learners and teachers on self-efficacy and academic achievement: The role of gender, culture and learning environment

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The Omani socio-cultural context, the mono-gender educational system in schools, and the learning environment at the higher educational institutions significantly affect learners' self-efficacy and academic achievement in the mixed-gender EFL classroom. Different studies have revealed both positive and negative implications of mixed-gender classrooms, especially for those who came from a mono-gender learning environment. The adjustment phase for the tertiary learners from school to the university is not only crucial but also significant for the continuation of higher education. The effects of socio-cultural factors on self-efficacy and academic achievement have not been studied in depth, particularly in eastern countries. So, the current study aimed at investigating the role of gender, learning background, socio-cultural circumstances, and the effect of the learning environment on EFL learners' self-efficacy and their academic achievement within the scenario of the prevailing culture and traditions in the Dhofar Region. To conduct this study, mixed research methods (qualitative and quantitative) have been adopted to investigate the perceptions of both teachers and learners. The sample of the study consists of 117 EFL learners ranging between 18–22 years of age and 25 EFL teachers ranging between 35–60 years of age. We used separate surveys for students and the teachers and interviewed students and teachers on a random basis. The results demonstrate that both genders were comfortable in segregated classes. The results also reveal that female learners were active learners and better performers than male learners in the school learning environment. The students reported that social restrictions discouraged them from mixing with the opposite gender in classroom activities and oral discussions. Most teachers believe that, compared to male learners, female learners performed better and were more engaged and responsive to different learning situations. The study found that there were statistically significant differences between both genders in terms of the effects

of socio-cultural environment, self-efficacy, and the learning environment. Female learners were better than male learners in mono-gender schools, and they have higher self-efficacy than male students at the university. In conclusion, EFL teachers should consider the socio-cultural context, learners' learning background, and other challenges of learners to bring out positive outcomes in a mixed-gender classroom.

KEYWORDS

co-education, mixed-gender classrooms, self-efficacy, academic achievement, sociocultural context, learner's perspectives, teachers' perspective, self-confidence

Introduction

Transitioning from mono-gender classrooms to mixed-gender classes at the university is a critical period for learners (Fokkens-Bruinsma et al., 2021), especially for those learners who have never been in a co-education learning environment. Mixed-gender classes have been endorsed and appreciated by educators and society in the last few decades. The mixed-gender classroom is the place where both males and females study together under the same learning conditions and the same setting. According to Evans (2014), mixed-gender classes help learners understand the similarities and attitudes of the opposite gender in a classroom during the period of formal education. Though gender-segregated classrooms were common in the 19th century in the West, Europe, and Russia to instill self-efficacy and management skills (Bajaj, 2009), the model of the mixed-gender classroom was initiated in the West to showcase gender equality in education (Hussain, 2020). Mixed-gender classes provide learning opportunities for both genders under similar learning conditions and in the same learning environment. Educational institutions where a mixed-gender learning environment is provided help both boys and girls in building social maturity and developing communication skills (Ahmad et al., 2014; Almasri et al., 2021).

Though there is much debate about the effectiveness of mixed-gender and mono-gender learning environments, research in recent years has shown that mixed-gender classrooms are not very productive and do not produce the expected results (Hussain, 2020). However, it is unanimously agreed that both genders have specific personality traits and characteristics that differentiate them marginally. They have different learning patterns and self-efficacy that affect academic achievement. Self-efficacy minimizes the disparity between school and university learning environments and academic success at a higher educational institution (Zysberg and Schwabsky, 2021). Self-efficacy is an area that has focused on girls and boys in the different ways in which it affects their academic performance and their overall well-being and success in life (Namaziandost and Çakmak, 2020). It is found that in a mixed-gender classroom, there is a vast difference in self-efficacy

of both genders compared to single-gender classrooms (Li and Singh, 2021). Self-efficacy has recently gained growing attention as one of the strong influences that affect student academic achievement (Nasir and Iqbal, 2019). High achievers have higher self-efficacy compared to low achievers (Yasin et al., 2020), and the learning environment and socio-cultural background contribute to developing self-efficacy in learners (Harvey et al., 2017; Zysberg and Schwabsky, 2021). The academic achievement of EFL learners is directly related to their type of learning environment, parents' education, and socio-economic situation (Hussain, 2020). There is abundant evidence that confirms that self-efficacy has a positive effect on academic success and other related academic activities (Lee et al., 2014).

Aragonés-González et al. (2020) argued that the classroom environment, coursebooks, gender, and cultural setting shape learners' attitudes toward learning. Gender roles can be controlled and readjusted by modifying teaching practices and teaching materials. Their study revealed that the education system needs to be reformed to give an equal representation of both genders in the curriculum and teaching resources. They found that socio-cultural challenges are the barriers to girls' education and affect the school dropout rate. They further emphasized the necessity of teacher training to understand gender differences and requested governmental intervention to reform the course materials.

Park (2018) reported that in a Korean context, co-education classrooms do not have a significant effect on academic achievement for both genders. However, the girls with low motivation and caliber were anxious in mixed-gender classes and it negatively affected their academic achievement. He also confirmed that the girls are high achievers compared to the opposite gender in a mixed-gender classroom (Lavy and Schlosser, 2011; Al Murshidi, 2014; Alhazmi and Nyland, 2015; Eisenkopf et al., 2015). Park (2018) observed that mixed gender classes have a positive effect on female learners' choice of course selection, particularly when he observed a significant increase in their selection of science courses compared to male learners. He also highlighted the fact that the selection of science and engineering courses on the part of male learners is due to the

high salary paid to scientists and engineers as compared to other professions.

It has also been observed that classes with a larger proportion of girls have a positive effect on classroom discipline, teacher-student relationships, and the learning environment (Lavy and Schlosser, 2011). To date, due to the absence of appropriate data, the gender composition of peer groups has received little attention. Eisenkopf et al. (2015) observed empirically sound evidence in their study that a single-gender learning environment has a positive effect on females studying science courses in Switzerland. The educational environment has a direct effect on students' attitudes toward learning, self-confidence, and ultimately affects students' achievement in a gender-segregated classroom. In the future, a study on the impact of the female-dominated classroom on male students' academic achievement is recommended.

The modernization of education across the world coupled with an emphasis on promoting the English language has altered the landscape of higher education in the West and Europe. In Middle Eastern societies, educators have started revisiting the effectiveness of co-education in improving the academic standards of students of both genders. Mathew et al. (2013) and Coskun (2014) observed that females in the Arab co-educational context demonstrated anxiety and discomfort in learning and class participation. However, this anxiety increased their productivity, and they showed better performance academically compared to their male counterparts.

In the UAE, in mixed-gender classrooms, female learners experienced cultural barriers to communicating with their male counterparts freely. Male students' low performance is the result of a lack of motivation and low self-efficacy in a co-educational learning environment (Al Murshidi, 2014). The school learning environment and learners' self-efficacy, which are interrelated (Machell et al., 2016), also affect both genders in the Arab co-educational context. In the Saudi context, gender-segregated classrooms have been a subject of discussion by local researchers in terms of striking a balance between the modernization of learning, local culture, and religious point of view (Alhazmi and Nyland, 2015).

The government in Oman aims at developing global citizenship in the students studying at higher education institutions (Al-Maamari, 2014), and it has spent heavily on higher education since the renaissance in 1970 (Al-Mahrooqi and Denman, 2018). Owing to the dominating culture in Oman, both genders in a co-educational environment are bound to stay away from mixed-gender mingling and maintain physical distance, avoid cross-gender communication during class activities, and have different learning styles (MacKenzie, 2016). Within such a contextual learning environment, learners encounter certain socio-cultural issues, since both genders have different learning styles and learning backgrounds (single-gendered schools; co-educational schools, international schools). Therefore, learners exhibit differences in their

self-efficacy, self-confidence, and motivation in learning. Researchers in the context of Oman discovered that high school graduates and students enrolled in foundation year programs in Oman have a lack of self-confidence, low proficiency in the foreign language, a lack of interest in reading and domestic responsibilities, and they face specific learning challenges such as mixed-gender classes, the difference between school and university learning environments, anxiety in learning, and cultural barriers while studying at university (Al-Issa and Al-Bulushi, 2012; Al-Mahrooqi and Denman, 2018).

Therefore, this study aims to identify the extent to which co-education helps students not only in learning their subjects but also in developing their personality and building their confidence (self-efficacy). Students who graduate from single-gendered schools have a low level of English and, hence, they are required to do a Foundation Year (Al-Mahrooqi and Denman, 2018). The students who enroll in colleges and Dhofar University come from complex cultural backgrounds — Bedouins and fishermen communities, along with the students residing in the city of Salalah. The overwhelming culture is a mixture of the regional variations that restrain the mingling of males and females. Most of the schools in the Dhofar region are gender-based schools, except for some private schools that have adopted mixed-gender classes (Risse, 2019; Watson et al., 2019). When students from these regions and cultural backgrounds enroll in colleges and universities, they not only find male and female students studying together but also are taught by people from different genders and nationalities. This poses a real challenge to a majority of students in coping with their educational aspirations. Crucially, low language proficiency, combined with cultural shock, creates a sense of otherness in students who attend co-educational colleges and universities, which contributes to digression and low self-efficacy. "Though culture shock is expected every time someone changes one's cultural environment, the impact varies from person to person and the experience can alter one's perception of the anticipated outcome" (Al Murshidi, 2014, p. 100). Research has shown that there is a link between gender and learning styles (Kaiser, 2006; Glynn et al., 2007; Ning et al., 2010; Nazir et al., 2018). The situation is no different in the area in which the researchers have done the study.

Having reviewed the existing literature, there is a dearth of comprehensive studies that discuss the relationship between culture, learning environment, and gender and its effect on learners' self-efficacy and academic success in a mixed-gender classroom in an Omani context. Therefore, the current study has been conducted to determine the role of gender, culture, and learning environment on learners' self-efficacy and achievement in a mixed-gender classroom in the context of a private university in Oman. The current study tries to bridge the gap in the existing literature in the context of Oman by highlighting the role and significance of gender, learning environment, and culture on the learners' learning process in a mixed-gender

classroom where culture, gender differentiation, and previous learning environment are the dominating factors that affect and shape learners' self-efficacy and confidence in learning and their academic success. This study is anticipated to contribute to other higher educational institutions that have similar learning environments and learners' self-efficacy differentiation.

Literature review

Mixed-gender classroom vs. single-gender classroom

In both gender-segregated and mixed-gender classrooms, teachers tend to have a consistent teaching methodology and gender does not have any kind of effect on their teaching approaches. Teachers perceive girls as high achievers compared to boys. Both parents and teachers observe that gender-segregated classrooms have a positive effect on building social skills in both learners. Academic performance in mathematics by both genders is notably better than in a coeducational learning environment. When compared to mixed-gender classes, many teachers found homogeneous-gender classes to be more intensive and engaging (Becker, 2013).

According to Evans (2014), single-sex schools in Zambia are considered healthy spaces for personal development and free of male dominance compared to mixed-gender schools, which are considered places of unfair power dynamics. Certain findings suggest that single-sex schools contribute to higher academic performance, self-efficacy, self-concept, and learner's autonomy (Hussain, 2020). Girls studied in the mono-gender learning environment in Zambia show fear about their encounters with boys in a mixed-gender classroom. Females who studied in single-gendered classrooms faced various challenges in transitioning to higher education and jobs with males. They felt less confident and had low self-efficacy, which affected their performance negatively in the class (Evans, 2014).

For Yalcinkaya and Ulu (2012), the students in Kazakhstan concentrated better in segregated classrooms; however, in mixed-gender classrooms, most of the students were distracted by the presence of the opposite gender. The mixed-gender classroom provides a competitive and interactive learning environment for the students. Most of the students felt that the segregated learning environment was positive in terms of productivity and learning. In some situations, the involvement of the opposite gender in classroom discussion harmed students' efficacy and motivation in learning.

Mixed-gender classroom and academic achievement

A great deal of research has been carried out to understand the variables affecting academic achievement.

However, only a few studies have focused on the role of gender in predicting a student's academic success (Whipple and Dimitrova-Grajzl, 2021). Female students not only surpassed their male counterparts in academic achievement but also in classroom activities and participation. Significantly, the lack of motivation pertaining to male learners is not the reason for their low academic performance; however, their low self-efficacy and lack of confidence in front of the opposite gender cause an academic weakness to emerge. Female students' anxiety had a positive effect on their performance and academic achievement. However, it needs to be explored further in the socio-cultural context (Mathew et al., 2013; Fallan and Opstad, 2016). According to Whipple and Dimitrova-Grajzl (2021), gender has a significant role in academic achievement. They maintain that male learners achieve higher grades compared to female learners, who have a moderate effect on their learning in the presence of the opposite gender.

Hussain (2020) found that learners from a single-gender learning environment in Pakistan scored higher on an English Language proficiency test. The social and gender environments in single-gender schools can be related to this disparity in results. Students' lower scores in co-educational schools indicate that they are distracted by the presence of members from the opposite gender and, as a result, they achieve lower grades in a co-educational environment compared to segregated schools. In the Indian context, Harinarayanan and Pazhanivelu (2018) observed that the demographics of learners, school learning environment and educational facilities, and students' mono-gender and mixed-gender learning backgrounds in school have a significant effect on learners' academic achievement. In his study, Becker (2013) focused on the gender of the teacher and reported that the teacher's gender does not affect learners' academic achievement and engagement in the classroom.

Mixed-gender classroom and culture

The cultural aspect has always been one of the dominating factors in shaping a learner's personality and attitude toward learning in the Persian Gulf region. Higher education in the Gulf region is a relatively new phenomenon with a predominant cultural aspect that is completely different from the Western educational model. This cultural dominance has led some of the higher educational institutions in the Gulf to have segregated campuses for both genders, especially in the UAE and Saudi Arabia (Parahoo et al., 2013; Song, 2019).

In Saudi Arabia, there is a clear cultural division of both genders in terms of domestic affairs, business, education, and social activities. Females in the Saudi context have to study in gender-segregated institutions and have to readjust themselves to linguistic, cultural, and religious challenges to progress in education, since the majority of females are responsible for domestic chores (Alhazmi and Nyland, 2015; Song, 2019). Learners' self-efficacy, motivation, socialization, gender roles,

and EFL learning ability are shaped by the cultural norms and learning environment provided by society (Song, 2019). In an Omani context, both genders have a lack of motivation and self-efficacy in learning a foreign language (Al-Mahrooqi, 2012).

Mixed-gender classroom and self-efficacy

Self-efficacy is the learner's belief or perception of one's learning capability, self-efficacy, and learning perception. However, there is very little research about the relationship between learning, self-efficacy, and academic achievement during the transition from high school to university (Van Herpen et al., 2017). In a mixed-gender classroom, both genders exhibit an equal level of satisfaction in learning, and teachers' learning background is not a significant factor that affects students' motivation and inclination toward learning (Harvey et al., 2017). Learners who have high self-efficacy and are motivated to participate in classroom activities actively compared to learners with a lack of confidence and low self-efficacy (Becker, 2013). In Kenya, females who are studying English as a Foreign Language demonstrate high self-efficacy compared to males (Makini et al., 2020).

The Gulf region has its own specificities in terms of a relatively new higher education sector and a different socio-cultural setting as compared to the western empirical contexts of most studies undertaken (Becker, 2013). Kuwaiti females are more anxious and less confident in front of males. In certain situations, it is also observed that senior students are more confident and autonomous compared to tertiary learners. Omani male students are more anxious and shier in front of female students, and feel insecure and sensitive for being mocked by their female counterparts. Similarly, in certain classroom activities and situations, female learners have exhibited a similar kind of sensitivity and anxiety as is the case for male learners (Mathew et al., 2013).

Mixed-gender classrooms and learning environment

The academic environment affects both learning and learners' behavior in a specific way in an academic setting. However, the learner's demographic has a negligible effect on the learner's learning environment. It is found that the academic environment has a positive effect and relationship with the individual's academic achievement (Benbenishty et al., 2016). However, it is not significantly related to increasing self-confidence in learners (Rocconi et al., 2020). In the Gulf context, the majority of the higher educational institutions are heavily supplied with the latest teaching and technological equipment,

which have transformed communication and interaction with the students. This highly tech-loaded environment, with the availability of Virtual Learning Management Systems, email, online forums, and blogs, has transformed learning. Also, it has been discovered that students expect to be connected with their instructors and classmates *via* various internet and high-tech resources (Parahoo et al., 2013).

According to Harvey et al. (2017), a learning environment in a gender-mixed classroom is associated with cultural obligations and social norms that are not necessarily characterized by genders. A study by Fortin et al. (2015) reveals that race, living standard, and family background of learners shape a learning environment in a mixed-gender classroom in schools. In most situations, these social circumstances are advantageous to male learners as compared to female ones. In their study, Makini et al. (2020) argue that teachers can also contribute to the learning environment by understanding the personality traits of both genders and by adapting their curriculum and teaching materials to these variables. In an Indian context, female learners have a better image of the learning environment than male students, and they take more advantage of educational resources (e.g., libraries and laboratories) and educational activities in comparison to boys (Harinarayanan and Pazhanivelu, 2018).

The theoretical framework of this research is based on two aspects of Bandura and Bussey's Social Cognitive Theory of Cultural Context and Gender Development and Differentiation (Bussey and Bandura, 1999). According to the Social Cognitive Theory of Gender Development, gender conceptions are developed through the mechanisms of motivation, self-regulation, and complex experiments linked with gender self-conduct. Gender development is characterized by a socio-cultural setting where people gain opportunities and face particular challenges based on their beliefs and self-conceptions, their professional pathways, and societal stereotypes about genders. Furthermore, changes in technology and sociocultural situations influence gender behavior (Bussey and Bandura, 1999). "People contribute to their self-development and bring about social changes that define and structure gender relationships through their agentic actions within the interrelated systems of influence" (Bussey and Bandura, 1999, p. 676).

Current study

Most of the studies on mixed-gender classrooms and segregated classrooms have been conducted in Western countries (Hussain, 2020), and the investigation on the effect of mixed-gender classrooms of students' academic achievement, self-efficacy, and learning environment in higher educational institutions in the Persian Gulf region has been an unexplored area (Parahoo et al., 2013), specifically in Oman. Therefore, this study intends to investigate whether mixed-gender classes

are effective in bringing about a conducive learning and competitive environment for both genders within the scenario of the prevailing culture and traditions in the Dhofar Region. The primary objective of this study is to investigate the effectiveness of co-education for both genders concerning culture, self-efficacy, academic achievement, and a positive learning environment. The focus of this research is also to probe the attitudes of both genders who studied in a single-gendered learning environment in schools. A mixed-method approach based on both quantitative and qualitative methods was adopted in this study.

Research questions

1. What are the perspectives of EFL learners on self-efficacy and academic achievement in a mixed-gender classroom?
2. What are the perspectives of EFL teachers on learners' self-efficacy and academic achievement in a mixed-gender classroom?
3. What is the effect of culture and the learning environment on learners' academic achievement?
4. What is the effect of culture and the learning environment on learners' self-efficacy?
5. Do the perspectives of EFL students on the school environment, university environment, and teaching and learning environment in the university differ according to gender?

Methodology

Study design

The study followed a mixed approach whereby researchers collected and analyzed both quantitative and qualitative data within the same study (Creswell and Plano-Clark, 2011). We distributed the link to questionnaire to the students with open-ended questions as well as closed-ended questions in the classrooms after obtaining the permission of the course teachers, and this was done through the first researcher. The link to the questionnaire for teachers with open-ended questions as well as closed-ended questions was also distributed to their offices after obtaining their consent. Some students and teachers were selected randomly for interviews to recognize their perspectives on the impact of the mixed-gender environment on their self-efficacy.

Participants

The sample of the study consists of 117 university students from different regions of the Sultanate of Oman: 32 males (27.4%) and 85 females (72.6%). In terms of age ranges, the

participants ranged between 18 years and 21 years, with mean age $M = 19.25$ ($SD = 1.32$). A total of 31.6% of the students are studying in the foundation program; 27.4% are studying in the first year; 24.8% are studying in 2nd year; and 7.7% are studying in the 3rd year. The participants were recruited from different courses at Dhofar University and were randomly selected.

Twenty-five language teachers were included in the current study. Their ages ranged between 35 and 55, with a mean age of 42.56 ($SD = 3.72$); Seven with a master's degree and 18 with a Ph.D. degree. Most of the teachers were assistant professors (18, 72%) with about 5–10 years' experience of working at Dhofar University, and they were from diverse cultures and different nationalities. Twelve teachers (48% of them) were from the Foundation Program, and 13 (52%) were from the College of Arts and Applied Sciences.

Data collection

The study employed a cross-sectional research design. Before commencing the data collection phase, ethical approval was obtained from the research department at Dhofar University to conduct the study on university students. Data were collected from students in several courses at Dhofar University. Data were collected from 12 March 2020 to 21 April 2020 during the Spring semester of the academic year 2019/2020. A letter of invitation, a consent form, and the instrument package were given electronically to the participants. The study was approved by the ethics committee of the author's university. The interviews were conducted *via* Zoom sessions from April 25th to May 10th, 2020. A zoom link was sent to students and teachers who were selected for the interviews. The process of data collection followed the voluntary principle. All the subjects provided written informed consent per the Declaration of Helsinki. However, they were free to withdraw during the research process, and their privacy and personal information were kept confidential.

Measures

The online survey was developed by the authors and information was gathered from two different informant perspectives (i.e., teachers and learners).

Students' survey

For the student survey, the first part includes sociodemographic variables like gender, age, level of study, type of school (single or mixed gender), college, and region. The second part of the survey items consists of three sub-dimensions. The first sub-dimension is about the previous school environment including seven items like "I performed

well when I was in school,” “I never felt shy to participate in class activities in the school.” The second sub-dimension is about the socio-cultural environment, including eight items like “my culture does not allow me to study in a mixed-gender class,” “social restrictions in my society discourage mixing with the other gender.” The third sub-dimension is about learners’ efficacy and the teaching and learning environment at the university including 15 items like “I feel depressed if I fail to answer in front of the other gender,” and “mixed-gender class environment encourages competition among all the students.” The survey was designed on a Likert scale with four choices, namely, (1) Strongly disagree, (2) Disagree, (3) Agree, and (4) Strongly agree. After completing the construction of the questionnaire, the content validity was verified by presenting it to five reviewers specializing in psychology and education, to ask their views on the questionnaire statements and their relevance to students, and their relevance to what was set to be measured. The scale was modified based on their opinions. Cronbach’s alpha was calculated, and it was 0.69 and it is an acceptable reliability coefficient.

Teachers’ survey

For the teacher’s survey, the first part includes sociodemographic variables like gender, age, experience, nationality, qualification, college, and academic rank. The second part of the survey deals with the perspectives of teachers on the learners’ self-efficacy and academic achievement in the mixed-gender classroom. It consists of 17 question items like “I encourage both genders to participate equally,” and “female learners are more active than boys during the lecture.” The survey was designed on a Likert scale with four choices, namely (1) Strongly disagree, (2). Disagree, (3) Agree, and (4) Strongly agree. After completing the construction of the questionnaire, the content validity was verified by presenting it to five reviewers specialized in psychology and education, to ask their views on the questionnaire statements and their relevance to students, and their relevance to what was set to be measured. The scale was modified based on their opinions. Cronbach’s alpha was calculated, and it was 0.73 and it is an acceptable reliability coefficient.

The interview questions

Some students and teachers were randomly chosen for the interview. The interview questions consist of three questions for the students, such as “what’s the role of culture in developing self-confidence?” and six questions for the teachers, such as “how can both the genders be motivated to perform confidently in the classroom?” and “in your views, how can teachers create an environment of competition and learning among both genders?”

Data analysis

The data were analyzed using the SPSS program (Version 26), and the interview questions were manually analyzed to extract the main themes from the teachers’ and students’ responses. Missing data were imputed when necessary in a random manner. Only a very small proportion of the data were missing (<2% overall). The normality distribution of the data was verified before the analysis by calculating the skewness and kurtosis coefficient, and their values were very close to zero (0.213 and 0.367). This indicates that the data distribution was close to the normal distribution. Outliers were also examined, and no outliers were found, so, all participants’ responses were considered when analyzing the data. We used many statistical techniques including means, standard deviations, correlation, *T*-test, and Cohen’s *d*.

Results

Regarding the research questions No. 1, 3, and 4, we analyzed the responses of the students by using mean and standard deviation. The results are given in the [Table 1](#).

School environment

The results demonstrate that both genders were comfortable in segregated classes. For example, “I was comfortable in a single-gender learning environment” the student’s approval was very high on this item, i.e., 4.21/5.00, which led them to participate actively in the classroom activities, group work, and competitive studies, and ultimately resulting in achieving high scores in school. For example, most students reported that “I enjoyed working in a group,” “I performed well in my studies when I was in school.” with an average of 3.93/5.00.

Socio-cultural environment

According to the results, the students reported that the social restrictions discourage them from mixing with the opposite gender in classroom activities and oral discussions. For example, “In my culture, girls are not allowed to speak more in front of the boys” with an average acceptance of 3.87/5.00. Both genders also affirm that though their culture does not restrict mixed-gender classes, most of the students prefer to study in a segregated classroom. For example, “I prefer to study in a single-gender class” was approved by 3.46/5.00. Many tertiary learners are even shocked to see gender-mixed classes as an initial experience in the university, which also impacts learners’ efficacy and motivation. Consequently, the students realize

TABLE 1 Responses of the study sample to the areas of the questionnaire in all its items.

Area	S. No.	Statement	Mean	SD	Percentage	Agreeable level
School environment	1	I performed well in my studies when I was in school	3.93	1.09	78.60	High
	2	I participated actively in school activities	3.57	1.40	71.40	High
	3	I never felt shy to answer teachers' questions in school	3.72	1.24	74.40	High
	4	I was competitive in school	3.79	1.36	75.80	High
	5	I was comfortable in a single-gender learning environment	4.21	1.22	84.20	Very high
	6	I scored good grades in school	3.91	1.11	78.20	High
	7	I enjoyed working in a group	4.03	1.20	80.60	High
The average of the first field (school environment)			3.92	0.73		High
Socio-cultural environment	8	I was shocked to see boys and girls studying in the same class	3.10	1.47	62.00	Medium
	9	My culture does not allow me to study in a mixed-gender class	2.94	1.33	58.80	Medium
	10	There are more boys in my class	2.98	1.47	59.60	Medium
	11	In my culture, girls are not allowed to speak more in front of the boys	3.87	1.40	77.40	High
	12	Some of my cultural rituals and social norms do not provide an opportunity to study at home	3.00	1.44	60.00	Medium
	13	Social restrictions in my society discourage mixing with the other gender	3.47	1.34	69.40	High
	14	My culture prefers separate classes for gender	3.33	1.54	66.60	Medium
	15	I prefer to study in a single-gender class	3.46	1.52	69.20	High
The average of the first field (University and Omani culture)			3.25	0.82		Medium
Self-efficacy and teaching and learning environment in university	16	I believe I can achieve the goals that I have set for myself	2.83	1.46	56.60	Low
	17	In general, I believe I can score higher grades in my assessments in a mixed-gender classroom	2.29	1.44	45.80	Low
	18	When facing a difficult task, I am certain that I will accomplish it	3.79	1.38	75.80	High
	19	I feel depressed if I fail to answer in front of the opposite gender	3.75	1.41	75.00	High
	20	I can successfully overcome many learning challenges in a mixed-gender classroom	3.64	1.32	72.80	High
	21	I am confident that I can participate efficiently in many classroom activities	3.38	1.49	67.60	Medium
	22	Compared to the opposite gender, I am confident that I can do most tasks efficiently	2.83	1.57	56.60	Medium
	23	I learn better in a mono-gender classroom	3.89	1.50	77.80	High
	24	A mixed-gender class environment encourages competition among all the students	3.88	1.37	77.60	High
	25	I like to be recognized as the best student among both genders	3.35	1.36	67.00	Medium
	26	I get enough opportunity to participate in the mixed-gender class	2.89	1.38	57.80	Medium
	27	The teacher provides an opportunity for both genders to participate in the class equally	3.06	1.46	61.20	Medium
	28	There is enough interaction between boys and girls in-class activities	2.54	1.39	50.80	Low
	29	The classroom activities at university help me improve my knowledge.	3.31	1.51	66.20	Medium
	30	The university learning environment helps me to be competitive in my studies	3.67	1.21	73.40	High
The average of the first field (University and Omani culture)			3.34	0.58	66.80	Medium
The Average of the questionnaire as a whole			3.46	0.48	69.20	High

TABLE 2 Responses of teachers on the teachers' questionnaire.

S. No.	Statement	Mean	SD	Percentage	Agreeable level
1	I feel comfortable teaching in mixed gender classes	4.33	2.10	86.60	Very high
2	I encourage both boys and girls to participate equally	4.15	0.87	83.00	High
3	In my class girls do better than boys	4.41	1.54	88.20	Very high
4	The majority of students in my class are boys	2.75	0.98	55.00	Medium
5	Girls are more responsive in my class	4.06	2.01	81.20	High
6	Most of the girls in my class do their homework regularly	3.98	1.42	79.60	High
7	Girls score better than boys in my class	4.22	1.34	84.40	Very high
8	Mixed gender classes encourage competitive spirit	2.65	0.76	53.00	Medium
9	Students' performance improves in mixed gender class	2.68	1.11	53.60	Medium
10	I prefer gender segregated classes	2.47	0.65	49.40	low
11	Mixed gender classes discourage students' active participation in class	3.87	1.22	77.40	High
12	Student communication is either limited or controlled in my class	4.31	1.28	86.20	Very high
13	Mixed classes have little or no effect in building confidence in both the genders	3.66	1.43	73.20	High
14	Boys participate actively than girls in my class	2.12	0.81	42.40	low
15	Girls are more regular in attending the classes than boys	4.03	1.08	80.60	High
16	Both the genders spend most of the class time passively	2.77	1.14	55.40	Medium
17	Students native culture does not allow mixing of the two genders	4.26	0.35	85.20	Very high

that the socio-cultural environment not only affects their self-efficacy and motivation but also has a negative effect on their academic achievement.

Self-efficacy and university teaching and learning environment

According to the average of the results, the students have a medium level of self-efficacy that is 3.34/5.00. Both genders are aware of the fact that mixed-gender classrooms provide them with a competitive learning environment. For example, "A mixed-gender class environment encourages competition among all the students," with an average of acceptance of 3.88/5.00. However, both genders emphasize that they have high self-efficacy in mono-gender classrooms. For example, "I learn better in a mono-gender classroom," with an average of 3.89/5.00. As a result, there is very limited/no interaction between both the genders during the classroom activities. For example, "There is enough interaction between boys and girls in-class activities," with an average of 2.54/5.00. Also, students feel uncomfortable if they are unable to respond successfully in the presence of the other gender. For example, "I feel depressed if I fail to answer in front of the opposite gender," with an average of 3.75/5.00. Ultimately, both genders believe that they will not be able to achieve high scores in the assessments, such as "I believe I can score higher grades in my assessments in a mixed-gender classroom," with an average of 2.29/5.00.

Both genders acknowledge that the university teaching and learning environment provides them with a better and more

competitive learning environment, for example, "The university learning environment helps me to be competitive in my studies," with an average of 3.67/5.00. The learners find that the learning environment at the university is conducive to improving their knowledge. For example, "The classroom activities at university help me improve my knowledge." The learners agree that the teachers are very supportive to both genders learning at the university. For example, "The teacher provides an opportunity to both genders to participate in the class equally," with an average of 3.06/5.00.

Interviews with students were also analyzed, and these interviews showed that the transition from education in a same-gender school to university education alongside the opposite gender represents an obstacle to their academic achievement; that this transition has negatively affected their participation in class in front of the opposite gender; and that many of them prefer not to speak in front of the opposite gender because they feel ashamed and embarrassed.

"Sometimes, I cannot participate in the class because of some boys or girls."

"Yes, because boys are in the class."

"Yes, the presence of boys."

"Yes, there are many girls in my class."

Regarding the results of research question No. 2, we analyzed the responses of the teachers by using mean and standard deviation. The results are given in the table below.

The results displayed in Table 2 indicate that most teachers do not have anxiety or obligation to teach mixed-gender classes. Moreover, they encourage both males and females to participate

TABLE 3 The significance of the differences between male and female students on the scale dimensions as well as on the total score.

Dimensions	Group	Number	Mean	SD	T-value	Sig.	d
School environment	Male	32	3.63	0.82	-2.75	0.01	0.54**
	Female	85	4.03	0.66			
Socio-cultural environment	Male	32	3.16	0.75	-2.35	0.01	0.88**
	Female	85	3.86	0.83			
Self-efficacy and teaching and learning environment in university	Male	32	3.38	0.67	-1.85	0.05	0.86**
	Female	85	3.91	0.55			
Total	Male	32	3.39	0.57	-2.35	0.01	1.05**
	Female	85	3.93	0.45			

** Significant at (0.01).

equally. Most teachers believe that, compared to male learners, female learners perform better and are more engaged and responsive to different learning situations. The teachers reported that girls are more responsible for completing home tasks and assignments and achieve higher grades compared to the opposite gender. However, some of the language teachers have a different opinion. Teachers were divided on the positive effect of mixed-gender classes and their effect on academic achievement.

Nearly all teachers opt for gender-mixed classes compared to gender-separate classes. Half of the teachers declined the idea that co-education has a negative effect on the classroom learning environment and students' communication with the teacher. However, the other 50% reported that the combined classes lead to limited or no communication between the opposite genders for socio-cultural reasons. Most teachers believe that despite the challenges, students are motivated and have self-efficacy for learning.

Regarding class participation, the teachers reported that both genders are active in learning in the classroom and that none of the genders is passive in the presence of the opposite gender. Evidently, the teachers observed that the female learners were more vigilant and punctual in attending lectures. Lastly, all the teachers agreed that the students have socio-cultural restrictions which prohibit them from mixing freely with the opposite gender in the class during different classroom activities.

Interviews with teachers were also analyzed, and these interviews showed that many students lack confidence in mixed-gender classes. Most of them agreed that the reason for the lack of confidence, and the unwillingness to speak in the classroom is due to the presence of the opposite gender.

"Many students lack confidence for many different reasons. One important reason is they feel uncomfortable in front of students of the other gender. (USA)"

"Yes, they often complain that in mixed classes they don't feel comfortable expressing themselves. However, I

believe in most cases this could be used as an excuse not to speak in English and/or their lack of commitment. (Italian)"

"It is true that students lack confidence. I believe the mixed class is a means to build confidence and overcome their fear, shyness, and inhibitions. (Indian)"

Regarding the results of the research question No. 5, we analyzed the responses of the students by using a *T*-test after checking the terms of its use. The results are given in the table below.

It is evident from Table 3 that there are statistically significant differences at the level of 0.01 between male and female students of Dhofar University regarding effective participation in the school environment, the effect of socio-cultural environment, and self-efficacy. The differences were in favor of female students, which means that female students were more actively participating in and completing both in- and out-of-class activities than male students. Moreover, there are statistically significant differences between both genders in terms of the effect of the socio-cultural environment on their learning at university. This confirms that the mixed-gender learning environment has a negative impact on female students, who were better than male students in single-gender schools, while positively affecting female students in terms of classroom participation and interacting in mixed classes at the university. There were significant differences in the self-efficacy of male and female EFL learners. Evidently, female learners have higher self-efficacy than male students at university.

It was evident from the interviews with teachers that female students were more effective in the classroom in the university environment.

"Girls are more effective in the class than boys. Girls come earlier to the class and have higher scores than boys. (Turkish)"

"Girls are more aware of their academic achievement, and they have higher motivation in the class. (Indian)"

“Mixed-gender classroom restrict the participation of male students. Male students [show] less participation in the activities and communications in the classroom activities. (USA)”

Many teachers justify these differences according to the cultural and socio-cultural factors.

“To a certain extent performing or expressing shyness is culturally oriented among both the genders. (Indian)”

“Yes, culture is one of the main obstacles contributing to shyness among both the genders. (Indian)”

Discussion

After the detailed analysis of the data collected through questionnaires and interview questions, the results indicated that both male and female students were more comfortable and performed better in segregated classes. Moreover, they participated actively in the classroom activities, group work, and competitive studies, which ultimately resulted in achieving high scores in school. In university, the students reported that the social restrictions discourage them from mixing with the opposite gender in classroom activities and oral discussions. Both genders also affirm that their culture does not restrict mixed-gender classes. These results are due to the influence of cultural and social factors of the customs, traditions, and values of the Omani society, which effectively limit the mixing of the genders.

The socio-cultural learning theory, specifically the work of [Vygotsky \(1986\)](#) and [Lave and Wenger \(1998\)](#), accentuate that social interactions are at the heart of learning and cognitive development ([Driscoll, 1994](#)). Differences in cultures also incorporate different worldviews. Being aware of such differences helps learners understand and appreciate “different beliefs, behaviors, and values” and interact more effectively with each other ([Bennett and Bennett, 2001](#)). This correlates with [Kim and Bonk \(2002\)](#) who employ the notion of culture framework for analyzing cultural differences in the context of cross-cultural learning environments. [Yang et al. \(2010\)](#) also found that we need to be aware of the “blending effect” of cross-cultural learning environments, especially with participants who have the same native language or are from the same geographic region after spending some time closely working together.

EFL teachers found female learners more vigilant, responsive, and engaged in learning compared to male students studying under similar learning conditions. This result is in agreement with the results reported by [Harinarayanan and Pazhanivelu \(2018\)](#), which indicate that female learners have a better image of the learning environment than male students, and they take more advantage of educational resources (libraries and laboratories), as well as educational activities in comparison

to male learners. Teachers can also contribute to developing a positive and competitive learning environment to encourage and engage both genders for equal and active participation in learning.

EFL teachers have reported that the majority of female students have high self-efficacy, motivation, readiness for learning, and active participation in academic and extracurricular activities as compared to male learners ([Namaziandost and Çakmak, 2020](#)). However, both genders believe that they are confident enough to do different tasks independently and can attain higher grades in mixed-gender classrooms. This study has found out that both genders in a mixed-gender classroom learning environment have demonstrated an adverse effect on their learning, engagement, and academic achievement. Further, the analysis clarified that female learners have been greatly affected in a mixed-gender classroom, as they felt depressed, restricted, and least engaged with the opposite gender. They also felt that the learning environment is less competitive and conducive to learning compared to male learners, who were less affected in a university learning environment. In segregated classrooms and mixed-gender classrooms, Omani students exhibit a significant difference in self-confidence, academic performance, and self-efficacy ([Tuzlukova and Ginosyan, 2022](#)). Students with higher grades have demonstrated higher self-efficacy as compared to the average students ([Yasin et al., 2020](#)).

The socio-cultural environment has great influence in shaping learners’ self-efficacy, motivation, and confidence in learning in the Arab countries ([Song, 2019](#)). This study has found that social restrictions and cultural norms have discouraged learners from participating in classroom activities and different oral discussions. Many learners at a tertiary level were even shocked to see the opposite gender in the classroom since most of the learners studied previously in a mono-gender learning environment at school, which negatively affected their self-efficacy, motivation, and academic achievement. Both male and female learners, not only in the Dhofar region but also in the regions of Oman, generally have low self-efficacy and motivation for learning a foreign language ([Al-Mahrooqi, 2012](#); [Al-Maamri, 2014](#); [Al-Mahrooqi and Denman, 2018](#)). Omani EFL learners also showed different socio-cultural and emotional challenges while transitioning to the university learning environment ([Tuzlukova and Ginosyan, 2022](#)).

Both genders in the school learning environment participated actively in both academic and extra-curricular activities. The analysis demonstrated that female learners were found more vigilant compared to their male counterparts. Also, there is a significant difference for both genders for their active participation in the school and university learning environment. Overall, school environment, socio-cultural setting, and university teaching and learning environment have a significant effect on both genders’ self-efficacy and

the academic achievement of the students studying at Dhofar University.

The results further showed that there are statistically significant differences at the level of significance of 0.01 between male and female students of Dhofar University regarding effective participation in the school environment. The same holds true for the effect of socio-cultural environment and self-efficacy pertaining to both genders in the Omani EFL setting. That is, female students have higher self-efficacy and academic achievement than male students. These results may be due to the influence of cultural, social, and economic factors. Male students often tend to work to cover the economic costs and refrain from studying, so we often find that female students have higher academic achievement and get higher grades.

These results are in conformity with the findings of Huang's (2013) study, which indicated that female learners displayed higher language arts self-efficacy than males. But it differs from the results of Abdelrasheed et al. (2021), which indicated that between the ages of 16 and 18, males outscore females by the equivalent of 11.6 IQ points, which, in turn, is reflected in their academic achievement. These results also differ from the results reported by Fallan and Opstad's (2016) study, which accentuated the fact that female students have significantly lower self-efficacy level and self-efficacy strength than their male peers.

Conclusion

The current study aimed to discover the perceptions of EFL learners and teachers on the effect of gender, socio-cultural environment, and the teaching and learning environment on self-efficacy and academic achievement of tertiary EFL learners in a mixed-gender classroom. The effects showed that most of the teachers believe that, in comparison to boys, girls perform better and are more engaged and attentive in a mixed-gender learning environment. The lecturers stated that female learners are more responsive to the assigned tasks, activities, and assignments and obtain better grades compared to their opposite gender. However, some of the language teachers have a different opinion. The EFL teachers reported that both the genders are enthusiastic about learning in the classroom and none of the genders are passive in the presence of the other gender. The study also found that female students are more vigilant and punctual in attending lectures. Almost all of the EFL teachers agree that socio-cultural restrictions restrain them from mixing freely with the opposite gender within the class during classroom activities and discussions.

Additionally, our data demonstrate that both genders were delighted with gender-segregated teaching in schools, which encouraged them to actively participate in class activities, group

projects, and other academic pursuits. Each gender confirmed that they prefer to study in segregated classes, despite the fact that their tradition does not prevent them from doing so. Many tertiary students are even astonished to study in a co-educational classroom for the first time in college, which has a detrimental impact on students' efficacy and motivation. The students came to understand that their socio-cultural milieu not only had an adverse effect on their motivation and self-efficacy, but also on their ability to succeed in school. The students' skill level is moderate.

These results show the need to motivate male students, take into account individual differences between students according to their abilities, and take into consideration the influence of cultural factors and circumstances that may affect students' academic performance.

Limitations

Our study has several limitations, which can be profitably addressed to stimulate further research. First, the current study was conducted at a private university in the Sultanate of Oman's southern region, which has its own traditions and culture. Second, our study is focusing on self-efficacy, academic achievement, and socio-cultural dimensions. Moreover, the sample of the current study constitutes EFL students studying at the tertiary level in a university with diverse linguistic and cultural backgrounds. Most of the learners were from a mono-gender learning background at school. One of the limitations of the current study is that the teachers are from different cultures; some of them are from Arab countries and some are from western countries, and this may be one of the factors that needs to be studied for its impact on students in future studies. The current study was also conducted during the spread of the COVID-19 pandemic, and the accompanying precautionary measures and the transition from traditional education to distance education.

Scientific implications

Future studies can focus on EFL learners studying at different levels in universities. Different psychological variables like self-efficacy, self-concept, learner autonomy, self-regulated learning, psychological wellbeing, and social variables like social intelligence, social skills, and empathy can be investigated concerning the mixed-gender learning environment. The current study focused on the learners from a single-gender classroom environment in schools. However, future research can target learners who study in mixed-gender classrooms in schools. Moreover, future studies can focus on how the self-efficacy can be developed by male students in the university context. A study should be conducted on designing a program

to enhance self-efficacy among male university students in the Sultanate of Oman, as self-efficacy and Grade Point Average (GPA) of male students are lower than those of female students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

This study was reviewed and approved by Dhofar University. Written informed consent was obtained from all participants for their participation in this study. The treatment of the research participants was fully compliant with the ethical principles set out in the World Medical Association *Declaration of Helsinki* of 1975, as revised in 2008.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Effects of value and interest intervention on EFL student teachers' research motivation in the Chinese context

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Language teacher research is conducive to the development of teachers' teaching skills and professional careers. Thus, many English teacher education programs require student teachers to do research. However, some empirical findings suggest that English as a foreign language (EFL) student teachers lack research motivation. Consequently, finding suitable interventions to increase their research motivation has become increasingly necessary. In light of the importance of research motivation intervention, this study involved designing an experiment to identify the effect of a value and interest intervention including the sharing of positive research experiences to improve student teachers' research motivation. Quantitative questionnaires and qualitative semi-structured interviews were used to gather evidence on the change in student teachers' research motivation during the intervention. The interview data revealed that student teachers' research motivation was influenced by their belief in the value of research to their teaching practice. The experiment results suggested that student teachers' intrinsic and extrinsic research motivations both increased after the intervention. However, the intervention was not effective in curbing their failure avoidance tendency. Pedagogical implications of the results are discussed at the end of this article.

KEYWORDS

research motivation, motivation intervention, EFL student teacher, value and interest intervention, mixed methods approach

Introduction

Language teacher research (be it practitioner research or action research) helps language teachers interpret education policies and understand their teaching contexts and their students' learning needs (Gilliland, 2018). Teacher research may also develop teachers' analytical abilities and increase their confidence (Sowa, 2009; Borg, 2010). Put simply, doing research is beneficial for teachers' pedagogical practice and professional development (Xu, 2013; Hosseini and Bahrami, 2020; Peiser et al., 2022). Thus, the cultivation of research literacy has become a primary concern for both pre-service teachers' education programs and in-service teachers' training programs (van Ingen Lauer and Arieuw, 2022).

There is a consensus that motivation is among the most important affective-cognitive factors which influence learning, including the acquisition of research skills (Dörnyei and Ushioda, 2010; Yuan et al., 2016; Peiser et al., 2022). Studies on teachers' research motivation could reveal language teachers' perceptions of research and explain their engagement in research. There has been a surge in studies investigating the research motivation of language teachers (i.e., Borg and Liu, 2013; Xu, 2013; Yuan et al., 2016; Hosseini and Bahrami, 2020). Those studies reveal that language teachers are not actively engaged in research activities, which may negatively influence their teaching efficacy and professional development. Therefore, it might be advantageous to identify some useful interventions for promoting language teachers' research motivation. Finding suitable motivation interventions is especially urgent and necessary in China, which has the largest numbers of pre-service and in-service teachers in the world. Moreover, quality improvement is "the theme of teacher education development in China" (Rao, 2020, p. 95). One useful and effective way to improve teacher quality is to cultivate teachers' research skills (Bao and Feng, 2022). Thus, the enhancement of student teachers' research motivation is becoming an essential part of teacher education programs in China. Apart from its practical significance, motivation intervention research can inform motivation and psychological theories (Hulleman and Barron, 2016). Despite the theoretical and practical significance, motivation interventions have received scant attention in the domain of language teaching research.

To address the above-mentioned problem, the current study aimed to identify the effect of a value and interest intervention in enhancing English as a foreign language (EFL) student teachers' research motivation in China. In other words, this study is based on existing literature and especially the limitations of previous studies. The next section details the relevant studies on language teachers' research motivation and motivation interventions. Then the research question of this study is presented. What follows is a detailed description of the method of this study, including the participants and context, instruments to measure research motivation and the experiment design. Our results demonstrate increases in student teachers' intrinsic and extrinsic research motivation after the interventions. However, the value and interest intervention was not effective in helping participants overcome their negative disposition toward doing research. The implications of the results are discussed at the end of this article.

Literature review

Language teachers' research motivation

Research motivation refers to the desire and motive to participate in or withdraw from research activities (Deemer et al., 2010; Yuan et al., 2016; Bahrami and Hosseini, 2022). Several theories have been used to expound on the construct – namely, research motivation, including achievement theory, and self-determination theory (Deemer et al., 2010; Hosseini and Bahrami,

2020). These theories highlight that research motivation is composed of at least three components – intrinsic motivation, extrinsic motivation, and failure avoidance (Deemer et al., 2010; Hosseini and Bahrami, 2020). Intrinsic motivation represents one's internally driven inclination to do research, such as the aspiration for scientific truth. Extrinsic motivation is the external motive to conduct research, including the desire to gain the respect of colleagues and earn some financial rewards. Failure avoidance means negative feelings about research, focusing on "the reduced research involvement due to fear of failing" in research activities (Hosseini and Bahrami, 2020, p. 4). Different from intrinsic and extrinsic motivations, failure avoidance is the motivation to withdraw from research activities caused by the fear of negative outcomes.

To date, several attempts have been made to explore the status quo of language teachers' research motivation (e.g., Borg, 2007; Hosseini and Bahrami, 2020). These studies suggest that language teachers have low levels of motivation to do research (be it intrinsic motivation or extrinsic motivation). Particularly, they lack interest in doing research (Xu, 2013) and are unable to recognize the value of academic research and relevance of research to their teaching (Borg, 2009; Medgyes, 2017). The lack of research motivation among language teachers renders it important to find effective interventions to strengthen their motivation. In particular, against the backdrop of the teacher research initiative, the cultivation of research ability, including how to read and interpret published research and how to carry out one's own studies, has become a required goal for language teacher education programs (van Katwijk et al., 2019; Ndayimirije and Bigawa, 2020). That is, each student teacher is obliged to do research and must complete academic research to graduate at both the bachelor's and master's levels. A low level of research motivation would directly influence a student teacher's research engagement, the quality of their thesis, their research productivity, their well-being and even their future career development (Peng and Gao, 2019; Van Katwijk et al., 2021; Li and Zhang, 2022).

As presented in the Introduction, quality education policies in China require language teachers to be "teachers as researchers" and life-long learners (Rao, 2020). However, studies targeting teachers in China also demonstrate a lack of research motivation and assert the belief that teachers are duty bound to improve their teaching skills rather than research skills (Xu, 2013; Yuan et al., 2016; Bao and Feng, 2022). That is, more attempts should be made to find effective ways to increase student teachers' research motivation in China. Moreover, due to the large number of teachers in China and the emphasis on teacher quality in national education policies, studies in the Chinese context may have enormous implications for teacher education programs in other countries. The next section will review literature pertaining to motivation intervention.

Motivation intervention and relevant theoretical approaches

Motivation intervention research is of paramount theoretical and practical importance. Theoretically speaking, the relevant

studies can inform us of the components of research motivation and also help us build or modify relevant motivation intervention theories. Practically speaking, these studies can establish a direct link between theoretical motivation constructs and practical pedagogical outcomes (Lazowski and Hulleman, 2016). Moreover, successful interventions which extant studies have identified can be applied in educational practice. Motivation intervention has been embraced for a long time in the domain of educational psychology. Numerous studies have been devoted to seeking effective interventions to enhance students' learning motivation in education research (for a systematic review, see Lazowski and Hulleman, 2016). Recently, studies have also emerged regarding language learning motivation or academic motivation in general. For example, Alrabai (2016) investigates the extent to which the use of motivational strategies could boost EFL learners' language learning motivation. The interventions are six motivational strategies targeting "situation-specific learner motivational dispositions," such as students' learning autonomy and their perceptions of the usefulness of language learning (Alrabai, 2016, p. 24). Alrabai's results demonstrate a beneficial effect of the interventions on language learners' learning motivation and EFL achievement. Similarly, Nawa and Yamagishi (2021) design an experiment to probe the impact of an online gratitude journal intervention on university students' academic motivation. Their results are also positive, confirming the function of writing gratitude journals in improving students' academic engagement. To summarize, these studies reveal that successful motivation interventions could not only increase students' learning motivation but also result in more successful learning outcomes. However, there is a paucity of studies targeting research motivation interventions within the area of language teaching research, not to mention those in the Chinese context. As argued previously, EFL student teachers are not eager to do research, and their low level of research motivation is an urgent matter for teacher educators and policymakers to address in China.

According to Hulleman and Barron (2016), there are two main theoretical approaches to motivation intervention – that is, targeted interventions and comprehensive interventions. The major difference between the two approaches is the motivation types in question. Targeted interventions focus on intervening in one or two components of motivation. Differently, comprehensive interventions treat motivation as a unified construct and are intended to improve participants' motivation as a whole. Therefore, interventions following the targeted approach are more manageable and less demanding (Hulleman and Barron, 2016). Within a targeted intervention approach, there are four specific types of interventions: expectancy and control beliefs interventions, value and interest interventions, goal interventions and psychological cost interventions. Expectancy and control beliefs interventions are related to students' attributions of success or failure. Ideally, students should attribute academic success to a more stable factor – namely, the growth of abilities. That is, they should have a growth mindset, which contributes to higher learning motivation. In simple terms, the development of a growth

mindset is a major goal of expectancy and control beliefs interventions. Value and interest interventions target students' perceptions of the value of learning and their interest in learning. This intervention category is intended to lead students to recognize the intrinsic and extrinsic value of learning activities. Goals interventions focus on the use of goal-setting in learning. It is assumed that teachers should lead students to set reasonable goals and encourage them to develop specific behavioral plans. Psychological cost interventions target students' negative dispositions toward learning. This intervention category focuses more on the alleviation of students' learning anxiety.

Previous studies contend that language teachers are not keen on doing research mainly because they do not perceive research as a useful and urgent activity for language teachers (Yuan et al., 2016; Medgyes, 2017). In other words, they are not motivated to do research because they are not aware of its value and its relevance to their teaching or professional development. The present study adopted a targeted intervention approach to design an experiment to assess the effectiveness of a value and interest intervention involving role models sharing their research experience. The detailed research question is as follows: To what extent would the value and interest intervention influence EFL student teachers' research motivation? Both quantitative (i.e., questionnaire survey) and qualitative (i.e., semi-structured interview) data are used to answer this research question. As Creswell (2014) points out, a parallel mixed methods design (i.e., the combined use of quantitative and qualitative data to answer the same research question) would generate more reliable, comprehensive and sound results of the experiment.

Materials and methods

Participants and context

This study was conducted in the context of an MA program in English teacher education in a university in eastern China. The main objective of this 2-year program is to foster students' teaching and research abilities. After graduation, students can be certified to teach English in a secondary school. One requirement of graduation for them is to finish their MA thesis, which should be examined by three experts during the blind review stage. The experiment was carried out in a methodology course of this program in the autumn semester of 2021. Upon successful completion of this course, student teachers can gain a comprehensive understanding of quantitative research methodology and can adopt the suitable method to carry out their own study. To that end, student teachers were also required to read dozens of research papers in this course.

The participants of this study were 45 first-year MA students majoring in English education (44 females and 1 male). Forty students held a bachelor's degree in English language and literature, while five were non-English majors in their bachelor studies. Although some students had gained research experience

TABLE 1 Overview of the research motivation scale.

Categories	Items	Cronbach's alpha (pre-test)	Cronbach's alpha (post-test)
Intrinsic motivation	1; 2; 7; 11; 12; 14; 15; 18; 20	0.810	0.861
Extrinsic motivation	5; 6; 10; 16; 17; 19	0.660	0.854
Failure avoidance	3; 4; 8; 9; 13	0.768	0.844

TABLE 2 Details of the four interventions and four role models.

	Date of intervention	Years of doing research	Representative research outputs
Speaker 1	November 11, 2021	2	One research paper
Speaker 2	November 18, 2021	3	First prize in a teaching and research competition
Speaker 3	November 25, 2021	4	One research paper
Speaker 4	December 2, 2021	5	Four research papers

during their previous studies, all participants identified as novice researchers. Among those 45 participants, three were selected to participate in a semi-structured interview after the first and last interventions. That is, we used the results of the questionnaire, which participants completed before the experiment, to choose one student teacher with high research motivation (Laura), one with medium research motivation (Eva) and one with low research motivation (Emma) as interview participants to enlarge the representativeness of the qualitative data. The names of the three interviewees used in this article (i.e., Laura, Eva and Emma) are pseudonyms. All the student teachers consented to participate in this study.

Instruments

Two instruments were used in this study: questionnaire and interview. The questionnaire was the research motivation scale (RMS), developed by Deemer et al. (2010), to measure participants' pre-test and post-test research motivation (see Supplementary Appendix S1). This scale was originally developed for students majoring in natural science and was later validated by Hosseini and Bahrami (2020) to test language teachers' research motivation. The RMS was arguably suitable for our participants. As shown in Table 1, it contains 20 items encompassing three motivation components: intrinsic motivation, extrinsic motivation and failure avoidance. The 20 items are scored on a five-point Likert scale (1 = strongly disagree and 5 = strongly agree). One thing to note is that the word *colleague* in some items sounds awkward to Chinese students because they prefer to use *classmate*

to refer to each other. Therefore, we changed *colleague* to *classmate* when administering the RMS. This scale had high reliability in the two tests since Cronbach's alpha of the three motivation categories was above .6 (see Table 1). To minimize the effects of practice, the sequence of items was different in the two tests. As for the two semi-structured interviews, their outlines are listed in Supplementary Appendix S2.

Research design

This study adopted a pre-experiment design – namely, a pre- and post-test design. Following an interest and value approach, this study used four role models' sharing of their research experience as the motivation intervention. The role models were selected according to two criteria. First, they needed to have some outstanding research achievements. Three role models have published high-quality papers in refereed journals and one obtained the first prize in a teaching and teacher research competition (see Table 2). All the studies that these four role models have worked on are closely related to language teaching and learning and/or teacher development. Second, to make the role models' experience sharing compelling for our participants, young researchers who had been doing research for 2–5 years were chosen (see Table 2). This study contained four interventions, whose details are shown in Table 1 and Figure 1. To accentuate the roles of value and interest in the motivation intervention, the four role models were required to emphasize three points as the main contents of experience sharing: (1) their own understanding of research; (2) the reason why they decided to undertake their research and (3) the benefits they have gained from doing research. Each intervention lasted for 30 min including a 10-min-long question-and-answer session. Before the intervention, the details of the experiment were shared with the four role models, including the aim of the experiment and the main contents of the experience sharing.

This study was carried out in three phrases. During the first phase (the pre-test phase), the RMS was administered to participants to gather evidence of their research motivation before the interventions. Participants were not told about the post-test to ensure that they would not deliberately remember their choices in the pre-test. The second phase was the intervention phase. The last phase was the post-test of research motivation which took place immediately after the last intervention. The same questionnaire (i.e., the RMS) was used in the post-test, but the sequence of items differed from that in the pre-test. Forty-five students participated in this study, but only 42 of them finished both the pre- and post-tests. To triangulate the results of the experiment, after the first and last interventions, semi-structured interviews were also conducted with three participants to collect qualitative data on changes in their views about research (see Figure 1). Thematic content analysis was performed on the interview data to ascertain changes in participants' research motivation (Oattes et al., 2022).

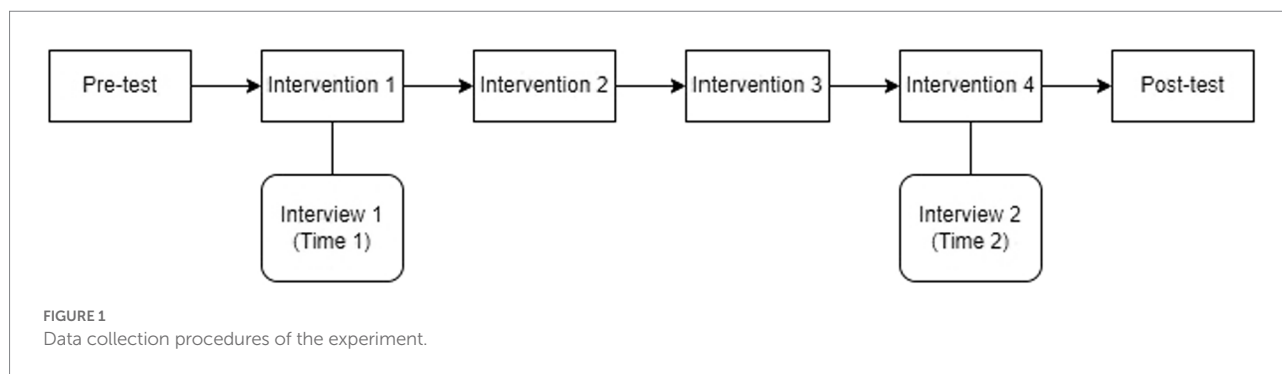


TABLE 3 Statistics of three research motivation categories in pre- and post- tests.

	Pre-test		Post-test		<i>t</i> (41)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Intrinsic	3.732	0.446	3.923	0.398	−3.222	0.002	0.4971
Extrinsic	2.937	0.558	3.156	0.698	−2.058	0.046	0.3176
Failure avoidance	3.533	0.615	3.410	0.620	1.606	0.116	0.2478

Results

Table 3 shows the descriptive statistics of participants' research motivation as measured by the scores of questionnaire items in the pre- and post-tests. On the whole, at the pre-test stage, our participants had a low level of intrinsic research motivation ($M=2.937$) since they tended to choose *disagree* (score of 2) or *neutral* (score of 3) for corresponding items. The mean score of items from the intrinsic motivation category was 3.732 (see Table 2). On average, the participants either chose *neutral* (score of 3) or *agree* (score of 4) for these intrinsic motivation items. This suggested that they had a mild level of intrinsic motivation. It should be noted that the descriptive statistics of items from the failure avoidance category must be interpreted differently. A higher mean score of these items suggests a higher tendency to withdraw from research activities caused by the fear of failure. Thus, according to Table 3, our participants were likely to avoid negative outcomes when they faced challenges and difficulties in doing research ($M=3.533$).

The above-mentioned profile of student teachers' research motivation could be confirmed by data from our first interview.¹ All three participants agreed that they were pursuing this MA program with the aim of being a teacher rather than a researcher.

¹ It should be noted that the first interview took place after the first intervention because we aimed to capture the change in participants' research motivation. As for retrospective questions related to students' original research motivation, the interviewers made it clear that interviewees should describe their true thoughts on research before the first intervention.

The following are some illustrative quotes from our interview data: "I chose to attend this MA program in order to get prepared for my teaching career" (Laura); "I am committed to be a teacher much more than a researcher" (Eva); and "the cultivation of teaching skills is the top priority for my MA study" (Emma). At time 1, only Laura was cognizant of the beneficial effects of doing research on her teaching. This fact was consistent with our quantitative results. More specifically, since some students (e.g., Laura) were motivated to do research by their belief that research could improve their teaching, the mean scores of items of the intrinsic motivation category were of a medium level ($M=3.732$). In contrast, Eva and Emma admitted that research is an "impractical, laborious and theoretical" thing for them. They were unclear about the necessity of doing research. For example, Emma claimed that "so far, I have not figured out the purpose for us to do research. For me, if it is not compulsory, I am not going to work on it." Since they believed that doing research is not that necessary and helpful, Eva and Emma even complained that their program's overemphasis on research literacy would take up time and energy which should be spent on training in teaching skills. They viewed the development of teaching and research skills as contradictory or competitive. Put simply, the three interviewees, and especially Eva and Emma, were not overly enthusiastic about doing research at time 1. Furthermore, the external benefits of doing research, such as earning a scholarship or drawing classmates' attention, were not appealing to them. Notably, they stated that they were overwhelmed by doing research. For example, Eva commented that "doing research is an extremely difficult thing which is far beyond my current capacity." Consequently, they tended to "avoid demanding research projects" (see the following quote from Emma).

I will definitely opt for an easy research project. If I find there are many unexpected challenges and difficulties in the project that I have chosen, I will quit... For one thing, I have not mastered a lot of research skills and I am sort of a novice researcher. For another, as a student, I cannot afford the failure of my MA research project.

After the intervention – that is, in the post-test phase, participants' research motivation presented a quite different

profile. Their intrinsic and extrinsic motivations both became higher in that they were more likely to agree with those items from the categories of intrinsic ($M = 3.923$) and extrinsic motivations ($M = 3.156$). Although compared with the pre-test, the mean scores of failure avoidance were lower, participants' failure avoidance tendency was still quite strong ($M = 3.410$).

Figure 2 shows differences in the three motivation categories between the pre- and post-tests. As Figure 2 clarifies, there were noticeable differences in intrinsic and extrinsic motivations, while failure avoidance tendency was identical on the two tests (see Table 3). Additionally, we utilized a paired samples t-test to check differences in participants' research motivation between the pre- and post-tests. Paired samples t-tests demonstrated that significant differences in intrinsic [$t(41) = -3.222$; $p = 0.002$; Cohen's $d = 0.4971$] and extrinsic motivations [$t(41) = -2.058$; $p = 0.046$; Cohen's $d = 0.3176$] existed between the pre-test and post-test. No significant difference between the two tests was observed for failure avoidance [$t(41) = 1.607$; $p = 0.116$; Cohen's $d = 0.2478$].

The data of from our second interview align with the quantitative results. After the interventions, all three interviewees formed a new understanding of the value of research. This is exemplified in the views of Eva and Emma: "Now, I come to realize that if the research topics are from our own teaching or learning experience, the research could be closely related to teaching and its results could also be translated into teaching practice easily" (Eva); "From the four speakers' experience sharing, I learned that research can be a down-to-earth and pragmatic thing and provide substantial practical implications for my teaching" (Emma). Once they recognized the value of research for their teaching, their inner interest in research was largely boosted with the claim that "now I am totally aware of the positive impact of research on my

teaching, and I am much more devoted to research in order to solve some practical problems" (Eva). Put simply, the intervention largely boosted participants' inner interest in research. According to the three interviewees, at time 2, they believed that the external benefits of doing research are rewarding, which may motivate them to engage more in research. However, they confessed that they were still scared of doing research on their own. They were "seized a lot by the fear of failure." The following quote from Emma may illustrate this point. That is, the interventions did not seem to drastically change their failure avoidance motivation.

Now I know that my research could be valuable and useful only if I choose a topic which is from my own experience or reflection. However, it is literally impossible for me to do so for my MA research project. The reason is simple: I do not have the ability and courage to explore one interesting and meaningful topic regardless of its difficulty. Otherwise, given my insufficient ability, it would probably turn out to be a failure. So, I will opt for a topic from the literature, which may not be so difficult and complex. My point is that compared with the value of the research topic, the difficulty of the research and its probability of failure would be given more attention. Furthermore, for the topic or phenomenon I am interested in, it is not necessary for me to explore it by myself, because I can read relevant studies which could also give me some takeaways for my teaching.

Taken together, the quantitative and qualitative results suggest that a value and interest intervention exemplified by research experience sharing is useful in enhancing EFL student teachers' research motivation, especially concerning their intrinsic and extrinsic motivations.

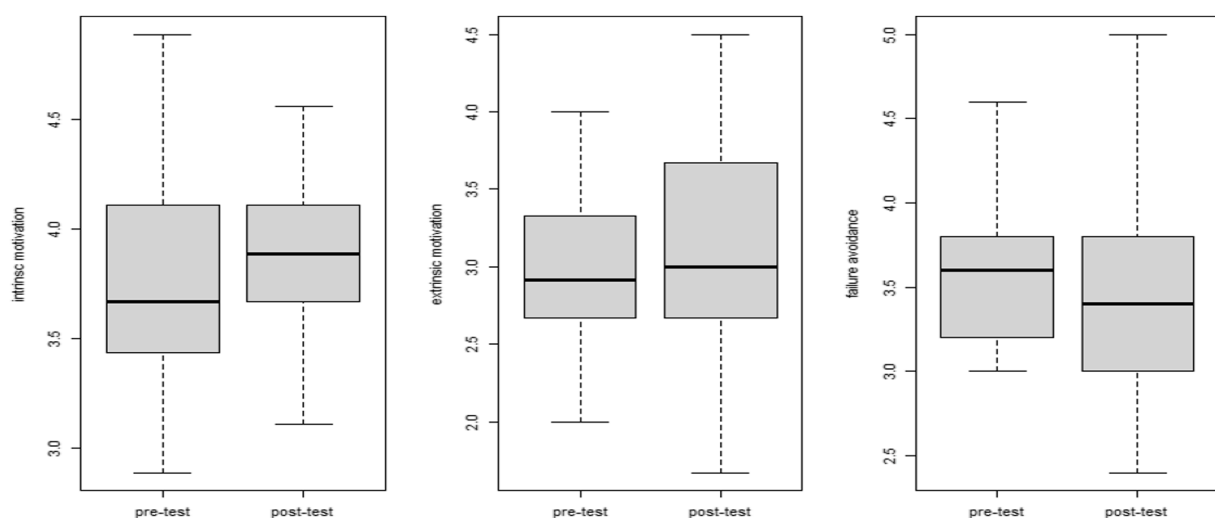


FIGURE 2
Differences in three research motivation categories between the pre-test and post-test.

Discussion

Before we interpret the experiment results, one interesting finding from our qualitative data is worth mentioning. That is, student teachers tend to hold the belief that the development of research literacy is a peripheral concern compared with the development of teaching skills in teacher education programs. This finding concurs with previous findings (e.g., van Katwijk et al., 2019; Bao and Feng, 2022). Arguably, it is fair to conclude that student teachers are more teaching-oriented and their attitudes toward research are deeply influenced by their beliefs about the relations between teaching and research. However, although teacher educators and researchers tend to assume that teacher research can empower them to teach in a better and more efficient way, most student teachers do not trust this assumption completely. As our data reveal, some even hold the view that the development of research skills occurs in competition with the development of teaching skills. Along similar lines, van Katwijk et al. (2021, p. 4) remark that “[a]lthough most teacher educators endorse the value of pre-service teacher research, a considerable number of pre-service teachers seem to be skeptical of its relevance for and direct use in the teaching profession.” In light of the above discussion, the ideal interventions to increase student teachers’ research motivation should center on cultivating the thinking that research is beneficial for teaching.

Our experiment results demonstrate the effectiveness of the value and interest intervention in improving student teachers’ research motivation. According to the above discussion, part of the reason to account for the success of the intervention is that the four interventions give participants a full and deep understanding of the value of doing research (Borg, 2010; Yuan et al., 2016; Medgyes, 2017). More specifically, participants came to recognize the value and benefits of doing research for their future teaching from the four role models, leading to an increase in their intrinsic motivation. Likewise, the external benefits obtained by the four role models enabled our participants to comprehend the practical benefits of doing research, such as finding an ideal job and winning a scholarship. Consequently, their extrinsic motivation also exhibited a rising tendency after the four interventions. However, the interventions were not effective for reducing their failure avoidance tendency. One possible explanation is that the value and interest approach we used does not deal with negative dispositions of research motivation. As Hulleman and Barron (2016) suggest, the psychological cost intervention approach seems more suitable to tackle failure avoidance. In this respect, our results lend empirical support to Hulleman and Barron (2016) motivation intervention theory. That is, the targeted intervention approach is only effective for some components of motivation depending on the specific approach being used. In this case, the value and interest approach was primarily helpful in enhancing student teachers’ intrinsic and extrinsic research motivations. This study further demonstrates the importance

of experimental work in building motivation theory. Hulleman and Barron (2016, p. 182) also assert that “additional experimental tests of theory offer a more rigorous test of the theory, moving beyond the information that can be learned from interviews, observations and correlational studies.” In a similar vein, more experimental work is warranted in the domain of language teachers’ research motivation.

Conclusion

This study attempted to clarify the effects of a value and interest intervention in enhancing EFL student teachers’ research motivation. Our analysis of the quantitative and qualitative data yielded two major findings. First, student teachers’ research motivation tends to be greatly influenced by their beliefs about the value of research for their teaching. If they assume that research is conducive to their teaching, they will have a greater inner interest in research (i.e., higher intrinsic motivation) and vice versa. Second, an intervention instantiated by research experience sharing is effective in improving student teachers’ intrinsic and extrinsic research motivations.

The results of this study have significant implications for teacher educators and education program administrators. Firstly, in terms of intrinsic motivation, teacher educators must determine ways to raise students’ awareness of the importance of research and the relevance of research to their future teaching career. For example, apart from experience sharing, leading students to read relevant literature on pedagogical implications may also enable students to realize the function of language teacher research, thereby increasing their intrinsic motivation. Meanwhile, professors could employ some output-oriented teaching methodologies, such as project-based methods, to help students realize the importance of research for their future teaching career and arouse their interest in carrying out research. The goal of enhancing student teachers’ intrinsic motivation is to make them resilient (Chu and Liu, 2022; Liu and Chu, 2022) in their future teaching career. Secondly, regarding extrinsic motivation, administrators should make full use of these external factors to motivate student teachers to do research. For instance, a more vigorous and viable assessment system which incorporates research achievements should be designed to encourage student teachers to devote more to research. They can also design some relevant policies and implement some useful initiatives to build a more thriving and vibrant learning and research community among students. To that end, peer learning may enhance student teachers’ motivation to do research.

As mentioned previously, this study further illustrates the importance of experimental work in building and testing motivation theory. However, it should be noted that there was a minor limitation regarding the experiment design of this study. Since the number of students is limited within English education programs in virtually all Chinese universities, it is impractical to divide participants into two

groups (experiment and control groups). That means the pre-experiment design had to be used in this study. Compared with the quasi-experiment design, the pre-experiment design may give rise to some erroneous variables, such as the influence of supervisors on participants' research motivation. Such erroneous variables, however, may not have influenced our results substantially because research motivation is quite a stable cognitive-affective construct. Additionally, the sample size of this experiment was quite small. Future studies may include more participants to enlarge the representativeness of the experiment results.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by School of Foreign Languages, Soochow University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

PB: conceptualization, data collection and analysis, writing, revision, and funding. LH: conceptualization, data analysis, revision, and funding. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1039473/full#supplementary-material>

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Latent profile analysis of university students' self-management and self-monitoring in the links among motivation, engagement, and wellbeing

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This study drew on Garrison's self-directed learning model for university students in a self-determination theory framework. We adopted a person-centered approach to explore the different combinations of self-management and self-monitoring. Using a sample of Chinese university students ($N = 142$), we obtained the following data *via* a self-report survey: autonomous motivation, controlled motivation, self-management, self-monitoring, academic engagement, and wellbeing. Latent profile analysis (LPA) distinguished three self-management and self-monitoring profiles, which are "very low/low," "high/high," and "low/very low." Profiles with a high level of self-management and self-monitoring were positively connected with adaptive outcomes and linked to autonomous motivation. Implications are outlined for theory and practice.

KEYWORDS

self-directed learning, higher education, self-management, self-monitoring, latent profile analysis

Introduction

As a traditional learning theory, self-directed learning (SDL) plays a vital role in formal, informal, and unformal learning (e.g., [Abd-El-Fattah, 2010](#); [Kim et al., 2019](#); [Zhu et al., 2020](#)). [Merriam et al. \(2007\)](#) emphasized that a critical assumption in SDL is that "people take the primary initiative for planning, carrying out, and evaluating their own learning experiences" (p. 110). Transitioning from high school to university is a critical challenge for students, which means profound changes in life and learning ([Quan et al., 2014](#)). For most university students, this was their first experience living away from their families and learning independently. Moreover, high school classes, where preparation for the college entrance exam takes a large part, tend to focus heavily on delivering and

acquiring specific knowledge in line with the competition for higher education (Sablina et al., 2018). On the contrary, university classes emphasize acquiring knowledge through the active participation of students rather than requiring students to acquire specific knowledge passively (Garn and Morin, 2021). SDL is therefore highly significant for university students.

Prior SDL research has mainly focused on the SDL process's external factors (e.g., external management) rather than internal factors, such as cognitive processing. To cover this gap, Garrison (1997) proposed an SDL comprehensive model that includes motivation (entering/task), self-management (control), and self-monitoring (responsibility). Garrison's SDL model emphasizes that learners' motivation could enhance their self-management and self-monitoring. Meanwhile, self-management and self-monitoring reflect the complex integration of external factors and cognitive processing, which could enhance SDL. A growing body of studies has examined Garrison's SDL model; however, these studies typically employed a variable-centered approach instead of a person-centered approach (Zhu et al., 2020). While the variable-centered approach has been proven valuable in identifying linear correlations, it is difficult to describe the complicated interaction between self-management and self-monitoring (Bergman and Andersson, 2010). Moreover, in self-determination theory, motivation is defined as a quality way, which varies from high autonomy to high control, and has different functions for learners' learning and psychological outcomes (Ryan and Deci, 2000). In other words, the combinations of the quality and quantity dimensions of motivation jointly contribute to students' learning and psychological state. Prior studies did not adopt a quality view of motivation that prevents teachers, researchers, and policy creators from understanding which kind of motivation matters for students' SDL. Also, researchers mainly focused on the factors that improve students' SDL, not the benefits of the SDL for students' learning and psychological outcomes, such as engagement and wellbeing (Zhu et al., 2020).

These research gaps have prevented us from understanding the different patterns of the interaction between learners' self-management and self-monitoring and the distinct prediction effects of motivation in the SDL context. Through a person-centered lens, we can investigate the sub-populations of the different combination patterns of self-management and self-monitoring to provide learners with suitable support. In this study, we used latent profile analysis (LPA), a model-based method (Pastor et al., 2007), to understand the different combinations of self-management and self-monitoring within individuals. In addition, we explored how different types of motivation predict self-management and self-monitoring profiles and whether differences existed in engagement and wellbeing with different self-management and self-monitoring profiles. The research model for this study is presented

in **Figure 1**. The research questions are formulated as follows:

- Q1. How can university students be classified according to their self-management and self-monitoring?
- Q2. How do different types of motivation predict profile membership?
- Q3. Do differences exist between the identified profiles with respect to their engagement and wellbeing?

Self-directed learning: Garrison's self-directed learning model

SDL is initially proposed by Tough (1971), and since then, it has been well researched in informal learning. Recently, more and more researchers have emphasized the importance of SDL in formal learning (e.g., school education and higher education; Abd-El-Fattah, 2010; El-Gilany and Abusaad, 2013; Maltais et al., 2021; Chen et al., 2022). The researchers proposed different theoretical models to account for the SDL based on their theoretical statements (Merriam et al., 2007). In 1997, Garrison put forward a multi-dimensional SDL model (see **Figure 2**) based on a "collaborative constructivist."

Garrison's SDL model includes three dimensions, which are "motivation (entering/task)," "self-management (control)," and "self-monitoring (responsibility)." Self-management is related to task contexts that are the external control of learning activities. This dimension is about setting learning goals and managing learning resources and support. According to Garrison (1997), self-management can contribute to adaptive learning outcomes in the learning process. The second dimension of Garrison's SDL model is self-monitoring. Self-monitoring reflects the cognitive and metacognitive components of the learning process. Self-monitoring focuses on learners who take the responsibility to monitor their learning activities. The third dimension of Garrison's SDL model is motivation. Motivation is related to the initiation and maintenance of the learning process. Garrison (1997) stated that motivation could be divided into entering and task motivation. Entering motivation is related to the tendency of learners to participate in the learning process. Task motivation is associated with continuity and focus on the learning process.

In Garrison's SDL model, self-management and self-monitoring are distinct but theoretically reciprocal. Recent studies have tested Garrison's SDL model's validity in different populations and learning contexts (Abd-El-Fattah, 2010; Zhu et al., 2020). For example, Abd-El-Fattah (2010) proved that self-management positively affects self-monitoring. Zhu et al. (2020) confirmed that self-monitoring facilitates self-management. However, these studies did not concern the complex reciprocal relationship between self-management and self-monitoring. Given these findings, examining the interplay of self-management and self-monitoring might have gone

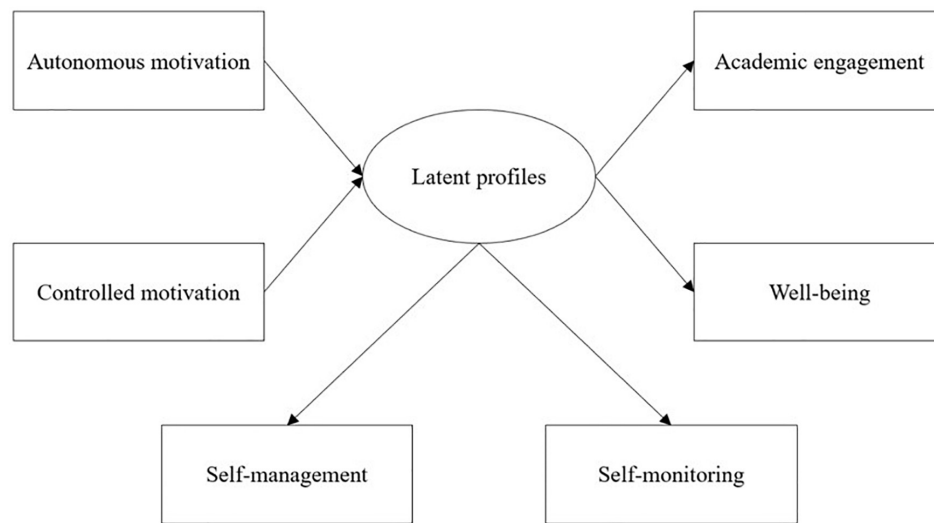


FIGURE 1
Research model.

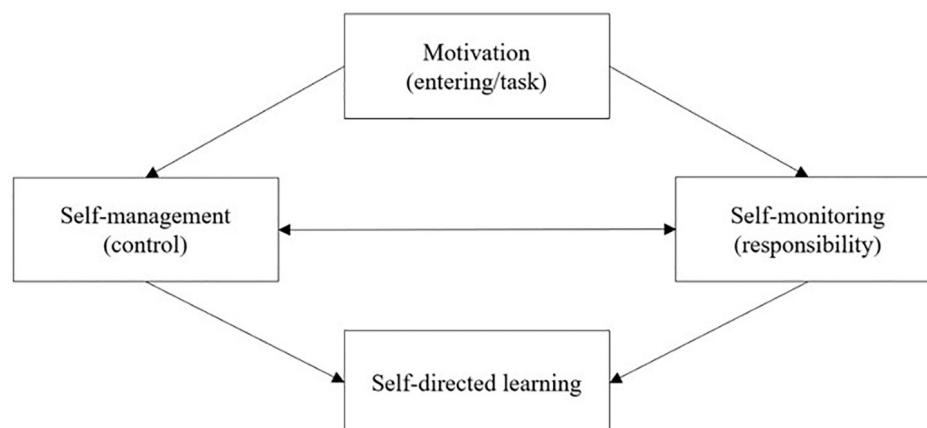


FIGURE 2
Garrison's SDL model.

unnoticed because prior studies hypothesized the unidirectional relationship between these two distinct but corrected variables. To cover this research gap, we employed a person-centered approach to examine the interplay of self-management and self-monitoring within individuals. Moreover, these studies proved a high correlation between self-management and self-monitoring (Abd-El-Fattah, 2010; Zhu et al., 2020). Garrison (1997) also emphasized that high levels of self-management may prevent learners from acquiring high levels of self-monitoring and adaptive learning outcomes. Therefore, in Garrison's (1997) point, it may not exist the high self-management and high self-monitoring profiles. Meanwhile, people with high self-management may have less desired outcomes than others.

Quality of motivation: A self-determination theory perspective

Motivation explains the reasons humans start and insisting behavior. Prior studies have been regarding motivation as a quantity vary. The quantity of motivation determines whether humans start or stop the behavior. However, based on empirical evidence, SDT explains motivation in a quality way, a continuum from high autonomy to high control (Ryan and Deci, 2000). Autonomous motivation means that people participate in activities because they think it is interesting (intrinsic motivation), view it as congruent with their value (integrated motivation), or believe it is essential (identified motivation). Controlled motivation means that people engage

in activities because they do not want to feel guilt or shame (introjected motivation) or avoid punishment (external motivation). Intrinsic motivation is the healthiest motivation, representing high integrated levels. Recently, some researchers argued that Ryan and Deci's (2000) motivation scale could not reflect a continuum from control to autonomy. Moreover, integrated motivation is difficult to be measured (Sheldon et al., 2017). Therefore, Sheldon et al. (2017) suggested a new motivation scale that includes intrinsic motivation, identified motivation, positive introjected motivation, negative introjected motivation, and external motivation. In this new motivation scale, autonomous motivation consists of intrinsic and identified motivation; controlled motivation consists of positive introjected, negative introjected, and external motivation. Researchers have proven that Sheldon et al. (2017)' motivation scale is better than Ryan and Deci's (2000) original motivation scale.

In SDT, autonomous motivation enhances adaptive outcomes (Ryan and Deci, 2000), while controlled motivation leads to maladaptive outcomes. Although Garrison (1997) emphasizes the importance of intrinsic motivation in "meaningful and worthwhile learning," Garrison's SDL model did not consider motivation in a quality way, leading to it not distinguishing the distinct effects of different kinds of motivation. In sum, we hypothesize that autonomous motivation will relate to more adaptive self-management and self-monitoring profiles. Also, the controlled motivation will relate to more maladaptive profiles. Redefine Garrison's SDL model in an SDT framework attribute to distinguish the functions of motivation in the SDL process.

The present study

This study aimed to extend Garrison's SDL model in a combination of quality and quantity views of motivation. Meanwhile, self-management and self-monitoring are reciprocally related, but in Garrison's (1997) opinion, self-management may facilitate self-monitoring and desired outcomes. Considering the complex relationship between self-management and self-monitoring, it is hard to describe this relationship in a variable-centered approach (e.g., linear regression analysis). To cover this research gap, we employ a person-centered approach to describe the interplay of self-management and self-monitoring within individuals. Moreover, the initial aim of Garrison's SDL model is to describe the SDL process in informal and unformal learning contexts. It did not explain whether university students can benefit from SDL. Zhu et al. (2020) suggested that future research could examine the effects of SDL on engagement. Meanwhile, wellbeing reflects a positive psychological state. Thus, we choose engagement and wellbeing as the outcomes of self-management and self-monitoring profiles.

To achieve the purpose of this study, first, we decided on the optimal number of self-management and self-monitoring profiles, second, we examined the distinct effects of autonomous motivation and controlled motivation on self-management and self-monitoring profiles, and finally, we explored the differences in engagement and wellbeing across different self-management and self-monitoring profiles.

Materials and methods

Participants

To achieve the purpose of this study, we conducted an online survey *via* the Wenjuanxing platform,¹ a web-based questionnaire platform in China. Specifically, the questionnaire's QR code was sent to potential participants who were university students, and all items were marked as necessary. To ensure these participants do not randomly select the answers, we set a wrong item ("I do not have a telephone"). A total of 150 participants scanned the QR code and completed the online survey. Excluding eight university students, the remaining 142 university students (66 males and 76 females) from different universities in China responded to all items.

Measures

The measures were translated from English to Chinese by the researcher, a native Chinese speaker and fluent in English. A back-translation from Chinese to English was conducted by a native Chinese speaker fluent in Chinese. Throughout the questionnaire, we used the same 1–5 Likert response scale (1 = strongly disagree; 5 = strongly agree).

Motivation

To assess different types of motivation, we used a 25-item questionnaire developed by Sheldon et al. (2017). Intrinsic motivation (e.g., "I study because I enjoy it"; Cronbach's coefficient alpha = 0.770), identified motivation (e.g., "I study because I strongly value it"; Cronbach's coefficient alpha = 0.788), positive introjected motivation (e.g., "I study because I want to feel proud of myself"; Cronbach's coefficient alpha = 0.725), negative introjected motivation (e.g., "I study because I would feel guilty if I did not do it"; Cronbach's coefficient alpha = 0.725), and external motivation (e.g., "I study because important people (i.e., parents, professors) will like me better if I do it"; Cronbach's coefficient alpha = 0.675) were assessed by five items, respectively.

¹ <https://www.wjx.cn/>

Self-management and self-monitoring

We assessed self-management and self-monitoring by adapting the SDL readiness scale (Fisher and King, 2010). Self-management (e.g., “I set strict time frames”; Cronbach’s coefficient alpha = 0.825) and self-monitoring (e.g., “I prefer to set my own learning goals”; Cronbach’s coefficient alpha = 0.746) were assessed by 10 items, respectively.

Engagement

We assessed four components (behavior, emotion, cognition, and agency) of engagement. To assess the behavioral engagement and emotional engagement, we used the five-item behavioral engagement scale (e.g., “I try hard to do well in school”; Cronbach’s coefficient alpha = 0.847) and five-item emotional engagement scale (e.g., “When I’m in class, I feel good”; Cronbach’s coefficient alpha = 0.847), which were developed by Skinner et al. (2009). To assess cognitive engagement, we used the four-item cognitive engagement scale (e.g., “When studying for this class, I try to generate my own examples of the concepts to help me understand them better”; Cronbach’s coefficient alpha = 0.840) as suggested by Senko and Miles (2008). To assess agentic engagement, we used the five-item agentic engagement scale (e.g., “During class, I ask questions to help me learn”; Cronbach’s coefficient alpha = 0.646), which was developed by Reeve (2013).

Wellbeing

To assess wellbeing, we used the subjective vitality scale (Ryan and Frederick, 1997). The subjective vitality scale includes seven items (e.g., “I feel alive and vital”; Cronbach’s coefficient alpha = 0.841).

Data analysis

We conducted LPA by Mplus 8.3 and decided the optimal numbers of profiles by Akaike information criteria (AIC), Bayesian information criteria (BIC), sample-size-adjusted BIC (aBIC), entropy, Lo–Mendell–Rubin adjusted LRT test (aLMR), and Vuong–Lo–Mendell–Rubin likelihood ratio test (VLMR). AIC, BIC, and aBIC are based on the model log-likelihood, and the lowest scores represent the preferred model. Entropy represents the precision of the cases classified into the profiles. aLMR and VLMR compare the k-profile model with the k-1 profile model. The significance of aLMR and VLMR representing the k-profile model is better than the k-1 profile model.

After identifying the optimal numbers of profiles, we standardized indicators by z-scores. We used the three-step method to examine the effects of motivation on self-management and self-monitoring profiles. We employed the BCH method to examine the effects of self-management and self-monitoring profiles on engagement and wellbeing. Although, there is no clear standardization of the magnitude

of indicators. We considered values of over ± 1 SD as very high/low, values of ± 0.5 to 1 SD as high/low, and values up to ± 0.5 SD as slightly above/below average.

Results

Preliminary analysis

Descriptive statistics and bivariate correlations among all measured variables are given in Table 1. Self-management and self-monitoring were positively related to intrinsic motivation, identified motivation, positive introjected regulation, negative introjected regulation, behavioral engagement, emotional engagement, cognitive engagement, agentic engagement, and wellbeing. Meanwhile, self-management and self-monitoring were negatively related to external motivation.

Self-management and self-monitoring profiles

We decided three profiles as the optimal numbers of profiles based on a range of statistical criteria presented in Table 2. Except the aBIC was slightly higher than the four-profile model, the three-profile model’s AIC, BIC, and aBIC were lower than other models. The *p*-values of aLMR and VLMR for the three-profile model were significant, while the four-profile model was not.

Figure 3 shows a graphical representation of the three profiles. Students in profile 1 showed very low self-management and low self-monitoring, so we called this “very low/low profile.” Students in profile 2 showed high self-management and high self-monitoring, so this profile was called “high/high profile.” Students in profile 3 showed low self-management and very low self-monitoring, so this profile was called “low/very low profile.”

Antecedents of self-management and self-monitoring profiles

The effects of motivation on self-management and self-monitoring profiles are presented in Table 3. Comparing “low/very low profile” and “very low/low profile,” there were no significant predictive effects of motivation. Comparing “low/very low profile” and “high/high profile,” the identified motivation ($B = 3.830^*$, $S.E. = 1.917$, $OR = 46.019$) and intrinsic motivation ($B = 2.959^{***}$, $S.E. = 1.035$, $OR = 19.275$) positively affect the “high/high profile.” Meanwhile, comparing “very low/low profile” and “high/high profile,” the identified motivation ($B = 2.896^{**}$, $S.E. = 1.077$, $OR = 18.095$) and intrinsic motivation ($B = 1.945^{**}$, $S.E. = 0.609$, $OR = 6.992$) also positively affect the “high/high profile.”

TABLE 1 Descriptive statistics and correlations among variables.

	IM	IDM	PIM	NIM	EM	SM	SMO	BE	EE	CE	AE	WB
IM	1											
IDM	0.553***	1										
PIM	0.381***	0.570***	1									
NIM	0.410***	0.604***	0.725***	1								
EM	−0.456***	−0.181*	0.052	0.006	1							
SM	0.778***	0.658***	0.428***	0.477***	−0.464***	1						
SMO	0.726***	0.667***	0.505***	0.552***	−0.280**	0.790***	1					
BE	0.739***	0.630***	0.340***	0.407***	−0.502***	0.798***	0.755***	1				
EE	0.770***	0.582***	0.331***	0.364***	−0.556***	0.820***	0.681***	0.806***	1			
CE	0.352***	0.555***	0.606***	0.642***	0.078	0.462***	0.443***	0.325***	0.374***	1		
AE	0.794***	0.547***	0.371***	0.361***	−0.329***	0.742***	0.686***	0.739***	0.744***	0.3660***	1	
WB	0.783***	0.583***	0.397***	0.445***	−0.503***	0.865***	0.768***	0.829***	0.809***	0.3260***	0.747***	1
M	3.831	4.063	4.097	4.136	3.114	3.825	3.739	3.739	3.707	4.049	3.847	3.849
SD	0.845	0.611	0.698	0.674	0.744	0.701	0.581	0.928	0.887	0.665	0.797	0.822

IM, Intrinsic motivation; IDM, Identified motivation; PIM, Positive introjected motivation; NIM, Negative introjected motivation; EM, External motivation; SM, Self-management; SMO, Self-monitoring; BE, Behavioral engagement; EE, Emotional engagement; CE, Cognitive engagement; AE, Agentic engagement; WB, Wellbeing.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 2 Fit indices, entropy, and model comparisons for estimated latent profile analysis model ($N = 142$).

	AIC	BIC	aBIC	Entropy	aLMR	p aLMR	VLMR	p VLMR	N for each profiles
1	556.873	568.697	556.041						
2	310.475	331.166	309.017	0.990	236.492	0.0000	−274.437	0.0000	53, 89
3	292.475	322.033	290.392	0.983	22.487	0.0002	−148.237	0.0001	48, 89, 5
4	291.584	330.010	288.877	0.897	6.456	0.1895	−136.237	0.1708	28, 5, 88, 21

AIC, Akaike information criteria; BIC, Bayesian information criteria; aBIC, Sample-size-adjusted BIC; aLMR, Lo–Mendell–Rubin adjusted LRT test; p aLMR, p -value for Lo–Mendell–Rubin adjusted LRT test; VLMR, Vuong–Lo–Mendell–Rubin likelihood ratio test; p VLMR, p -value for Vuong–Lo–Mendell–Rubin likelihood ratio test.

Consequences of self-management and self-monitoring profiles

Turning to the outcome, the differences in the mean level of engagement and wellbeing were tested. The mean levels of each outcome across the three-profile model and the statistical significance are presented in [Table 4](#) and [Figure 4](#). Behavioral engagement, emotional engagement, cognitive engagement, agentic engagement, and wellbeing were highest in the “high/high profile.” However, the differences in these outcomes between the “very low/low profile” and “low/very low profile” were not statistically significant.

Discussion

This study aimed to extend the understanding of the relationships between self-management and self-monitoring, which are essential elements in SDL. Moreover, we examined the antecedents and consequences of self-management and self-monitoring profiles.

We decided three profiles as the optimal numbers of groups based on a range of statistical criteria. Due to the high correlations between self-management and self-monitoring, we only found the “very low/low profile,” “high/high profile,” and “low/very low profile.” We did not find a profile with high self-management and low self-monitoring, or reverse. It was opposite to the opinion of [Garrison \(1997\)](#) that high self-management may not facilitate self-monitoring but corresponds with [Abd-El-Fattah’s \(2010\)](#) results. After identifying optimal profiles, we tested the antecedents and consequences of the self-management and self-monitoring profiles.

We found that students with intrinsic and identified motivation were more likely to be in the “high/high profile.” However, other kinds of motivations were not mattered. That is, these kinds of motivations did not make sense for the prediction of profiles. This result proved the view of SDT that not every kind of motivation matters. Autonomous motivation makes students become more self-management and self-monitoring. However, despite controlled motivation not making students less self-management and self-monitoring, it did not make students become high self-management or high self-monitoring. It emphasized the importance of autonomous motivation.

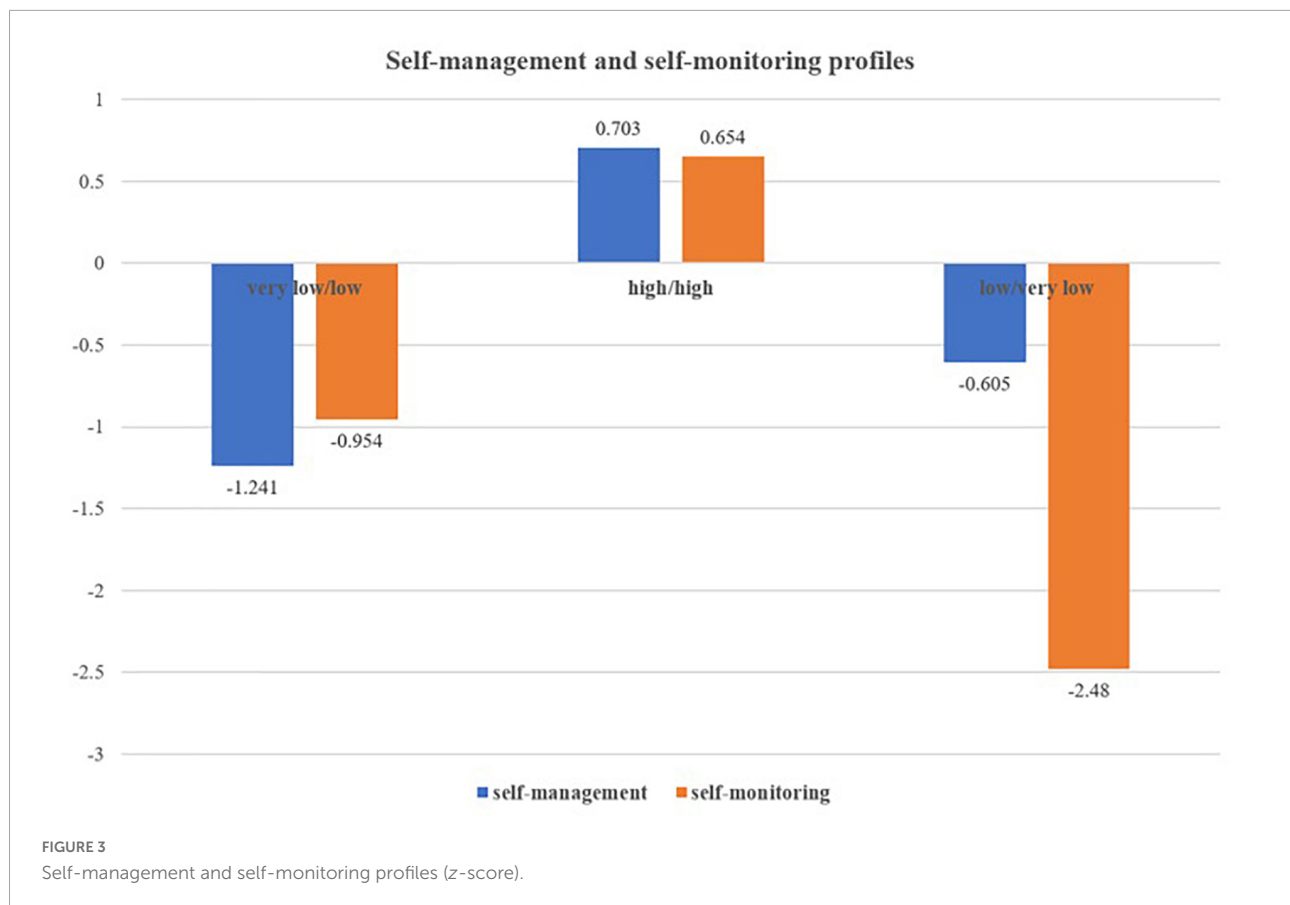


TABLE 3 Results of the effects of motivation on self-management and self-monitoring profiles.

	Low/very low vs. very low/low			Low/very low vs. high/high			Very low/low vs. high/high		
	B	S.E.	OR	B	S.E.	OR	B	S.E.	OR
IM	1.014	1.038	2.757	2.959***	1.035	19.275	1.945**	0.609	6.992
IDM	0.933	1.401	2.543	3.830*	1.917	46.019	2.896**	1.077	18.095
PIM	0.916	0.610	2.499	0.822	2.148	2.274	-0.094	2.228	0.910
NIM	0.583	0.671	1.791	1.747	1.458	5.735	1.164	1.317	3.202
EM	1.753	1.614	5.771	0.262	2.267	1.300	-1.491	1.372	0.225

IM, Intrinsic motivation; IDM, Identified motivation; PIM, Positive introjected motivation; NIM, Negative introjected motivation; EM, External motivation.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Moreover, we found that identified motivation is more likely to make students have high levels of self-management and self-monitoring than identified motivation. In SDT, intrinsic motivation is the healthiest type of motivation (Ryan and Deci, 2000). However, we examined self-management and self-monitoring in a formal learning context. University students were given established learning content and learning plans. It may need students' identified motivation more than intrinsic motivation to integrate external conditions.

Finally, we examined the differences in engagement and wellbeing among different self-management and self-monitoring profiles. We found that students with "high/high

profile" have higher engagement and wellbeing than others. It proved that self-management and self-monitoring are important for students' engagement and wellbeing. Moreover, this result was opposite to the opinion of Garrison (1997) that high self-management may not facilitate adaptive outcomes.

Implications for theory and practice

Our study offers theoretical and practical implications for the study of SDL. This study integrated Garrison's SDL model and self-determination theory through a person-centered lens.

TABLE 4 Results of the effects of self-management and self-monitoring profiles on engagement and wellbeing (z-score).

	Very low/low	High/high	Low/very low
BE	-1.057 ^b (0.745)	0.646 ^a (0.368)	-1.357 ^b (0.870)
EE	-1.084 ^b (0.759)	0.614 ^a (0.480)	-0.527 ^b (0.755)
CE	-0.537 ^b (1.228)	0.374 ^a (0.519)	-0.074 ^b (1.490)
AE	-0.884 ^b (0.944)	0.550 ^a (0.524)	-1.312 ^b (0.687)
WB	-1.148 ^b (0.686)	0.656 ^a (0.392)	-0.650 ^b (0.643)

BE, Behavioral engagement; EE, Emotional engagement; CE, Cognitive engagement; AE, Agent engagement; WB, Wellbeing.

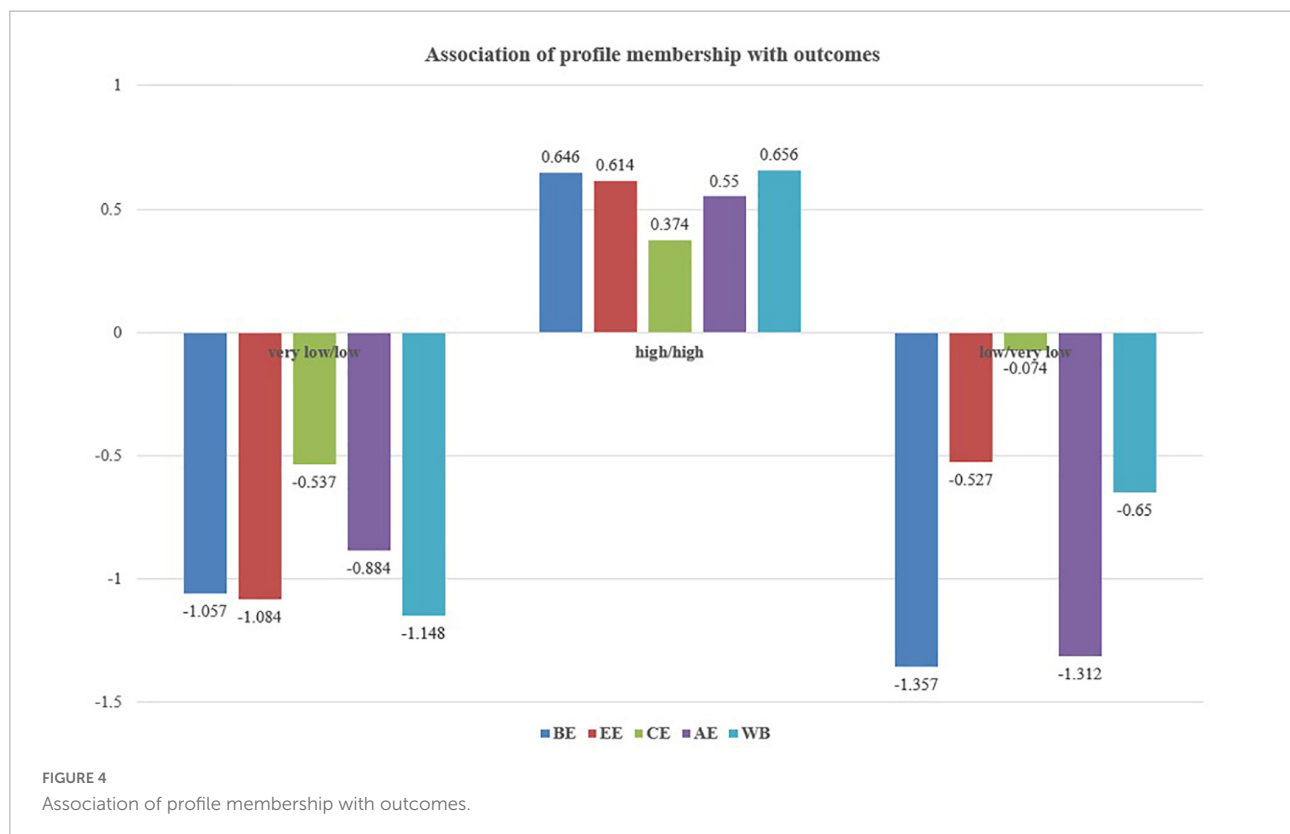
Our findings revealed that while the relations between self-management and self-monitoring are regarded as unidirectional in the prior studies (Abd-El-Fattah, 2010; Zhu et al., 2020), LPA provided evidence for the bidirectional relations between self-management and self-monitoring. Specifically, the existence of the very low/low and high/high profiles of self-management and self-monitoring highlights the reciprocal relationship between self-management and self-monitoring. The enhancement of self-management may contribute to the high levels of self-monitoring. Meanwhile, self-monitoring also promotes the development of self-management.

The application of these findings has the potential to enhance educational practices. Although university students are given established learning content and learning plans in

the formal learning contexts, they can have high levels of self-management and self-monitoring, which matter for their learning and psychological outcomes. It emphasizes the demand to enhance university students' SDL in formal learning contexts. Our study also showed that the combination of the quality and quantity dimensions of motivation matter for SDL. In other words, the quantity of controlled motivation does not matter for students' SDL. As teachers, they can enhance students' intrinsic and identified motivation to help students become more engaged and happier in the learning process.

Limitations and future directions

As for the limitations, first, we only used 142 university students to identify the profiles of self-management and self-monitoring, which may prevent us from finding more profiles and cannot ensure the validity of the results. Future research needs to put forward the study in large size of participants. Second, the relationships between motivation, self-management and self-monitoring profiles, engagement, and wellbeing were explored through cross-sectional research design. Therefore, no causal relationships could be inferred. Future research can take a longitudinal design to cover this gap. Finally, due to the high positive correlations between self-management and self-monitoring, we did not find high/low profiles. Future research



can add some other elements of SDL to explore different kinds of profiles.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Exploring the role of translators' emotion regulation and critical thinking ability in translation performance

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In recent years, the field of psychology has received more attention from researchers that work in the area of translation studies. This review set out to delve into the role of translation students' critical thinking, as a construct of cognitive psychology, and emotion regulation, as a positive psychological construct, in translation performance. The positive and significant relationship between translation students' critical thinking skill and their translation performance has been verified in the literature. Moreover, studies have revealed that emotion regulation and its regulator components, such as emotional intelligence, intuition, resilience, and professional expertise can significantly influence translation performance. This review can be beneficial for translation trainees, translation trainers, and curriculum designers to raise their awareness about the role of critical thinking and emotion regulation in translation studies.

KEYWORDS

critical thinking, emotion regulation, translation performance, psychology, translation studies

Introduction

Psychology is a very broad subject that mainly deals with human behavior, thoughts, reasoning, and perceptions. Psychology can be used in numerous issues that constitute daily life, including the examination of internal mental processes and the improvement of higher-order thinking skills to effectively cope with different aspects of life such as education. Therefore, psychology plays a significant role in our lives, regardless of our knowledge about it (Al-Jarf, 2022). It has been ordered into a few sub-branches, including clinical, cognitive, developmental, evolutionary, forensic, health, occupational, social, and neuropsychology. Centrally involved (among these branches of psychology) in translation studies is cognitive psychology. Due to the emphasis on internal mental processes, the cognitive approach caused a revolution in the science of psychology and became the dominant approach in psychology in the late 1970s (Wang, 2020). According to McLeod (2007) cognition refers to the knowledge. He asserted that psychologists examine cognition which is "the mental act or process by which knowledge is acquired" (p. 73). This branch

of psychology inspects internal psychological developments, including the way of thinking, perceiving, communicating, remembering, and learning. Investigating the role of cognition on internal mental processes and higher order thinking skills like critical thinking skills, the important effect of these skills on all aspects of our communication from listening to writing, and the important impact of these skills on the process of translation and the quality of the final product of this process have drawn the attention of investigators.

Critical thinking is considered a major and important construct of cognitive psychology. This primary area of cognitive psychology, despite its steadily increasing importance over time and its area of study, that is, the study of internal mental processes reflects a relatively new, stimulating, and very attractive research perspective (Wang, 2020). As Sternberg (1986) stated, critical thinking is “the mental processes, strategies and representations people use to solve problems, make decisions, and learn new concepts” (p. 3). There have been some investigations about the association between critical thinking and different kinds of cognitive abilities from writing to reading ability (e.g., Yildirim and Soylemez, 2018; Mbato, 2019; Bean and Melzer, 2021; Nejad et al., 2022). Moreover, critical thinking as an important component of cognitive psychology can have an important role in every process that involves cognitive and metacognitive skills such as translation. According to National Network for Translation, a competent translator must have various skills as: professionalism, networking skills, attention to detail, flexibility/adaptability, organizational skills, writing skills, general knowledge, analytical skills, subject knowledge, curiosity, excellent knowledge of the foreign language, IT skills, picking up new ideas quickly, good cultural awareness, love of reading and research skills. Most of these characteristics such as flexibility/adaptability, organizational skills, attention to detail, analytical skills, research skills, and curiosity require deep understanding and thinking skills (Azin and Heidari Tabrizi, 2016). Therefore critical thinking is significant in studying translation performance. This review aims to shed light on the studies of cognitive psychology to scrutinize the correlation between critical thinking skill and translation quality.

Translation students are constantly exposed to different types of texts which require them to be able to use critical thinking skills as well as translation skills simultaneously. Critical thinking skills govern the process from the beginning, from the time the translator starts reading the source text, until the end, which is the production of the end result, the target text. A translator who has the ability to think critically does indeed have the ability to examine her/his given choices and their implications. This translator makes choices pertinently and decides on how to use her/his various competencies. To achieve this, s/he should have the power of higher-order thinking, or in other words, have the ability to think critically. Critical thinking helps a translator to go further than just the surface of the text and to think deeply, have an overview of a text and find the whys and nature of the text. Therefore s/he can easily analyze, interpret, evaluate, and make decisions (Mohseni and Satariyan, 2011).

Translators are constantly dealing with a complex interaction between text, reader, and the first and second languages, and they need to understand the main idea and concept of the text that should be translated. In order to comprehend the main idea of the text and facilitate this complex interaction, they require critical thinking skill which is required for solving problems, making judgments, learning new notions, and controlling one's feelings (Saud, 2020). Critical thinking skill, as a cognitive skill, is used beyond the mere understanding of the main idea of the source text. Neubert (1997) argues that “in order to achieve a satisfactory target text, the established rules of correspondence between L1 and L2 need to be critically extended” (p. 20). Kussmaul (1995) believes that “criticality is not a talent given to the select few, but that as basic features of the human mind, anyone can be critical when they transfer source texts to target texts” (p. 52). Due to the important role of these skills in the process of translation and their high degree of contribution to the understanding of the concept of the text as an important step in the process of translation, it is important to delve into the association between critical thinking as an indispensable part of the translation process and the quality of the translated text as the final product of this process.

Another important element in translation is the translators' emotional states. Translators' positive emotions have crucial roles in translation. According to Derakhshan et al. (2022), the broaden-and-build theory supported positive psychology, and it justifies that experiencing positive emotional constructs, such as enjoyment, love, happiness, engagement, resilience, grit, self-efficacy, and emotional regulation “broaden people's momentary thought-action repertoires and build their enduring personal resources” (p. 2). Positive psychology, as a modern approach to learning of foreign language, has been expanded in recent years (e.g., Wang et al., 2021; 2022; Xie and Derakhshan, 2021). Emotion regulation is a related concept to positive psychology (Derakhshan et al., 2021). Gross (2007) also indicated that emotion regulation refers to “shaping which emotions one has, when one has them, and how one experiences or expresses these emotions” (p. 6). Another objective of this review is to investigate translation students' emotion regulation, the factors that regulate translator emotions, and their influence on translation performance. Studying these psychological features of translators and their effects on translation performance can pave the way for solving potential problems in translation performance and promoting its quality.

Review of literature

The concept of translation

The English term translation is taken from Old French, and it occurs between two unlike languages which are called source language (SL) and target language (TL); also, it might be either written or oral translation (Munday, 2016). In a similar vein, Pym (2014) refers to Start text “as the one we translate from,

and to the target culture as the translation produced; then translating is set of the process leading from one side to the other” (p. 1). Moreover, according to Newmark (1988) translation is “rendering the meaning of a text into another language in the way that the author intended the text” (p. 5). House (2015) mentioned that translation results from a linguistic-textual procedure, in which the source language is re-contextualized in another language. Erton (2020) stated that translation is the process of conveying messages across cultural and linguistic barriers, and it is remarkably communicative. Additionally, Jakobson (2004) proposed some definitions of translation for three types of translation, including intra-lingual, inter-lingual, and inter-semiotic. He defined intra-lingual translation as translating the verbal signs of the same language by using the other existing signs in that language. He also mentioned that inter-lingual translation is described as the employment of verbal signs in one language by applying the verbal signs of the other language that we are supposed to translate. Moreover, they asserted that inter-semiotic translation is the employment of verbal signs of one language by using non-verbal signs.

Tymoczko (2018) asserted that translation is considered a multifaceted language-related cognitive activity. According to Lefevere (1992), there are factors influencing the performance of translator's in translation, such as cognitive, metacognitive, emotional, and cultural factors. Accordingly, Alves and Gonçalves (2013) mention that verbalizing for communication will cause some alterations in the cognitive situation; moreover, translation can be explored from several points of view that can be linguistic, discursive, cultural, social, political, and emotional. Lahodinsky et al. (2019) also underscored the considerable skills for becoming a successful translator. He listed some features of good translators, including higher linguistic proficiency, extensive cultural background, analytical mind, higher proficiency in the subject matter, along with numerous significant potentials, such as outstanding memory, flexibility, and time-management skills. House (2015) stated that translation considerably depends on numerous extra-linguistic features. He mentioned that the relationship between linguistic-textual features and extra-linguistic contextual factors makes translation such a complicated process. The emergence of translation psychology during the 1990s changed the focus of investigators from the translation process to the translators and their individual cognitive and psychological differences (Jääskeläinen, 2012). Therefore, translators' cognitive and psychological constructs, as the causal factors of complexity in the translation process, have drawn the attention of many investigators (Mahdy et al., 2020).

Emotions have, in general, been indicated as a noteworthy feature in information processing in translation, and negative and positive emotions result in diverse processing styles (Rojo and Ramos, 2018). The emotional states of translators have also affected the creativity and quality of the translated text (Jääskeläinen and Lacruz, 2018). The regulation of emotional states develops the thinking process and attention span by the

enhancement of logical thinking and problem-solving skill (López and Naranjo, 2021).

The concept of emotion regulation

According to Gross and John (2003), emotion regulation refers to processes through which individuals control their feelings, such as resentment or apprehension. They mentioned that emotion regulation highlights the increasing, maintaining, or decreasing positive and negative emotional states. According to Gross (1998), emotion regulation is “the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (p. 275). Gross and John (2003) described emotion regulation as a cognitive model dealing with controlling one's own emotions (i.e., self-emotion regulation) without regard for controlling the feelings of others.

Two main emotion regulation strategies affecting individuals' behavior are cognitive reappraisal and expressive suppression (Gross, 1998). According to Gross and John (2003) cognitive reappraisal refers to “a form of cognitive change that involves construing a potentially emotion-eliciting situation in a way that changes its emotional impact” (p. 349). Bielak and Mystkowska-Wiertelak (2020) also mentioned that cognitive reappraisal includes the reinterpretation of the meaning of a stimulus that results in the regulating of the emotion. They mentioned that cognitive reappraisal, as a cognitive, modification strategy, is used for decreasing the response to negative emotions. On the other hand, Gross (1998) stated that expressive suppression “is a conscious inhibition of ongoing emotion expressive behavior” (p. 226). Gross (2015) noted that expressive suppression refers to not showing others what one is feeling. He asserted that it is a type of strategy that individuals employ to stop expressing negative emotions.

The relationship between emotion regulators and translation performance

Numerous translation researchers have recently approved the significance of translators' emotions for investigating translation development and have begun to inspect the influence of emotion on translators' performance (e.g., Hubscher-Davidson, 2018; Lehr, 2020; Hunziker Heeb et al., 2021). The statement that decision-making in translation is not simply the outcome of pure rational thought motivates investigators to explore the effect of psychological states on the translation process (Hubscher-Davidson and Lehr, 2021). In addition to the investigation of emotional causes in the translation environment, the latest research has focused on the translator's ability to regulate emotions when translating (Hoffmann et al., 2020). Cifuentes-Férez and Fenollar-Cortés (2017) investigated the effect of student translators' emotional management skills on translation

performance. They considered three constituents of emotional management skills, including emotion regulation, emotional expressivity, and self-esteem. They underscored the significance of emotion regulation in the quality of learners' translation performance. Their study implicated that translation students should practice hiding or inhibiting negative emotional states and responses to perform better in translation tasks. Using Gross and John (2003) Emotion Regulation Questionnaire, they showed that translators who consistently suppress their feelings outperform in translation, and the regulation of translators' emotions regularly affects their quality of performance. Moreover, their study indicated that the interaction of emotion regulation and emotional expressivity can significantly predict translation quality. It means that translators who inhibit expressing their negative emotions and inhibit their emotional states are more likely to have a qualified translation. Hunziker Heeb et al. (2021) found the significant effect of translators' emotion regulation on decreasing the cognitive load of translation. They argued that translators' positive and negative emotional states have large amounts of cognitive load during task performance, and regulating translators' emotions can inhibit them from producing translations with poor quality. Their study contributes to understanding how translators cope with the additional challenges of emotional aspects of their work and provide insights into how competencies such as emotion regulation might be included in the training.

Rojo (2017) highlighted the role of personality traits and degree of professional expertise, as two significant emotional regulators in determining the performance of translation. He asserted that only a few personality traits have been indicated as significant constructs in regulating translators' emotions during translation performance. He also asserted that intuition, emotional intelligence, and resilience are regarded as the emotion regulators of translators in translation performance (Rojo, 2017). His study also implicated that upgrading translators' ability to regulate emotions requires the awareness of the consequences of negative and positive emotions on translation performance and of the factors that can mediate the effects. Rojo and Ramos (2016) studied the impact of personality traits, such as resiliency, on translation performance. They repeated Lehr (2013) methodology. They indicated that translators with low levels of resilience, who were accustomed to getting reproach from their customers, are likely to prevail over the consequences of negative feedback more competently than translators with higher levels of resilience. Their study verified evidence from Lehr's work, pointing to a differential impact of emotions on different facets of translation performance and signifying that various emotions may trigger diverse processing styles. Rojo and Ramos (2018) examined the role of expertise in emotion regulation and its outcomes for translation quality. They compared the performance of translation students and professional translators through Lehr (2013) methodology, and they assessed trait variation in psychological resilience. Their study revealed that personality factors, such as resilience and expertise level, are influential in controlling emotional states and directing translational behavior, and they may enhance translation quality.

In another study, Hubscher-Davidson (2013) found that emotional intelligence, as a type of personality traits, is significant in controlling translators' behavior and can be effective in the quality of translation. Emotional Intelligence is regarded as one of the most significant factors that seemingly regulates translators' minds and contributes to them to be creative in translation tasks (Ebrahimi et al., 2016). Hubscher-Davidson (2013) also found a difference between literary and non-literary translators regarding their emotional intelligence scores. Her study revealed that higher emotional intelligent translators are inclined to regulate their emotions and control the affective nature of texts. Their study implicated the significant role of emotional intelligence to gain a deeper understanding of translation and interpreting processes. Having used Waddington (2001) translation assessment rubric, Ghobadi et al. (2021) investigated the predictability power of individual cognitive-emotional differences, including working memory, emotional intelligence, and, tolerance of ambiguity, in translation performance. They found that the interaction of these cognitive-emotional components predicts translation performance. They also mentioned that higher emotional intelligent translators are more aware of linguistic and non-linguistic relations in a language, and they can appropriately render the source language to the target language, particularly in oral translation. Their study implicated that individual cognitive differences could have some potential effects on translation performance. Moreover, translation trainers should pay attention to students' internal psychological traits when designing translation-training programs so that they could align the programs with the strengths, weaknesses, and personality characteristics of their trainee. Using structural equation modeling, Ghaemi and Bayati (2022) explored the role of experienced translators' burnout and emotional intelligence in translation competence. Their findings demonstrated that, in contrast to burnout, emotional intelligence is significantly correlated with translation competence. They argued that emotionally intelligent translators with higher levels of interpersonal, adaptability, and stress management capabilities, are likely to have more competence in translation. Their study has some implications for translator trainers. The positive relationship found between emotional intelligence and translation competence of language learners can encourage policymakers and curriculum designers to equip language teachers with appropriate training programs to foster the emotional competencies of their translators. Some helpful techniques, which can be used to increase emotional intelligence in the classroom, include discussion, listening to light music, watching emotional clips, self-disclosure, designing questionnaires, reading literature, and psychological texts. Also, Ferdowsi and Razmi (2022) examined the relationship between emotional intelligence, self-efficacy, creativity, and simultaneous translation quality. Their study indicated that simultaneous translators' emotional intelligence significantly correlates with their self-efficacy and creativity during their translation performance.

Hubscher-Davidson (2013) highlighted the role of translators' intuition as an emotional regulator in predicting students' and professional translators' translation performance. Benjamins Votonen and Kujamäki (2021) investigated the extent of learners'

reliance on their theoretical knowledge of translation in their justifications and use of the meta-language of the field. Using transcribed retrospections, students were asked to express their opinion when translating texts. Their findings indicated that around one-third of all decision-making in translating complex sentences and unknown words is based on their intuition, and the use of meta-language is scarce. They argued that learned principles and theories can make ‘intuition’ among student translators, and it can turn into tacit, implicit knowledge that is demanding to verbalize. This implies that non-conscious and intuitive decision-making are significant features in the student translators’ translation performance. They also mentioned that student translators are inclined to use their intuition facing translation’s predominant, difficult problems.

Professional expertise is also regarded as a decisive component of emotion regulation. Rojo (2017), in analyzing the effect of emotions on translation performance, found that personality traits and translators’ emotions can be regulated by the translator’s professional expertise. Angelone and Shreve (2011) elucidated the role of translators’ expertise in emotional regulation. They mentioned that expert translators employ metacognition to regulate their emotions. They argued that professional translators’ metacognition can inhibit the negative emotions related to ambiguity controlling translation, resulting in high-quality translation. Mellinger (2019) asserted that student translators, with higher metacognitive skills, tend to employ problem awareness and problem-solving behaviors during the translation task. Moreover, they tend to have higher levels of translation expertise. His findings contribute to the understanding of specialized translation pedagogy and illustrate how metacognitive behavior can change as a result of coursework. Whyatt (2018a) also defined a translator as an individual who uses his professional expertise to produce translations with acceptable quality. Whyatt (2018b) also indicated that expertise in translation refers to features, including “fewer external resources, shorter problem-solving pauses, fast text production, and high-quality target texts” (p. 260). His findings showed that the frequency of problem-solving pauses can differentiate professional translators from novice ones in the paraphrasing task. Moreover, his study showed that expertise in translation leads to superior performance in paraphrase and in bilingual knowledge management in the context of translation as a cross-language task. The dual nature of translation expertise can be optimized in translation training programs and in individual self-development by deliberate practice.

Critical thinking and features of critical thinkers

Many investigators have provided numerous definitions for critical thinking. Yulian (2021) regarded critical thinking skills as the main cognitive process dimension in Bloom’s taxonomy. According to this taxonomy, critical thinking includes remembering, understanding, applying, analyzing, evaluating, and

creating. Shubina and Kulakli (2020) asserted that critical thinking is the most common way of assessing thoughts, evaluating contentions, managing issues, making decisions, collecting and appraising different data, and concluding about particular principles to give the best solution. Tong et al. (2020) mentioned that critical thinkers reflect, relate, and appraise all features of circumstances or problematic issues. They maintained that this level of thinking incorporates abilities like concentrating on components of a problem or an adverse situation, gathering and coordinating data about the problem, and recalling the understood information. Itmeizeh and Hassan (2020) stated some of the features of critical thinkers, including the followings:

“Purposeful, self-regulatory, self-rectifying, habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking precise results” (p. 2).

Etemadfar et al. (2020) emphasized that good critical thinking is not an innate or natural ability for most L2 students, but it can be taught through effective pedagogical methods. Some studies have been done on the positive and significant relationship between critical thinking skills and some cognitive skills, such as writing (e.g., Putri, 2018; Esmail Nejad et al., 2022), reading comprehension (e.g., Din, 2020; Okasha, 2021), speaking (e.g., Setyarini et al., 2018; Iman and Angraini, 2019), and listening skill, e.g., (Ivanovska and Petkovska, 2019; Erkek and Batur, 2020). In addition, it is important to see the role of individuals’ way of thinking in fostering translation quality. Translation, as a cognitive-emotional skill, requires incorporating different skills and abilities (Hubscher-Davidson, 2013). Kashirina (2014) believed that critical thinking skill is significant in the translation process. She mentioned that teaching critical thinking must be a necessary part of translator professional training because it leads students to acquisition of mature creative thinking, which is crucial for translation problem-solving. She asserted that teaching critical and creative thinking is not an end in itself but a means to improve the quality of the text analysis and, consequently, translation quality, or adequacy. Her study accentuated the role of critical thinking in raising translator’s awareness, and increasing translation quality. Her study implicated the need for students to be facilitated to acquire critical and creative thinking skills in the process of professional training that should incorporate critical and creative thinking training.

The role of critical thinking in translation performance

Criticality in translation is referred to translations with uncertain, non-institutionalized utilization of the language (Wilss, 1988) or

translations in which the choice of a translation alteration is not rule-governed (Kusssmaul, 1995). Some investigations have been done on the relationship between critical thinking and translation performance. According to Neubert (1997), criticality is essential to remove the intervention, linguistic or textual, initiated by the source language or the source text. He also argued that “in order to achieve a satisfactory target text, the established rules of correspondence between L1 and L2 need to be criticality extended” (p. 20). Based on the study of Kusssmaul (1995), high-quality translations are those in which a translator appropriately employs criticality, and few high-quality translation procedures are represented by the lack of adaptability and reveal the utilization of old techniques in tasks that necessitate a fresh orientation. Using Watson-Glaser Critical Thinking Appraisal (1980), Parham and Fahim (2013) examined the translation trainees’ critical thinking. They scrutinized the role of critical thinking in translation quality. They found that critical thinking significantly predicted translation quality. Their study implicated that teachers should attempt to establish an atmosphere where critical thinking is exercised, and students should pick up relevant skills systematically in a fashion that encourages the application of critical thinking outside the classroom, for all real-life activities. In line with Parham and Fahim (2013), Azin and Heidari Tabrizi (2016) found the relationship between critical thinking and translation performance. They employed California Critical Thinking Skill Test -Form B (CCTST) to assess student translators’ critical thinking skills. They found out that translators with higher levels of critical skills tend to have higher-quality translation performance. They argued that critical thinkers not only outperform in inspecting the message of source language text but also synthesize it more efficiently. Jahromi and Suzani (2016) used Ricketts Critical Thinking Ability questionnaire (2003) to elicit learners’ critical thinking skill. In order to assess learners’ translation quality, they also used Vinay and Darbelnet’s model, which presented two strategies of translation: direct and oblique. The calque, literal and borrowing translation are the constituents of direct strategy. On the other hand, adaptation, transposition, modulation, and equivalence translation are covered in oblique strategies. Their study revealed a significant positive relationship between critical thinking skills and direct strategy of translation of literary texts. Saud (2020), in his study, indicated that student translators’ deductive and inductive reasoning skills, as indicators of critical thinking, significantly predicted their translation performance. He mentioned that translators with higher deductive and inductive cognitive skills outperform in translation performance. He also asserted that translators are required to examine various translations, make a judgment, and translate or select the best translation through inductive reasoning. Moreover, translators are required to employ critical thinking skills to ponder and interpret different translations, and come to a rational conclusion through deductive reasoning. Ghaemi and Sadoughvanini (2020) indicated that translation trainees’ higher-order thinking skills are significantly correlated with their translation quality. They justified their results based on Bloom’s taxonomy. They mentioned that all the constituents of higher-order thinking skills, such as analyzing and creating, have key roles in increasing translation ability and performance. Their

study also revealed that the number of translation errors are significantly correlated with analyzing and creating. They argued that the ‘analysis’ component in Bloom’s taxonomy, including breaking information down into parts and different forms and comparing a source text and background knowledge, develops the extra-linguistic knowledge, “i.e. translation errors of translators to a great extent” (p. 21). However, they mentioned that ‘creating’, as another component of Bloom’s taxonomy, connects the new evidence with earlier knowledge or with multiple texts to support a new notion, and create a new reasoning method. They mentioned translation errors have some psycho-physiological constituents, including intellectual inquisitiveness, critical thinking, and cognitive components, highly correlated with translators’ creating and analyzing skills.

In the field of machine translation, Li (2022) examined the effect of Chinese student translators’ critical thinking on the quality of post-editing in machine translation by estimating the error frequency for each translator. Using Watson-Glaser Critical Thinking Test and Critical Thinking Assessment Test (CAT), he found that learners, with higher levels of critical thinking, have less frequent post-editing errors. His study showed that lower-level critical thinkers tend to have frequent grammatical and, particularly, stylistic errors. They argued that the level of translators’ critical thinking influences the conformity of the meaning of the translated text to the original version, which is a substantial feature of the literary, informational, economic, legal, and technical translation quality. Therefore, it is required to keep the writer’s style and aesthetics of the work. He also argued that other components, such as professional experience and knowledge, can also affect translators’ linguistic and syntactic errors during post-editing authentic texts. He mentioned that translator’s critical thinking can significantly influence the stylistic errors and the ability to select the most standard version of machine translation. He described stylistics as “a sense of language, which is interconnected with critical thinking” (p. 25). Daems et al. (2017) also found that critical thinking is significantly correlated with translation quality, but they asserted that translator’s experience can mediate this correlation. These above-mentioned studies showed the importance of critical thinking on translators’ translation performance.

However, there is a reciprocal relationship between translation students’ critical thinking and translation tasks. Liu (2019) used Bloom’s cognitive hierarchy theory in order to explicate increasing the influence of translation tasks on translation students’ critical thinking. He believed that the integration of memorization, grasping, manipulation, analyzing, evaluation, and creation should be applied in translation courses which can improve translators’ critical thinking skills.

Implications and suggestions for further research

This conceptual review probed the role of translators’ critical thinking and emotion regulation in their translation performance.

Earlier studies have shown a significant relationship between critical thinking and translation quality (e.g., Liu, 2019; Ghaemi and Sadoughvanini, 2020; Saud, 2020; Li, 2022). In other words, translators' critical thinking facilitates the analysis of the source text and expedites the efficient translation of the message (Azin and Heidari Tabrizi, 2016). Moreover, translations with higher levels of critical thinking are more likely to use deductive and inductive reasoning in the translation process (Saud, 2020). In addition, studies have shown that the sub-components of Bloom's higher-order thinking skills, including analyzing and creating, are significantly correlated with critical thinking, which fosters translation quality (Liu, 2019; Li, 2022). The results of earlier studies have shown that translators' use of emotion regulation strategies leads to the efficiency in translation. The studies showed that some emotion regulators, like personality traits and professional expertise, can regulate translators' emotions, leading to higher translation quality. Translators with higher levels of emotional intelligence, resilience, and intuition, as personality traits, outperform in translation performance.

This conceptual review has some implications for translator trainers, translator trainees, and curriculum designers. Translation trainees can also improve their critical thinking skills by applying some practical ways. Translation trainees can think critically to solve problems so that they meet their objectives. Every decision they make has an objective or purpose attached to it, and identifying exactly what that is, and what they actually want out of it, gives them a starting point to work with. They should ask questions from themselves about the expectation they want to get out of doing tasks. They should also consider the consequences of their decision in tasks. They need to weigh up the possible consequences that may arise from each of their options and go for the one that benefits them most while limiting the negative effects. A good way to do this is by writing a list of pros and cons. By asking themselves to think of every possible positive outcome alongside every possible negative outcome, they can make a much more informed decision. They should spend time on doing research and focusing on learning, and they should adapt themselves to new situations to overcome new situations and improve their critical thinking. There are various techniques and exercises to use critical thinking in classrooms. Caroselli (2009) lists 50 activities. She explained them in three categories: Quick Thinking, Creative Thinking, and Analytical Thinking. Examples of Quick Thinking are brainstorming and perceptual shift. Creative thinking exercises were designed for those competent learners who lack self-confidence and think they should not be expected to come up with critical thinking answers. Analytical thinking, based on the scientific approach of defining a problem, enables learners to overcome a problem. The course should be consistent and logical and students should be aware of what they do. Moreover, theory should be always connected with practice, and there should be constant feedback in the course. In addition, it should have engaging activities in order to trigger critical thinking skills among learners. Translation trainees should engage in doing activities that promote critical thinking skills and require them to reflect, collaborate, ask questions from peers, etc.

They should ask meaningful questions since asking questions enhances their critical thinking in learning. Moreover, translators' critical thinking skills can be improved through social involvement. If they get opportunities to participate in discussions, they must go ahead with it. This will help them encounter different views, examine incoming information, and improve communication skills. They should also practice active learning through understanding and not just by reciting it. Active learning, as a component of the experiential approach, can be attained *via* cooperative learning, visual learning, presentations, etc. The student translators' critical thinking skills can develop through real-life examples, tales, analogies, and factual stories. Translation students can also foster their emotional intelligence and resilience. They should consider the role of affective factors on their translation performance. It can be mentioned that learners should be assisted to control, adjust, and regulate their emotions to improve their translation quality.

This review can notify translator trainers of the prominence of enhancing translation students' critical thinking and emotion regulation strategies. Those who teach translation particularly can employ their creativity and include appropriate tasks and classroom activities to enhance students' critical thinking skills along with their translation ability. Translator trainers should consider students' attitudes, interests, abilities, and skills in these kinds of tasks and classroom activities and should try to encourage the students to use their critical thinking, and this can be the first step toward enhancing of students' critical thinking. In order to increase students' critical thinking, translator trainers can guide the trainees through exercises, provide more opportunities for them to ask different questions, and help them study materials increasing higher-order thinking skills. To keep the students' attention going, translator trainers can add quizzes, puzzles, and create an appealing experience for students. They should devote time to translating students to participating in active, collaborative learning activities that help them appraise, scrutinize, and synthesize materials. Moreover, they can use classroom debates and appoint learners to involve in debated issue, and help them defend their views. Translator trainers' effective use of questions and involving students in class discussions over challenging and appealing topics could engage them in critical thinking processes. Therefore, asking appropriate higher-level questions can promote the translation students' critical thinking. They can also use jigsaw activities by dividing the class into groups. They can have each individual in the group explore a different feature of a broader topic. During class time, trainers can ask trainees to share their findings. They are recommended to employ seminars about translation, and they can get students to participate in class discussions. Critical thinking can be explicitly taught in translation classrooms, as an accelerator of the thinking ability as well as the translation ability of the learners. The explicit instruction of critical thinking, according to the review, can develop higher order thinking in the translation process. It is the translator trainers' responsibility to encourage learners to use their thinking ability and learn to express themselves critically and creatively. It is believed that translator trainers need to be more flexible in their

teaching and try to pay more attention to translation students' attitudes, interests, and abilities. Moreover, translator trainers should use appropriate tasks, and activities in reading courses to promote critical thinking skills, which then can result in the improvement in reading source texts.

This review has shown that personality traits are regarded as the components which regulate the translation students' emotions. Translator trainers should be aware of students' characters, and they should recognize translation students' needs and help them to find their solutions for translation problems. Emotional intelligence, as a component of personality traits is considered as a regulator of translators' emotions. The translator trainers are required to provide inspiring and enjoyable translation tasks which provoke their emotional intelligence and reduce language anxiety in their minds. Thus, the provision of enjoyable tasks can regulate translation students' emotional intelligence to advance their translation performance. These issues dwindle students' cognitive load and foster their translation quality. Translator trainers can also improve students' resilience as a regulator of emotion. The role of resilience could be that of influencing the appraisal of threat and thereby the level of anxiety experienced. Higher levels of resilience-related resources might enable individuals to manage any anxiety they experience, thus limiting any adverse effects on performance. Translator trainers can foster translation students' resilience through positive rapport, instruction of social-emotional skills, developing positive emotional constructs, and building a sense of meaning and purpose.

Moreover, this conceptual review can enlighten those who are involved in planning curriculum for translation students and can equip them with additional information regarding the complex concepts of critical thinking and emotional regulation. Those who develop the curriculum for translation students can include purposeful courses in translation. The specific focus of these courses should be on critical thinking skills and emotions, the purpose of such courses should be the training of translators with high critical thinking and emotion regulation strategies. In other words, the focus of curriculum designers should be on critical questioning, critical reading, critical and creative writing, and critical listening in all curriculum areas.

Future research should consider the potential effects on the quality of translation. Future studies could investigate the association between critical thinking and different types of translation texts. Moreover, it is necessary to investigate how translation quality is influenced by translation students' positive emotional constructs, such as foreign language enjoyment, engagement, grit, self-efficacy, pedagogical love, and well-being.

Further studies should investigate the influence of factors like academic capabilities, learner style, and negative emotional states, such as foreign language anxiety, apprehension, boredom, and burnout, on translation quality. Moreover, the relationship between translators' critical thinking and their emotion regulators, such as resilience, emotional intelligence, intuition, and professional expertise should be investigated in the future. Finally, the effect of some variables, such as age, gender, education, intercultural communication experiences, and economic status, on student translators' critical thinking skill and their strategy in regulating emotions can also be considered in the future.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychological and educational learning strategies and models during the COVID-19 pandemic: A comparative bibliometric analysis

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This paper undertakes a literature review of psychological, Educational Learning Strategies, and Models during the COVID-19 Pandemic. It examines data from 359 publications relating to this subject, published on the Web of Science, Scopus, and ScienceDirect between 2020 and 2021 using bibliometric analysis adapted with VOSviewer software. The review discusses the following approaches (keywords, authors, references (research papers), research work, countries, and research institutions). It concluded that bibliometric analysis is fundamental for detailing the theoretical literature and developing an integrated theoretical framework for psychological and Educational Learning Strategies. The psychological impact on students and potential stress needs to be closely monitored and evaluated, to plan effective policies while adopting these pedagogical approaches.

KEYWORDS

bibliometric analysis, psychological and educational learning strategies, VOSviewer, models, COVID-19

Introduction

Due to the significant movement to distance education that has occurred in response to the Coronavirus Disease 2019 (COVID-19) pandemic. As almost all teaching methods have rapidly moved to distance education, it is now imperative that consistent distance education approaches be developed using psychological and pedagogical learning methodologies (e.g., Dede, 1996; Bates, 2008; Chang and Huang, 2012; Adedoyin and Soykan, 2020; Ali, 2020; Johnson et al., 2020; Mahyoub, 2020).

If, as Astley suggests, the wide variety of research projects is due to the many subfields of study that make up the educational sciences (Astley 2019), the process of preparing research in various fields is intricately tied to several frameworks. The work that has come before is tedious and repetitious, and there is so much of it that it may

be hard for a researcher to define ideas, plot a route for their study, or even realize that they have gotten off track because they are not familiar with the work of prominent scholars. Who can rely on, control, and deal with this large body of this research?

Some databases organize research (like Web of Science, ISI, Scopus, and Google Scholars). As management sciences and researchers prepare increasing numbers of distinguished studies, there is a need to explore how to manage this increase in literature.

Computer software helps manage data, enabling it to be organized, stored, published, and distributed. Through such resources, we are able to process increasing numbers of previous studies. For example, software such as Citespace and VOSviewer help us know the most influential researchers globally. Therefore, the field should focus on references, keywords, research cases, and organizations.

This study undertook bibliometric analysis, examining and comparing previous methods (including meta-analysis and systematic reviews), with a focus on psychological, Educational Learning Strategies during COVID-19. This paper analyzed the production of psychological educational learning strategies as indexed in Web of Science (WOS) and Scopus (2020–2021). According to Mulet Bayona et al. (2021), the research questions of this study are:

RQ. What does bibliometric analysis contribute to the review and development of the theoretical literature on psychological and Educational Learning Strategies?

The sub-questions are:

RQ1. What role does bibliometric analysis play in establishing the PELS theoretical frameworks?

RQ2. What structure is produced by the publications and citations that constitute PELS quality?

RQ3. Which keywords do PELS authors use most frequently?

RQ4. Who are the most frequently mentioned writers in the area of PELS?

RQ5. What are the most frequently cited research publications in the area of PELS?

RQ6. What are the most significant research institutes for producing research papers in PELS?

RQ7. Which countries contribute the most to the development of research publications in PELS? (Q5 1 R2).

This research will enable us to discover research trends in this field and help familiarize readers with the topic and become more knowledgeable about the development of Psychological and Educational Learning Strategies in the scientific community. Likewise, the justification and significance of the analysis in this study are based on seven research questions that guided the work. The major objective is to identify the source titles, institutions, authors, and countries with the largest scientific output on higher

education, as well as to identify higher education trends in the scientific literature.

The purpose of the study is to determine the results and process of bibliometric analysis, which will aid the researcher in educational sciences in finding distinctions for research, including identifying keywords, the most influential researchers in the field, the research work, reference sources, countries, and reference research institutions. Consequently, the research compares bibliometric analysis to conventional literature evaluations in the educational sciences, considering of bibliometric analysis and research techniques for bibliometric studies in the educational sciences. In addition to a bibliographic examination of the psychological problems faced by students during the COVID-19 pandemic, this study includes a discussion of its significance.

The deductive hypothesis methodology (hypothetical-deductive method) was adopted, which begins by examining the initial assumptions (hypotheses) and trying to support or test them according to what theories for bibliometric analysis have been developed previously concerning psychological and Educational Learning Strategies.

Materials and methods

Bibliometric analysis is a method of science mapping that analyzes data from previous research and studies, considering how articles, authors, areas and resources are related to one another (five methods include Citation, Co-citation, Bibliographic coupling, Co-author, and Co-word), defining the critical areas of research, keywords, authors, countries, and organizations in a specific field of knowledge (Chang and Huang, 2012; Zupic and Čater, 2015; Hallinger and Chatpinyakoo, 2019; Su et al., 2020) such as E-learning strategies in COVID-19.

To carry out the study, data were taken from three approved databases, namely Web of Science (ISI), Scopus, and Science Direct. We retrieved published research *via* a topic search of the psychological and Educational Learning strategies and models used during the COVID-19 Pandemic using the WoS database on January 5, 2020. The following search terms were used: topic = (“the psychological and Educational Learning strategies” “COVID-19” “models” “Pandemic”), in title-abs-key from 2020 to 2021. There were 359 studies distributed over 2 years.

Web of science (ISI) data

The 359 studies retrieved included articles, conferences, and book chapters, as shown in Figure 1.

Figure 1 shows the number of studies used in the bibliometric analysis, distributed as follows: 357 studies in 2020 and 2 studies in 2021, with a total of 359 studies.

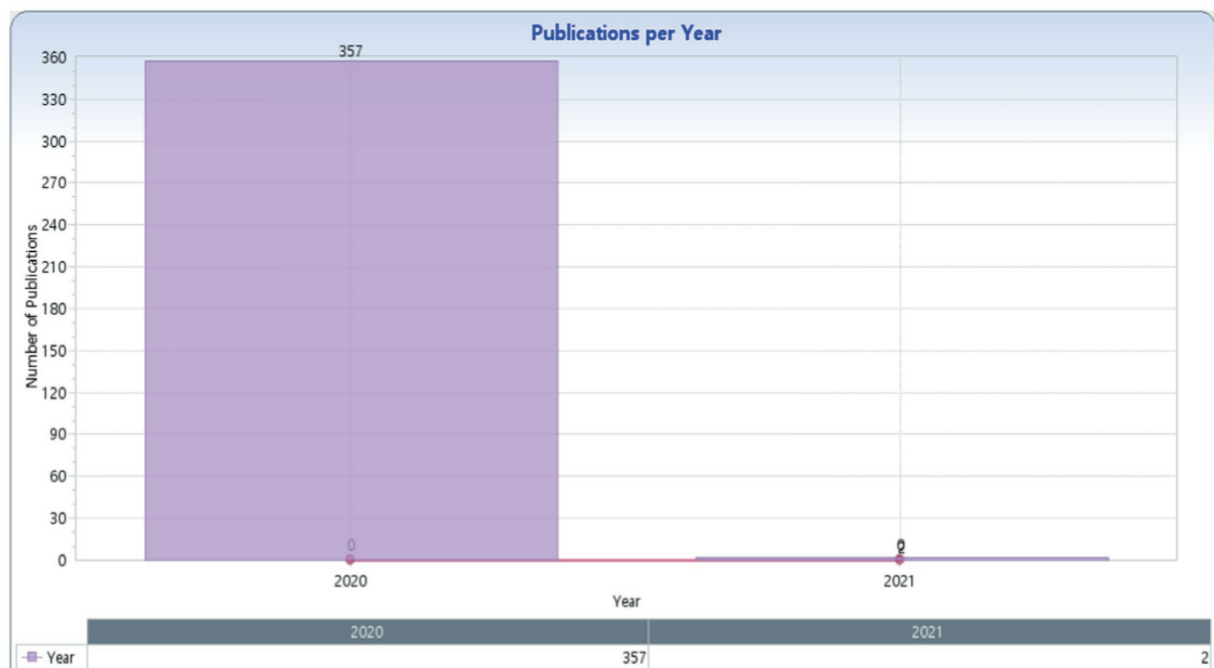


FIGURE 1
Publications per year in Web of Science (KnowledgeMatrix Plus outputs).

Scopus data

In total, we retrieved 290 studies on the topic of learning strategies and models in COVID-19 from the Scopus database, as shown in Figure 2.

Figure 2 shows the number of studies used in the bibliometric analysis of the Scopus database including, 155 studies in 2020 and 135 studies in 2021, with a total of 290 studies.

Science direct data

Figure 3 presents the distribution of 297 studies on the topic of learning strategies and models in COVID-19 retrieved from the Science Direct database.

Figure 3 shows the number of studies used in the bibliometric analysis relying on the Science Direct database, including 265 studies in 2020 and 32 studies in 2021, with a total of 297 studies.

Analysis approaches

To prepare the bibliometric analysis, the number of publications and citations were used to find the relationship between keywords, based on outputs of two software

KnowledgeMatrix Plus KISTI (2016) and VOSviewer (Van Eck and Waltman, 2017; Van Eck and Waltman, 2020).

Results of study

Web of science data

Figure 4 shows the results of a bibliometric analysis (network and density) for keywords in learning strategies and models used during COVID-19 (Appendix 1).

In terms of network and density, Figure 4 shows that there are two sub-fields of research on the subject of learning strategies and models in COVID-19. The first field (the red cluster) is mainly related to the pandemic, student, and course, etc. (Appendix 1). The second field (the green cluster) is related to the model, deep learning, and COVID-19, etc. For more details, the Table 1 shows the keywords missed within each cluster.

Table 1 shows that are two approaches to research on the topic of learning strategies and models in light of the COVID-19 pandemic, the first related to research on the learning strategies and curricula used in COVID-19, such as e-learning, distance learning, online learning, platform, quality, school, student, teacher, teaching, technology, transition, and university (the first cluster), similar with the results of studies (Ali, 2020; Mahyoob, 2020; Mpungose, 2020; Elumalai et al., 2021). The second is related to machine learning and deep learning, which has been widely talked about during the

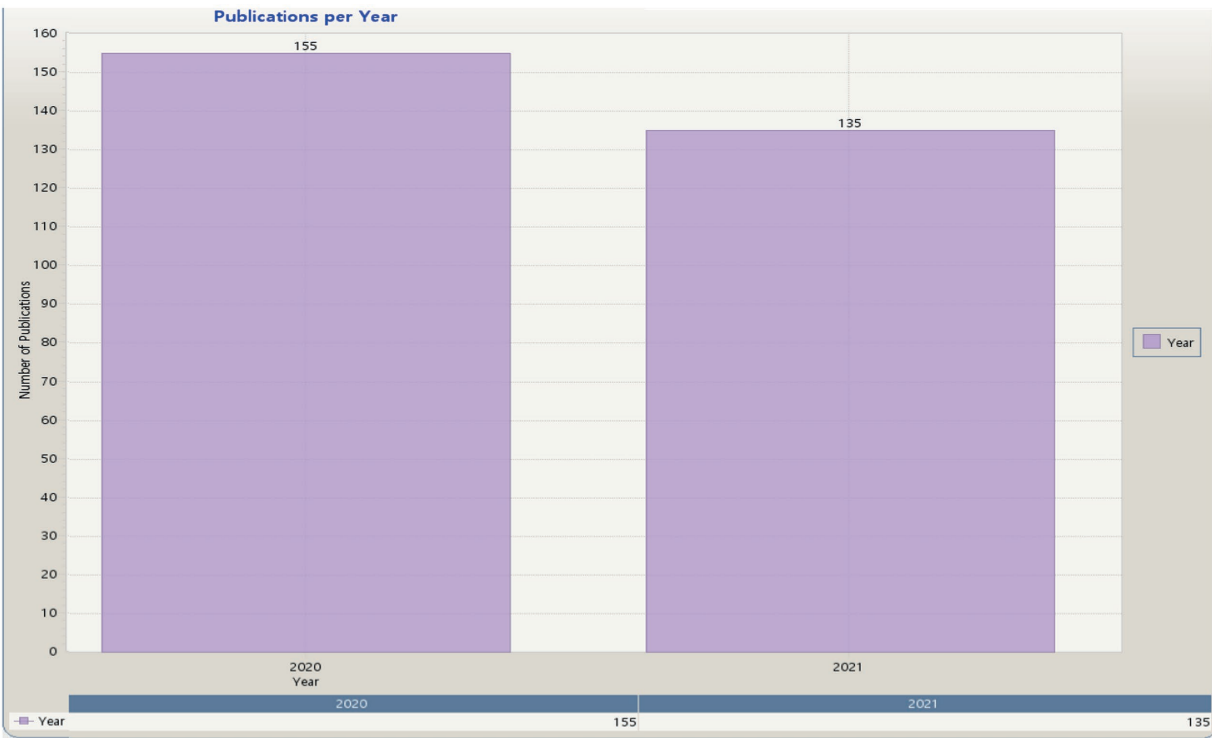


FIGURE 2
Publications per year in Scopus (KnowledgeMatrix Plus outputs).

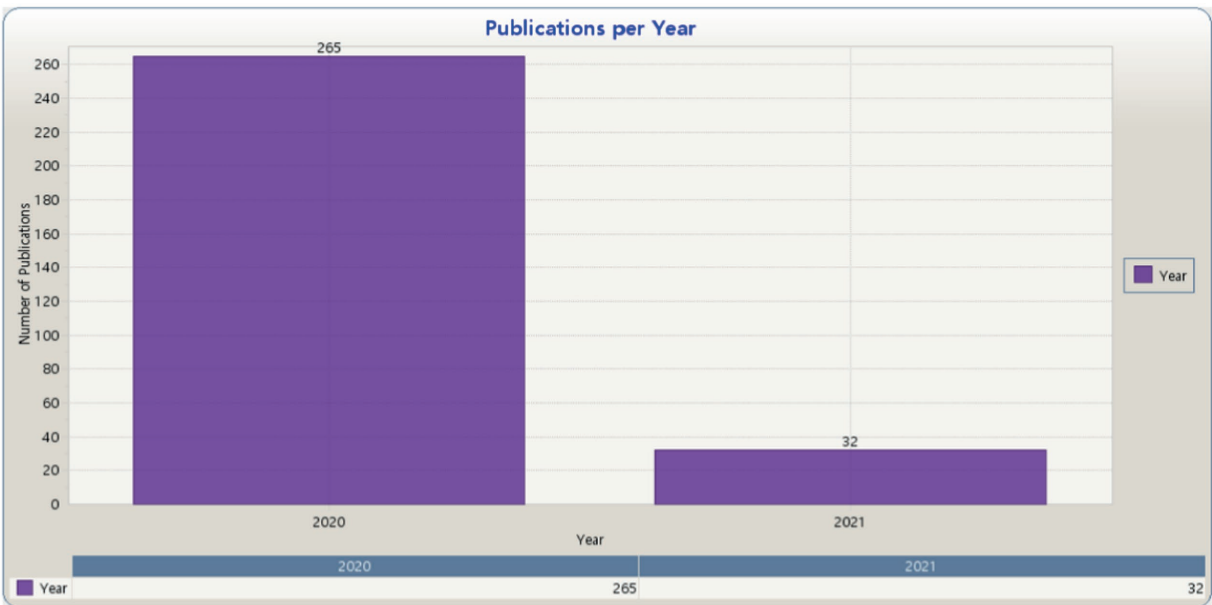


FIGURE 3
Publications per year in Science Direct (KnowledgeMatrix Plus outputs).

pandemic, such as artificial intelligence, chest x-ray image, convolutional neural network, coronavirus disease deep learning, diagnosis, machine learning, patient, radiologist, SARS CoV, testing, treatment, vaccine, and virus (the second cluster), showing results that

are similar to those of another study (Fusco et al., 2021). This confirms the different research strategies on this topic, such as the different learning strategies and models. In addition, there are two completely different directions of research on this topic.

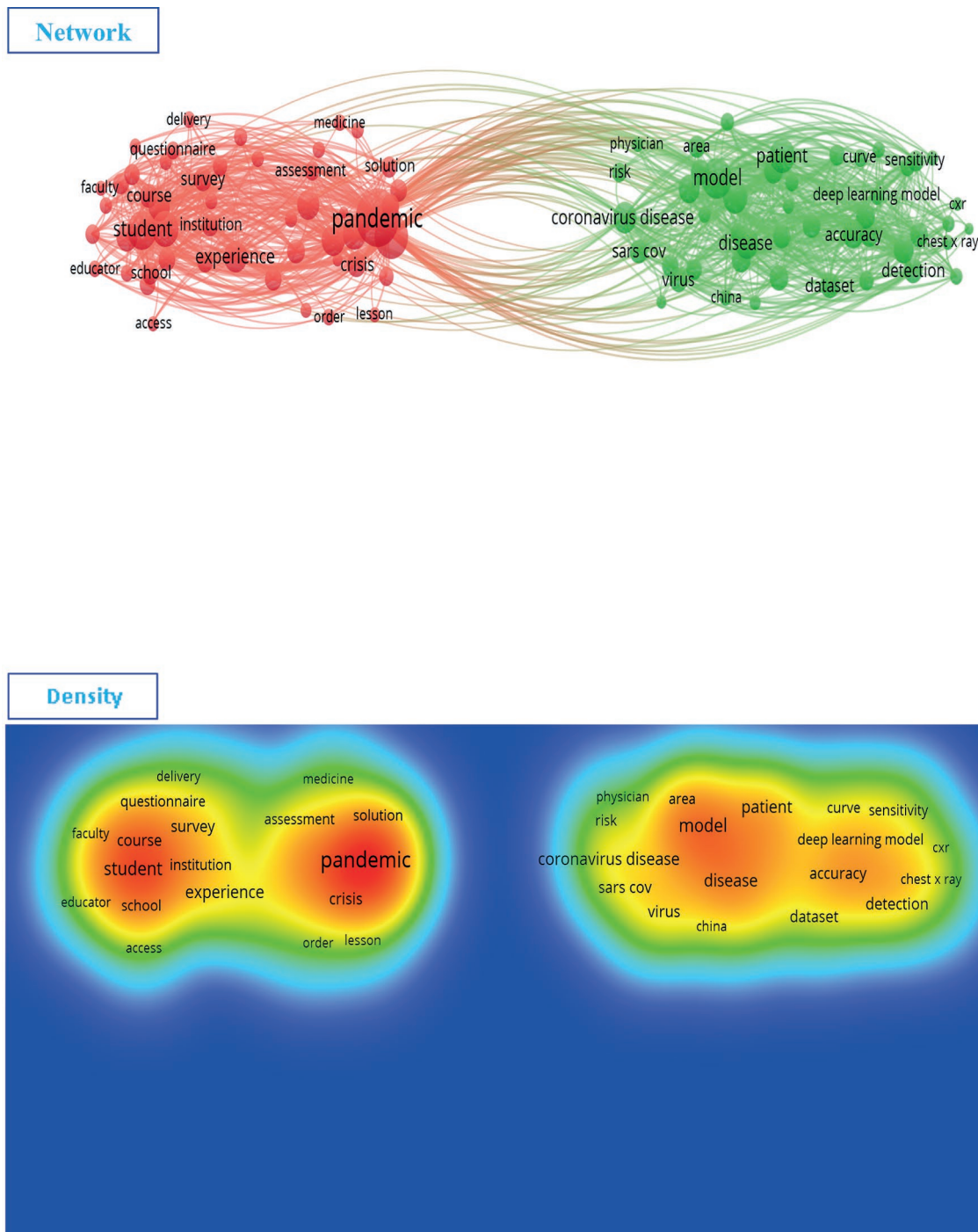


FIGURE 4
The network and density of keywords depend on Web of Science (VOSviewer outputs).

Scopus data

The next figure shows the results of the bibliometric analysis of keywords using the Scopus database.

Figure 5 shows that there are five sub-fields of research on the subject of learning strategies and models used during the

COVID-19 pandemic. The first field (the red cluster) mainly related to human, adult, gender. The second field (the yellow cluster) is mainly related to COVID-19, learning systems, online learning, and e-learning. The third field (the green cluster) relates to deep learning, and artificial intelligence. The fourth field (the blue cluster) is related to machine learning,

TABLE 1 Learning strategies and models in COVID-19 depending on Web of Science (VOSviewer outputs).

Clusters	Keywords
Cluster 1 (50 items)	Access, assessment, challenge, communication, community, context, course, crisis, delivery, distance, distance learning, e-learning, education, educator, environment, era, experience, face, faculty, goal, home, impact, institution, learning, lesson, medicine, online, online learning, opportunity, order, pandemic, participant, perspective, platform, quality, questionnaire, recommendation, response, school, situation, social distancing, solution, student, survey, teacher, teaching, technology, transition, university.
Cluster 2 (47 items)	Accuracy, algorithm, area, artificial intelligence, AUC, case, chest x-ray, chest x-ray image, china, classification, CNN, convolutional neural network, coronavirus, coronavirus disease, curve, cxr, dataset, death, deep learning, deep learning model, detection, diagnosis, disease, feature, hospital, identification, image, individual, infection, machine, machine learning, model, patient, performance, physician, pneumonia, prediction, radiologist, risk, sars cov, sensitivity, specificity, technique, testing, treatment, vaccine, virus.

TABLE 2 Learning strategies and models in COVID-19 depending on Scopus (VOSviewer outputs).

Clusters	Keywords
Cluster 1 (36 items)	Adolescent, adult, aged, betacoronavirus, child, China, computer simulation, coronavirus disease, coronavirus infection, coronavirus infections, education, distance, epidemic, female, global health, human, humans, learning, male, medical education, middle-aged, models, pandemic, pandemics, pneumonia, prevention, psychology, retrospective, risk factor, student, theoretical model, United State, viral, virus pneumonia, young adult.
Cluster 2 (26 items)	Algorithm, algorithms, artificial intelligence, biological organs, classification, information, computerized, controlled study, CNN, conventional neural network, deep learning, diagnosis, diagnostic imaging, diagnostic test accuracy, feature extraction, image processing, image segmentation, lung, major clinical study, pneumonia, receiver operating, sensitivity, thorax radiology, tomography, transfer learning, x-ray computed tomography.
Cluster 3 (16 items)	Coronavirus, coronavirus, decision making, decision trees, diseases, epidemiology, forecasting, infectious disease, learning algorithms, machine learning, ML mode, prediction, predictive analytics, public health, regression analysis, viruses.
Cluster 4 (9 items)	COVID-19, e-learning, education computing, higher education, learning models, learning systems, online learning, students, teaching.
Cluster 5 (8 items)	Drug effect, drug repositioning, isolation, priority journal, procedures, sars-cov-2, severe acute respiratory, virology.

forecasting, and the fifth field (the purple cluster) is related to SARS CoV-2, isolation and purification (Appendix 2), as shown in Table 2.

Table 2 shows that there are five research directions or approaches that the researcher can take in the topic of learning strategies and models in COVID-19, but the basis for them is the existence of two real directions: the first is related to research on learning strategies and curricula used during COVID-19 (e-learning, distance learning, and online learning), which includes cluster four [see the result of study (Rahimi et al., 2021; Subramanian et al., 2022)]. The second is related to machine learning and deep learning (artificial intelligence in COVID-19). It includes clusters one, two, three, and five.

Science direct data

Figure 6 shows the results of the bibliometric analysis of keywords retrieved from the Science Direct database.

As Figure 6 shows, there are eight sub-fields of research on the subject of learning strategies and models in COVID-19. The first field (the red cluster) shows COVID-19 (Appendix 3). The second field (the blue cluster) shows deep learning. The third field (the green cluster) was related to the pandemic. The fourth field (the pink cluster) shows machine learning. The fifth field (the purple

cluster) is related to transfer learning. The sixth field (the purple cluster) relates to education, and the seventh field (the orange cluster) shows pneumonia. The eighth field (the brown cluster) is related to artificial intelligence, as indicated in more detail in Table 3.

Table 3 displays similar results to the previous tables. There are two research directions or approaches related to the topic of learning strategies and models in COVID-19. The first is related to research on the learning strategies and curricula used in COVID-19 (e-learning, distance learning, and online learning) (Chang and Fang, 2020, Kamysbayeva et al., 2021; Sharin 2021). It includes cluster one, two, and four. The second is related to machine learning and deep learning (artificial intelligence in COVID-19). It includes clusters three, five, six, seven, and eight.

Conclusion and implementations

This review used bibliometric network analysis to provide an overview of researchers worldwide' studies on psychological and educational learning strategies and models used all over the world during the COVID-19 pandemic. The sample included 359 articles indexed in Web of Science (ISI) data, 290 articles indexed by Scopus Data, and 297 articles indexed by Science Direct data. It provides insights into the dissemination of knowledge among

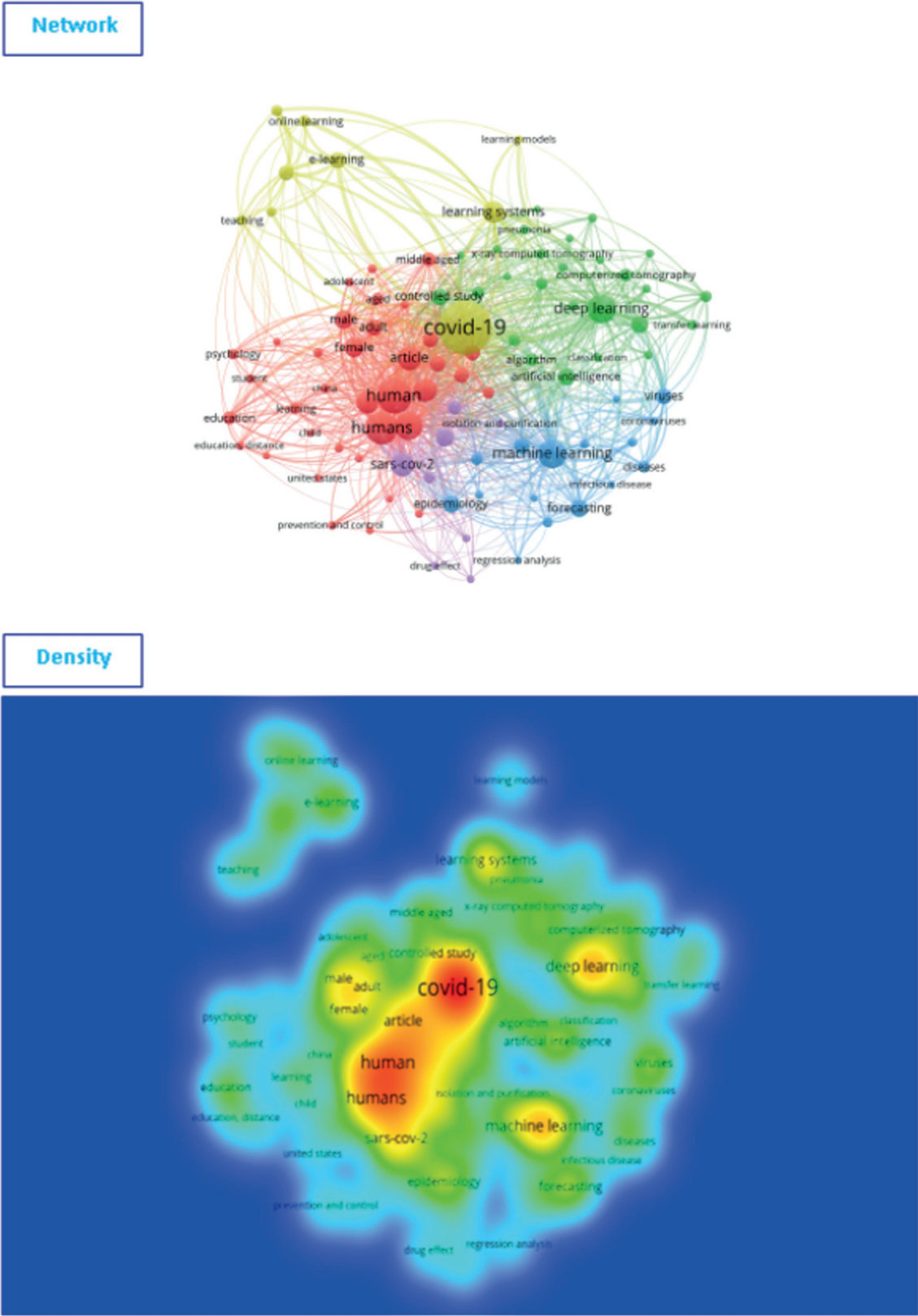


FIGURE 5
The network and density of keywords depend on Scopus (VOSviewer outputs).

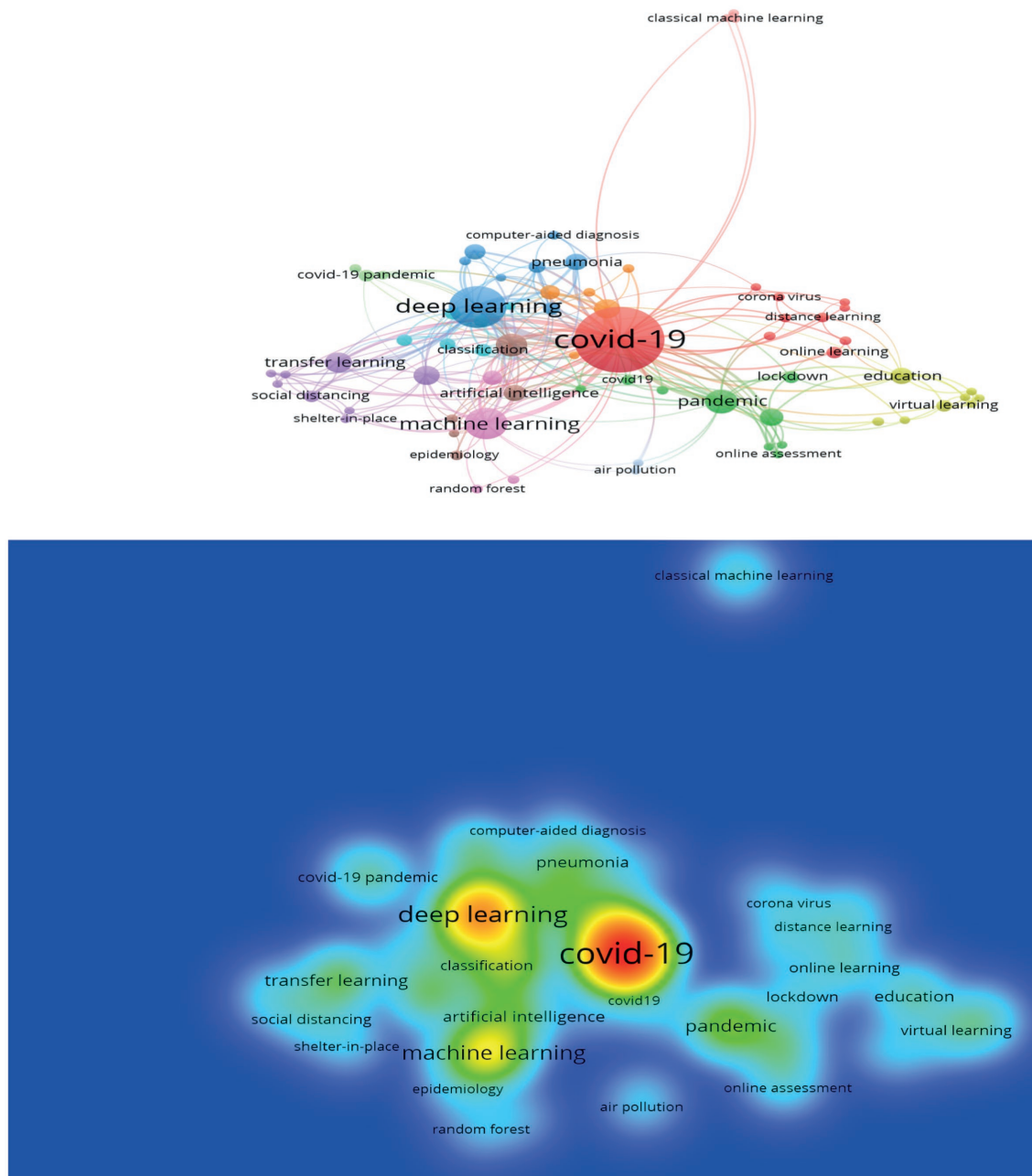


FIGURE 6
The network and density of keywords depend on Science Direct (VOSviewer outputs).

researchers in this field. According to the main review findings, several topics were highlighted and may be further reviewed in the future.

The impact of the COVID-19 pandemic has been profound. It was necessary to radically change the style of teaching and learning depending on the current conditions imposed by the pandemic, including the tools and strategies used by institutions of higher education and the experiences of faculty members. This transition has had a psychological and educational impact on students, which has led to students' anxiety and stress (see Akour

et al., 2020; Ali, 2020; Mishra et al., 2020; Radu et al., 2020; Brika et al., 2021; Zalat et al., 2021; Yahiaoui et al., 2022).

There are also many important messages for the post-coronavirus period. Among them, faculty members and universities were not exposed to many required teaching methods. Also, many of them had to go through a very steep learning curve to be able to deliver basic lessons. Many studies also covered the educational impact on students and the strategies used by higher education institutions in all countries of the world. The literature on the psychological impact and the strategies used

TABLE 3 Learning strategies and models in COVID-19 depending on Science Direct (VOSviewer outputs).

Clusters	Keywords
Cluster 1 (10 items)	Acceptance, coronavirus, COVID-19, deep learning models, distance learning, online learning, parents, perception, plastic surgery, training
Cluster 2 (9 items)	COVID-19, e-learning, Jordan, lockdown, online assessment, online pbl, pandemic, sars-cov2, virtual classroom
Cluster 3 (8 items)	Bayesian optimisation, CNN, computed tomography, computer-aided diagnostics, coronavirus disease 2019, deep learning, pneumonia, x-ray
Cluster 4 (8 items)	Binary logistic regression, COVID-19 outbreak, education, medical student education, propensity model, remote learning, student's health behaviour, virtual learning
Cluster 5 (8 items)	Overhead view, person detection, sars-cov-2, shelter-in-place, social distancing, statistics, transfer learning, yolov3
Cluster 6 (6 items)	Chest x-ray, Chest x-ray images, classification, convolutional neural network, convolutional neural networks, long short-term memory
Cluster 7 (5 items)	Forecasting, incremental learning, lstm, modelling, optimization
Cluster 8 (5 items)	Artificial intelligence, coronavirus, data science, epidemiology, topic modelling

is limited to a few countries, as discussed in a study by Son et al. (2020). There is much work to be done to understand the psychological effects on students at universities in many countries, including developing ones.

COVID-19 has had a profound impact on students, and its impact on student's mental health and well-being cannot be fully understood. Many of the current psychological assessments in this area are short-term reviews. Perhaps well-studied longitudinal studies can shed light on this in the future.

Colleges and universities have also had to deal with a lot of change during this time. However, the psychological impact on students and potential stress needs to be closely monitored and evaluated, to formulate effective policies while adopting these pedagogical approaches.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1029812/full#supplementary-material>

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Investigation of the effect of flipped listening instruction on the listening performance and listening anxiety of Chinese EFL students

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Introduction: Given the fact that flipped instruction especially with the aid of technology has gained momentum in second language (L2) instruction, numerous L2 researchers have explored the usefulness of flipped classroom for L2 learning.

Methods: As an attempt to further this research area, the current research examined the effect of flipped listening instruction on the Chinese English as a foreign language (EFL) students' listening performance and listening anxiety using a quasi-experimental research design. To this end, a total number of 44 EFL learners from two intact classes in a Chinese language school were selected as the participants of the research and they were randomly assigned as the control group ($N=21$) and an experimental group ($N=23$). Within a course of one semester, the control group was instructed employing traditional listening instruction, while the experimental group were taught based on the flipped mode of instruction.

Results: The data collection was carried out by administering the listening section of IELTS and Foreign Language Listening Anxiety Scale (FLLAS).

Discussion: The results of ANCOVA revealed that the flipped listening instruction significantly enhanced listening performance of the participants. Also, the flipped classroom substantially reduced listening anxiety of the EFL learners. The outcomes of this research might provide notable implications for EFL practitioners.

KEYWORDS

flipped instruction, listening performance, listening anxiety, IELTS, EFL

Introduction

The upsurge of technology has led to dramatic change in education (Nickerson and Zodhiates, 2013). With the advent of the internet during the 1990s, accompanied by Web 2.0, higher education has dramatically shifted from traditional pedagogical methods to current models using computer technology (Valtonen et al., 2021). E-learning as a new technological innovation is increasingly used in educational contexts. The widespread availability of authentic resources is one of the biggest advantages of the technology for language learners (Yunus,

2018). In the meantime, the recent developments in technological devices (e.g., mobile technology and smartphones) have led to ever-increasing popularity of computer-assisted language learning (CALL) as a mode of learning and instruction in educational contexts (Chen et al., 2021; Lim and Aryadoust, 2021; Park and Son, 2022; Rahimi and Fathi, 2022). As a result of such developments, blended learning has gained more recognition nowadays (Liu, 2020). Blended learning is regarded as a fundamental redesign of the instructional method with a paradigm shift from lecture-centered to learner-centered instruction where learners have active roles in their learning process (Poon, 2013).

The flipped classroom is a good example of a blended learning methodology which might provide the productive use of face-to-face instruction time with learners (Strelan et al., 2020; Liu et al., 2022). The essence of the flipped instructional approach has been directed toward the development of learning outside the class *via* the visualization of digital content produced by the instructor (Bergmann and Sams, 2012). Consequently, instructors are able to scaffold and guide students' learning process while providing valuable feedback inside the class.

Learners tend to be more active in flipped classroom because they become independent with the help of their teacher as a facilitator and the guidance of technology tools (Zainuddin and Attaran, 2016). In order to learn effectively in FL classrooms, learners should have the opportunity to engage in a variety of activities to gain a grasp of the new target language. Nonetheless, instructors might inevitably skip important aspects of effective FL teaching because of the restricted classroom time, thus limited time is left for practices (Turan and Akdag-Cimen, 2020). The flipped classroom model also known as inverted classroom switches the classroom structure from a conventional lecture approach to more collaborative learning activities where teachers are able to provide students with additional practices in the classroom (Milman, 2012).

Against this backdrop, the flipped teaching approach has been increasingly integrated into English language classrooms (Fathi and Rahimi, 2020; Afzali and Izadpanah, 2021; Xue and Dunham, 2021; Khazaie et al., 2022; Liu et al., 2022; Teo et al., 2022). It is argued that the flipped instruction is successful in achieving the instructional goals and enhances the EFL learners' motivation, making them more active in learning activities (Chen Hsieh et al., 2017). From EFL students' perspectives, using technology in the flipped classroom is an enjoyable and practical way to preview and review materials (Chen Hsieh et al., 2017). Moreover, EFL students appreciate the self-paced and autonomous learning feature of flipped approach since it leads them dive into the content deeply (Aghaei et al., 2020). Overall, students have shown positive attitudes toward language learning in the flipped classroom (Doman and Webb, 2017).

EFL literature includes numerous studies on the use of flipped classrooms in Asian countries (e.g., Turan and Goktas, 2016; Chen Hsieh et al., 2017); however, these studies are predominantly concerned with exploring the perceptions toward flipped classroom, various approaches in using this instruction, and conducting descriptive studies (Doman and Webb, 2014). Furthermore, few studies have explored the effectiveness of flipped

instruction using experimental research designs (Webb and Doman, 2016). Moreover, most of the previously conducted studies have focused on investigating the effect of flipped classroom on students' English skills such as speaking (Abdullah et al., 2021), reading (Samiei and Ebadi, 2021), and writing (Fathi and Rahimi, 2020), few studies thus far have explored the role of flipped approach in listening skill of EFL students. As such, the exploration of how flipping a course can contribute to enhancing EFL students' listening comprehension might be an interesting research area, particularly given the fact that students' further control over their learning content is argued to affect their degree of engagement and learning outcomes (Ushioda, 2011). In addition, the effect of flipped classroom on listening anxiety has remained under-explored. The role of anxiety in L2 learning, in general, is of paramount importance (Horwitz et al., 1986) and some scholars have considered this construct to be task- or skill-specific (Mac Intyre and Gardner, 1994; Fathi et al., 2020). As such, investigating the effect of flipped classroom on listening anxiety seems much warranted as one key novelty of this research. The only recent study in this respect is the work of Rajabi et al. (2021) which focused on the impacts of the flipped classroom method on classroom anxiety and listening performance of Iranian EFL students. As the flipped classroom approach has turned out to be implemented by a considerable number of researchers recently in the educational systems (Polat and Karabatak, 2021), the need to investigate the effects of flipped approach on language skills in EFL context is significant. Bearing this in mind, further research is required to reveal how the integration of flipped approach can affect students' listening skill and listening anxiety among Chinese EFL learners. Therefore, the following research questions guided this research:

Research Question 1: Does flipped listening instruction significantly enhance EFL learners' listening performance?

Research Question 2: Does flipped listening instruction significantly reduce EFL learners' listening anxiety?

Literature review

Flipped classroom

This research is theoretically grounded in Wen (2008) Output-driven model based on which learners' requirement for output prompts them to focus on input, and the input then allows the learners to generate more fine-grained output. From this perspective, appropriate engaging input is required to enhance the degree of learners' intake, output also aid learners in improving students' competencies, and finally favorable feedback facilitate learning process (Wen, 2015). This model lends itself to the flipped mode of instruction as the learners are first given videos/clips prior to attending the class *via* getting exposed to the input and then they are required to produce quality output during the class time.

The recent developments in technology have positively constructed a diversity of language pedagogical approaches, namely

CALL, e-learning, and mobile-assisted language learning (MALL), as well as learning management systems (LMS). According to Hill and Hannafin (2001), the dramatic effect of computer technology has altered both the nature of communication and information and resources available in learning/teaching environments. Riding on the tide of rapid developments in digital technologies, many L2 instructors and learners have gone through digital language learning and its applications (Li and Lan, 2021). In many cases, application of mobile technology creates opportunities for collaborative learning, thus this collaboration in language learning opens up chances for learners to practice L2 skills and build new knowledge both inside and outside the classroom (Kukulska-Hulme and Viberg, 2018). Alongside the rise of online learning, one of the approaches that takes advantage of educational technology is flipped classroom approach. The flipped model reverses the places of activities inside (namely, the student note taking and the teacher-led lecture) and outside the classroom such as homework and assignments (Bergmann and Sams, 2012). Since its arrival, attempts have frequently been made to uncover the extent to which flipped approach is effective in affecting student achievement (Zheng et al., 2020; Polat and Karabatak, 2021).

The flipped approach is a relatively new pedagogical model by which the teacher shares predetermined digital materials with learners *via* a platform outside of the classroom, and also teaches a particular topic *via* this additional platform asynchronously by using instructional videos (Bergmann and Sams, 2012). In the first (pre-class learning) phase of the flipped model, learners acquire knowledge by viewing learning materials in a variety of media formats, including podcasts, online or lecture videos, and text-format input materials sent by the instructor prior to class (Bergmann and Sams, 2012). In the second (in-class learning) phase of the flipped approach, the class time is devoted to student-centered active learning tasks, such as role plays, problem solving, interactive lectures, problem solving, laboratory experiments, and group discussions (Chen et al., 2014).

Over the past years, a surge of interest in conducting the flipped classroom method in both K-12 and higher education can be observed (Bergmann and Sams, 2012; Zhu, 2021). A bulk of research has been done to determine the effectiveness of flipped teaching model in this area (see Strelan et al., 2020). One example of such investigation is the comprehensive meta-analysis of the effect of flipped model on students' performance by (Strelan et al., 2020). They suggested that flipping the classroom provides opportunity for problem solving and active learning. Likewise, Shi et al. (2020) revealed that the flipped classroom approach promotes college students' cognitive learning. They also found that flipped classroom is more effective when teachers integrate individualized active and interactive pedagogical approaches. Chuang et al. (2018) asserted that the way learners perceive and prepare information before the class time can affect the potential effectiveness of a flipped classroom. In their study, highly motivated students did the quizzes well and therefore benefited most from the flipped learning.

The flipped learning model has received attention and popularity in the field of English Language Teaching (ELT) among

researchers and practitioners recently, and there has been a heightened interest in this topic in recent years (Turan and Akdag-Cimen, 2020). Similarly, the flipped classroom has become very popular among researchers in the context of EFL (Shahnama et al., 2021). Flipped classroom can be beneficial for both the teachers and students in FL classes as instructors are able to address all subjects in the given curriculum and focus more on interactive and collaborative activities (Basal, 2015). It also creates autonomous and flexible learning for students since it allows them to learn at their own pace and experience active learning (Amiryousefi, 2017). Research has shown that flipped classroom provides a sequence of instruction that places learners at the heart of their prior experiences and emphasizes the role of collaborative learning that leads students to improve their higher-order thinking skills (Fathi and Rahimi, 2020). The results of Afzali and Izadpanah (2021) study indicated that flipped classroom raised students' interactivity and participation in addition to their learning motivation. This, in turn, raised their enjoyment in using the learning English grammar model. In a similar vein, the majority of participants of the flipped group in the study conducted by Haghighi et al. (2019) enjoyed learning English in a flipped learning classroom. They showed that these participants were more engaged in the course input and significantly outperformed their peers in the traditional classroom group. The recent study of Öztürk and Çakıroğlu (2021) demonstrated that self-regulated learning strategies in the flipped classroom model positively influenced the development of FL skills. In this line of inquiry, Namaziandost and Çakmak (2020) investigated the relation of self-efficacy and gender with flipped classroom. The findings of their study revealed that flipped model increased self-efficacy among students in the flipped classroom. Females in the flipped classroom exhibited more significant improvements in their self-efficacy than the male participants. This suggests that female students can increase their individual confidence in the flipped classroom while learning English as a FL.

Delving deeply into this area, researchers have examined the effect of flipped classroom on the language skills such as speaking (Phoeun and Sengsri, 2021), reading (Samiei and Ebadi, 2021), and writing (Challob, 2021) in the field of ELT. Among the four skills, listening has gained little attention in the realm of EFL (Namaziandost et al., 2020). There is still insufficient empirical evidence regarding the interplay between listening comprehension and listening anxiety as FL anxiety is a less thoroughly researched skill in general (Elkhafaifi, 2005). According to Amiryousefi (2017), listening and speaking are two difficult skills to master given their interactive nature, thus through flipped classroom teachers can help EFL learners to develop these language skills. The results of Amiryousefi (2017) study showed that EFL learners' listening and speaking developed substantially in the flipped learning since they were more engaged with materials and tasks outside the class. A similar pattern can be observed in Namaziandost et al. (2020) findings which stressed the effectiveness of flipped instructional model in EFL learners' listening comprehension.

L2 listening and anxiety

Listening is believed to be a crucial component of language learning (Vandergrift and Baker, 2018). The significance of listening for L2/FL learning has been highlighted by scholars in the literature (Feyten, 1991). Listening comprehension is conceptualized as the ability to comprehend the spoken language of native speakers (Mendelsohn, 1994). Hamouda (2013) further stated that listening comprehension refers to the listeners' ability to understand the speakers' speech and their ability to repeat the text. As all well-formed English structures are based on a fundamental group of linguistic rules, speakers may also vary acoustically (realizing individual speech sounds) in addition to their semantic and syntactic preferences (Brothers et al., 2019). As a result, this may lead learners to have difficulty in decoding English sentences while listening to native speakers. In contrast with reading comprehension in which language learners are able to manage the input, listeners have less control over correction and repetition since the producer determines the delivery level (Kim, 2000). In the classroom, students need to have good listening comprehension to get engaged actively in the learning process because the information is mostly presented *via* the instructor's explanation and discussion (Vandergrift, 2007). Moreover, language learners intend to master listening skill in order to understand the target language (L2) speakers and have access to the rich diversity of aural and visual L2 texts through network-oriented multimedia, such as YouTube, blogs, and podcasts (Vandergrift, 2007). Given its complexity, listening is regarded as a difficult skill for students to understand, particularly in learning a FL. In this respect, Arnold (2000) pinpointed that listening induces anxiety in students because it places pressure on them in the input process. Likewise, Chen (2019) underlined the difficult nature of listening comprehension and considered it as a source of anxiety among EFL learners.

Horwitz et al. (1986) defined FL anxiety "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (p: 128). They also highlighted the significant role of anxiety in determining learners' success or failure when learning a FL. According to Sparks et al. (2000), FL anxiety is the consequence of low performance. FL anxiety seems to be linked with a particular type of language skill, namely listening (Mac Intyre and Gardner, 1994; Zhang, 2013). Elkhafaifi (2005) presented an empirical investigation of the impact of listening anxiety on learners' listening comprehension. 233 postsecondary learners of Arabic as a FL were the participants of this study. The findings revealed that FL learning anxiety and FL listening anxiety were negatively associated and both had a negative effect on L2 achievement. This suggested that the participants susceptible to high levels of FL learning anxiety experienced higher levels of listening anxiety. It was also found that FL listening anxiety is related but distinct from FL learning anxiety. Similarly, Kim (2000) indicated that listening anxiety is significantly correlated with both general FL anxiety and listening

proficiency. Additionally, lack of confidence in listening was found to be the best predictor of listening proficiency.

As pointed out above, the scrutiny of the existing literature demonstrated that flipped instruction could enhance different constructs in EFL setting (e.g., Lee and Wallace, 2018), including L2 listening outcomes. However, reviewing the existing literature shows that the effect of the flipped classroom on listening comprehension is not yet fully examined, legitimizing conducting further empirical studies in this regard. Furthermore, what is not so far clear is the impact of flipped model on listening anxiety among EFL students. Therefore, taking the significance of listening comprehension and anxiety into account, and taking into consideration the research gap which exists in EFL context, it is deemed necessary to explore the effect of flipped classroom on the listening comprehension and listening anxiety of the participants.

Materials and methods

Participants

A total number of 44 EFL students of two intact classes from a private language school in China were selected as the participants of this research. As these students were more accessible to the researchers, convenience sampling method was used for selecting the participants who were all female students with their age ranging from 21 to 28 ($M=23.24$, $SD=5.12$). The students' proficiency level was B1 (intermediate) and they had enrolled in an IELTS preparation course whose purpose was to build up the four skills of the participants to get ready to take IELTS. The purpose of this course was particularly to enhance the listening skill of the participants in a period of 3 months. The two intact classes were randomly assigned to a flipped group ($N=23$) and a non-flipped group ($N=21$). Both classes were taught by the same instructor who had the experience of teaching EFL based on flipped mode of instruction. However, no student had previously experienced being taught based on flipped instruction. The homogeneity of the two groups concerning the global language proficiency was examined *via* giving Oxford Placement Test (OPT; Allan, 2004). The results of an independent samples t-test demonstrated that there was not any statistically significant difference between the two groups. The students were informed that their participation in the study was voluntary and the informed consents were obtained too. Additionally, the course was an extra-curricular instruction designed for the purpose of this research and was offered as a free course.

Materials and instruments

Although the scales/tests had been previously used and validated by researchers, a pilot study was carried out to check the face and content validity as well as the reliability of these scales in the context of this study. To this end, the content and items of the

tests were checked by two domain experts to ensure the appropriacy of the items. The scales were also given to 12 intermediate Chinese EFL students to measure their internal consistency. The results of this initial piloting showed the acceptable reliability of the scales. The face and content validities were also approved by the domain experts.

Listening for IELTS

The coursebook used for both groups was *Listening for IELTS* developed by Aish and Tomlinson (2017). This coursebook intends to prepare IELTS applicants for the listening module of the exam and is used for those who wish to gain the band score of 6–7. It is one of the widely used coursebooks in IELTS preparation classes as it is well-structured, provides a variety of tasks, and includes a complete answer key. This book contains 12 units which cover the potential topics that test takers might encounter on the IELTS exam, aiding users in enhancing their vocabulary repertoires and schematic knowledge on a wide range of topics. It also builds up learners' main strategies and skills they require for listening module of the exam.

Oxford placement test (OPT)

To measure participants' general language proficiency, OPT (Allan, 2004) was administered to the participants of both groups. OPT is widely used to measure English proficiency of different learners with various proficiency levels. The reliability coefficient of OPT, as measured by Cronbach's alpha, was .86 in this research. The results of an independent-samples *t*-test indicated that there was no substantially significant difference between the two groups, implying that the two classes were homogeneous with respect to their global English proficiency prior to beginning the treatment.

Listening performance test

International English Language Testing System (IELTS) listening section was used to gauge the listening comprehension of the EFL students before (as pre-test) and after (as post-test) the treatment. In order to avoid test effect as the potential internal validity threat (Ary et al., 2018), two samples were adapted from the IELTS listening practice tests (Scovell et al., 2004) and used as pre-and post-tests. The students were required to answer 40 questions devoted to four sections of listening module within 30 min. The Cronbach's alpha coefficients measured for the pre-and post-tests were .81 and .84, respectively.

Listening anxiety scale

Foreign Language Listening Anxiety Scale (FLLAS) was administered to assess listening anxiety of the EFL students before and after the treatment. FLLAS designed by Kim (2000) is a 33-item self-report measure in which the items are assessed on a 5-point Likert-type scale. This scale measures three facets of foreign language anxiety including *tension and worry* (10 items), *lack of confidence* (7 items), and *problems encountered* (16 items). The internal consistency of the FLLAS, as calculated by Cronbach's alpha formula, was .84 in the current research.

Procedure

The students had enrolled in an advanced listening course whose purpose was to boost listening competencies of the EFL participants to get ready to take IELTS. In the first session of the course, the participants were informed of the purpose of this study and the pre-tests (i.e., listening test and listening anxiety scale) were administered to the participants of the two groups. Then the two intact classes were randomly assigned to an experimental group and a control group. The treatment was carried out in winter of 2022 and lasted for 13 sessions. Given the purpose of this study, the experimental group were taught based on the flipped mode of instruction in which the students were provided with previously prepared materials of the listening instruction before attending the class. The learning materials of the flipped group were video clips selected from YouTube, the recorded classes of previously held online courses, and Voice-annotated PowerPoints. The duration of video clips was about 20–30 min. The students were requested to go through the video clips/PowerPoints of each session before attending the class. In order to ensure that they have covered and understood the flipped content, the teacher provided the students of the experimental group with worksheets and exercises related to the videos of each session. During each session, the teacher ensured that the learners had watched and understood the content of the videos *via* collaborative tasks, worksheet completion, and group discussions. Each unit of the textbook had a three-part structure and each session lasted for about 75 min.

On the other hand, the control group students were taught traditionally without flipping any content of the course. These students received the same type of instruction and tasks but they had less time for the practice inside the classroom. The same instructor was assigned as the teacher of both classes. The listening comprehension exercises were done collaboratively by the control group students and they received teacher scaffolding if they needed. However, as they had not been provided with the course content in advance, they had less opportunity to get exposed to the audio texts as the flipped group did. In general, the control group had less time for the listening exercises and group discussions inside the class. Students of both groups were encouraged not to use other materials except for those given by the instructor. It is worth noting that much attempt was made to offer the two groups with identical instruction *via* using the same materials. However, the flipped group were endowed with further opportunity to get exposed to and review the learning materials before the classroom, leading to a kind of unparalleled teaching for the two groups. This pitfall, nevertheless, was partially mitigated by encouraging the students of the control group to undertake further listening practice outside the classroom.

The instructional content of both groups was mainly directed to strategies on how to do the test tasks of IELTS listening section. It is worth mentioning that the participants of both groups were also encouraged not to study any other textbook/materials during the course time. The teacher tried to create an inspiring learning

TABLE 1 Test of normality.

	N	Skewedness (Std. Error)	Kurtosis (Std. Error)
Listening 1	44	0.456 (0.314)	-0.356 (0.658)
Listening 2	44	0.431 (0.314)	-1.102 (0.658)
Anxiety 1	44	-0.356 (0.314)	-0.174 (0.658)
Anxiety 2	44	-0.336 (0.314)	-0.496 (0.658)

TABLE 2 Descriptive statistics for pre-and post-tests scores.

Groups	Scales	Pre-test		Post-test	
		M	SD	M	SD
Experimental	Listening	17.79	4.01	23.24	4.53
	Anxiety	44.04	10.85	36.69	10.65
Control	Listening	18.14	3.30	19.46	4.24
	Anxiety	46.30	11.70	43.57	11.43

context and enhance students' motivation *via* pair and group exercises. He also helped students acquire effective learning strategies *via* doing tasks and having reflection on them. At the end of the course, the students of both groups were given the post-tests of listening achievement and listening anxiety to explore the potential effects of flipped listening instruction on the dependent variables of the study.

Data analysis

The collected data were fed to SPSS (version 23.0) for data analysis. First, descriptive statistics (means and standard divisions) was taken into account. Then One-way between-groups analysis of covariance (ANCOVA) was conducted to analyze the quantitative data as the inferential statistics. Following Pallant (2020), ANCOVA can be utilized in case there is a pre-test/post-test design in which the pre-test scores are considered as the covariates. In the ANCOVA analyses, the independent variable was the teaching type (i.e., flipped or traditional) and the dependent variables were post-test scores of listening performance and listening anxiety at the end of treatment.

Results

First, descriptive statistics was calculated. Then, to explore the impact of the flipped listening course on the EFL learners' listening performance and listening anxiety, the analysis of covariance (ANCOVA) was performed to compare the impacts of the two kinds of listening instructions used in the control (non-flipped) group and the experimental (flipped) groups on the listening performance and listening anxiety.

Prior to performing each ANCOVA, preliminary investigations were done to make sure that the assumptions of

normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate were not violated.

Table 1 shows the skewedness and kurtosis statistics and their ratios to the standard errors. As the ratios fell between -1.96 and +1.96, the data were regarded to be normally distributed.

Moreover, the Levene's test for homogeneity of variance for listening performance scores showed the equality of variances as no significant difference was found between the variance of the groups ($F = 4.65$, $p = 0.353$). Additionally, it was found that the interaction between the covariate (pre-test scores of listening) and independent variable (instruction type) was insignificant ($F = 33.54$, $p = 0.412$). Likewise, homogeneity of variance (i.e., Levene's test) was assessed for listening anxiety scores. The results demonstrated no significant difference between the variance of the groups ($F = 3.89$, $p = 0.326$). The interaction between the covariate (pre-test scores of listening anxiety) and independent variable was not also significant ($F = 28.27$, $p = 0.357$). These results confirmed that the assumptions of ANCOVA were met, leading the researchers to conduct ANCOVAs for both listening performance and listening anxiety.

Concerning the impact of the flipped listening instruction on listening performance of EFL learners, as Table 2 indicates, the listening performance mean score of the experimental group was 17.79 (SD = 4.01) on the pre-test and it increased to 23.24 (SD = 4.53) on the post-test. By the same token, the mean score of the listening performance for the control group on the pre-test was increased from 18.14 (SD = 3.30) to 19.46 (SD = 4.24) on the post-test. Nevertheless, after adjusting for the pre-test scores of listening performance, a statistically significant difference was found between the two groups on post-test scores of listening performance ($F(1, 41) = 10.60$, $p = 0.002$, partial eta squared = 0.20; see Table 3). This finding indicates that the participants of the flipped group enhanced their listening performance significantly more than the non-flipped group participants, implying that the flipped listening instruction was effective in improving the listening performance of the EFL participants.

With regard to listening anxiety, the descriptive statistics (see Table 2) demonstrate that the non-flipped group had a listening anxiety mean score of 46.30 (SD = 11.70) in the pre-test and this mean score decreased to 43.57 (11.43) on the post-test. Similarly, the listening anxiety mean score for the experimental (flipped) group was 44.04 (SD = 10.85) on the pre-test and this value was decreased to 36.69 (SD = 10.65) on the post-test. After adjusting for the pre-test scores of listening anxiety, the results of ANCOVA (see Table 4) showed that a statistically significant difference was observed between the two groups on post-test scores of listening anxiety, [$F(1, 41) = 176.83$, $p = 0.000$, partial eta squared = 0.81]. This result revealed that flipped listening instruction was effective in reducing the listening anxiety of the EFL participants.

TABLE 3 ANCOVA results for listening performance.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Covariate (pre-test)	150.679	1	150.679	9.321	0.004	0.185
Between-subjects	171.425	1	171.425	10.604	0.002	0.205
Within-subjects	662.822	41	16.166			

TABLE 4 ANCOVA results for listening anxiety.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Covariate (pre-test)	5059.113	1	5059.113	3778.276	0.000	0.989
Between-subjects	236.780	1	236.780	176.833	0.000	0.812
Within-subjects	54.899	41	1.339			

Discussion

The purpose of the present research was set to deepen our knowledge of how flipped classroom can affect L2 listening competence among EFL learners in the context of China. In order to further elucidate the utility of technology and its integration into L2 learning, the current study sought to explore the impact of the flipped instructional model on listening comprehension and listening anxiety of Chinese EFL learners. The outcomes revealed two main findings. First, it was found that the flipped classroom developed the listening comprehension of the participants. This finding is on a par with a number of previous studies (Amiryousefi, 2017; Vaezi et al., 2019; Etemadfar et al., 2020; Rajabi et al., 2021) which underscored the effectiveness of the flipped classroom model in improving L2 learners' listening comprehension. For instance, the findings from Etemadfar et al. (2020) study revealed that the EFL learners in the flipped classroom outperformed their classmates in the control group in terms of their listening comprehension. Similarly, Rajabi et al. (2021) indicated that the flipped classroom significantly improved the listening performance of the EFL participants. Likewise, Amiryousefi (2017) demonstrated that flipped learning helped EFL students to improve their L2 listening and engagement with materials outside of class. Also, this finding somewhat resonates with the result of Shahnama et al. (2021) study, suggesting that the flipped model promotes L2/EFL learners' achievement.

In light of justifying this result, it can be argued that the flexible and autonomous nature of the flipped classroom enables learners to learn on their own pace at anyplace or anytime they prefer. Put differently, learners are able to listen to the given

materials (e.g., podcast, vodcast, or instructional videos) as many times as they desire until they understand the content. Unlike the traditional teacher-centered instruction where the allocated time of the class is not enough for re-listening to the audio files, students of the flipped group can pause, rewind, and replay the materials to reinforce their listening comprehension. Students can learn different subjects in depth and become self-regulated as long as the content is shared with them prior to coming to the class. In spite of the pivotal role that listening skill plays in learning the L2 (Vandergrift, 2007), teachers sometimes underestimate the listening activities in the course books and ignore the output due to the lack of time in traditional classrooms. The reverse nature of the flipped classroom allows teachers to free up the class time for authentic listening tasks as well as output-based activities and devote their energy to giving further feedback and assessment. Consequently, learners have further opportunities for benefiting from the authentic materials, individualized feedback from their instructor, and peer support in the flipped classroom (Alten et al., 2019). Moreover, high exposure to authentic listening materials especially outside the class where learners have enough time and less anxiety to view and review the contents may develop learners' listening comprehension. This is to say, the rich input through the instructional materials (podcasts and videos), accompanied by classroom interactions and proper feedback improves learners' listening comprehension. Rajabi et al. (2021) hold the view that authentic materials if properly selected for different language proficiency levels can have useful impacts on L2 learners' listening proficiency. Another possible explanation may be that since learners in the flipped model have greater chances to contemplate on and decode the meaning of different sentences in the audio files with full consideration at home, they can minimize any mistake and misunderstanding. Therefore, teachers can make use of the extra time inside the class to address misconceptions and provide students with more personalized guidance on their listening comprehension. In addition to teachers' help and guidance, learners can also receive support from their classmates (Alten et al., 2019). More specifically, the flipped classroom is effective for students in case of being absent since they can access the instruction beyond the limitations of classroom wall.

Second, the listening anxiety of the EFL learners in the experimental group was significantly reduced after experiencing flipped instruction. This finding is partially in congruence with Abdolrezapour (2019) study which revealed that computer-mediated active learning intervention reduced English learners' anxiety in listening tasks and enhanced their motivation to participate in classroom activities. One interpretation for the obtained result might be that in the flipped classroom students have greater opportunity to learn and perform in active/collaborative learning (Lai and Hwang, 2016) and get engaged in higher-order thinking tasks, thus they experience less anxiety. Team- or peer-assisted learning (Topping and Ehly, 1998) and interactive activities not only help students to improve their listening comprehension, but also decrease their anxiety level through sharing diverse perspectives and solving problems. This

interpretation goes along with some researchers who believed that collaborative strategies that engage learners in peer-to-peer interactive tasks support L2 learning (e.g., Vandergrift, 1997) and increase learners' comprehensible input which lead them to have greater understanding of aural texts (Szostek, 1994). When learners discuss and interact with each other, they support, guide, and correct each other when needed and, thereby helping each other to progress by sharing their knowledge, cognitive, and linguistic resources (Rowell, 2002).

Based on what has been mentioned so far, it can be argued that collaborative listening activities in the flipped classroom may develop reciprocity and cooperation among learners which result in reducing their listening anxiety. In such an environment where the students have the same learning goals and support each other in this regard, anxious learners feel less stress. It is worth noting that in contrast to conventional classrooms in which anxious students feel embarrassed to speak in front of their peers, in flipped classrooms they receive social support and encouragement from the teammates to share opinions regarding listening. As Davies et al. (2013) noted, in the flipped classroom learners are transformed from mere passive listeners into active students. Another possible explanation is concerned with the students' preparedness before class (Basal, 2015) and enjoyment of the activities in class. The individualized nature of flipped model allows students to pre-study the materials at home without any distraction and get ready to answer the instructor's questions inside the class. Students would take part effectively in classroom discussions because they have gained a basic background about the lesson prior to class (Kukulska-Hulme and Viberg, 2018).

According to Bergmann and Sams (2012), students are willing to apply their knowledge in details *via* various problem-solving tasks, pair/group works, and discussion-based activities. In such a case, students feel less anxiety when they encounter the questions because they have relevant prior knowledge related to the contents. Through technology, students can search numerous learning resources online, watch videos on YouTube, and do listening quizzes online before class. As Sahin et al. (2015) stated, learners had positive perceptions toward flipped learning because watching videos was easier than reading the coursebook for them. Their argument may explain why learners in flipped classrooms might be better prepared before participating in class than their counterparts in conventional instruction settings. However, this study is inconsistent with the findings of Rajabi et al. (2021) which showed that the flipped classroom has no effect on EFL learners' classroom anxiety.

Conclusion

In this study, we examined the effect of the flipped classroom approach on L2 listening comprehension and L2 listening anxiety of Chinese EFL students. Overall, the findings revealed that the flipped classroom had a key role in developing the participants' L2 listening comprehension. Moreover, learners in the experimental

group experienced less anxiety compared to their peers in the conventional group. Despite the fact that flipped learning has been in the spotlight among a growing number of L2 instructors, the salient role of listening competence has been ignored in ELT context. It is hoped that the results obtained from this study could yield beneficial insights into the field of EFL by employing a more collaborative genre of digital learning (i.e., flipped classroom) in which listening comprehension skill is sufficiently practiced. As Shahnama et al. (2021) posited, although the flipped learning is in its infancy in the domain of EFL, it has the potential to improve learners' achievements in case of being designed and employed properly.

There are some implications derived from the present study. CALL programs with the goal of practicing successful flipped learning must create a friendly and welcoming social context for online EFL learning. In this respect, teachers can furnish an effective online community using various social networking sites (e.g., Telegram, Whatsapp, and so forth) in which the EFL learners can maximize their interaction and share their knowledge with regard to L2 listening. The learners can view the instructional videos deeply at a time that suits them best to diagnose their listening issues during the class activities. Thus, teachers can devote the class time to authentic output activities in order to enhance the students' listening comprehension and give appropriate and rapid feedback. As Wang (2020) mentioned, interacting and cooperating in the online space enables the students to learn from each other and also to reflect on their own learning.

It is recommended that flipped classroom, as a relatively new instructional approach in the educational system, be applied to develop learners' language skills and L2 listening comprehension in particular. To meet this purpose, teachers have active roles in encouraging and facilitating collaborative listening activities, peer-peer interactions, and in-class assessment. EFL instructors can give their students the necessary advice and guide them how to cope with unfamiliar vocabulary or grammatical patterns in the listening files they hear. With enough guidance and practice in a comfortable and stress-free classroom through interactive and collaborative activities, students could improve their listening comprehension skills and reduce their anxiety level too. Elkhafaifi (2005) suggested that creating a less stressful and comfortable classroom environment may enable students to improve their listening comprehension proficiency. Appropriate instruction in listening comprehension also decreases listening anxiety and provides students with a sense of autonomy. Even though teaching listening is believed to be difficult and time consuming in traditional lecture-based classrooms, the flipped teaching approach makes it easier and more pleasant for both teachers and students. Drawing on the tenets of positive psychology (Wang et al., 2021) can also help teachers to create a positive teacher-student interpersonal relations (Xie and Derakhshan, 2021). Given that most of the EFL teachers pursue traditional pedagogical methods in their lecture-based classes, they are unfamiliar with the utility of Web 2.0 technology in general. Therefore, EFL

policymakers and teacher educators should hold teacher trainings workshops to inform the instructors of the procedures required to conduct a successful flipped listening classroom to contribute to EFL learners' listening comprehension. They might also create a convenient education environment for EFL instructors and learners so that they may have a chance to practice their listening skills in a flipped classroom.

The current study suffers from some limitations that need to be taken into account for future research. First, this research recruited a small number of EFL learners; therefore, generalizability of the results may not be verified. Second, since this study was carried out in the EFL context of China, the findings might not be transferable to other EFL populations. As a result, a cross-cultural survey may be appropriate to provide a more vivid picture of the flipped model in different settings where English is considered as a FL. Also, next researchers are recommended to employ qualitative research methods too. Employing qualitative research designs will allow the researchers to get more insight into what practical and logistical challenges the instructors and the students might have experienced when the flipped method was implemented. Similarly, the EFL learners' perceptions regarding their experience of flipped instruction can be qualitatively explored in order to investigate how much qualitative results confirm the quantitative findings. In addition, in the current study, we just investigated the students' listening development and anxiety through pre-and post-tests. Having replicated the similar further study, future researchers may conduct delayed post-tests to recognize the long-term impacts of the flipped classroom on listening comprehension among EFL students. The EFL teachers' attitudes and outlook toward the flipped classroom integration for listening skill would be a good research topic for future studies. Additionally, attempts need to be made also to find the influential and useful strategies to improve students' listening comprehension skill in flipped classroom evaluation and ways to encourage students to view the materials out of class and participate in-class activities. Ultimately, as the individual differences and the effect of cultural, educational background, and other contextual factors can potentially affect the internal validity of such studies, future researchers might design studies to examine the role of these extraneous variables

by considering them as moderator variables or to carry out cross-cultural studies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Lingnan Normal University Research Ethics Office. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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School climate's effect on hospitality department students' aesthetic experience, professional identity and innovative behavior

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This study investigated the effects of school climate and students' aesthetic experience on their professional identity and innovative behavior. A survey was conducted with 385 students from hospitality-related departments of colleges and universities in Hainan, China, and the data were analyzed using a hierarchical linear model (HLM). Using the criteria constituting the students' aesthetic experience scale proposed by Chang, it was found that teacher support can improve students' professional identity; school climate and students' understanding of beauty and full experience contribute to the development of students' innovative behavior; students' understanding of beauty and full experience have mediating effects between teacher support and professional cognition; students' understanding of beauty and full experience have mediating effects between student support and innovative behavior; student support positively moderates the relationships between full experience with professional cognition and students' appraisal of the hospitality industry; and teacher support positively moderates the relationship between students' full experience and professional emotion. Therefore, teacher support under school climate and students' understanding of beauty and full experience under aesthetic experience were the most important factors in enhancing hospitality department students' professional identity and innovative behavior.

KEYWORDS

school climate, aesthetic experience, professional identity, innovative behavior, hospitality department students

Introduction

The COVID-19 pandemic severely impacted employment in the tourism and hospitality industries, with an estimated 100–120 million people worldwide becoming unemployed at the start of the pandemic (The World Tourism Organization [UNWTO], 2021). According to the “State of the Hotel Industry 2021” report, issued by the American Hotel & Lodging Association [AHLA] (2021), 2020 was a devastating year for the hospitality industry, with historically low occupancy rates, massive job losses, and hotel closures across the United States. Hotels were among the foremost industries heavily impacted by the pandemic and would be among the last to recover. All signs indicate that the hotel industry would move toward recovery in 2022, but a full recovery would take several years. The severe impact on the hospitality and tourism industries spilled over into hospitality and tourism education (Joshi and Gupta, 2021).

A core trend in the hospitality industry is the application and development of innovations that provide a strong impetus for this industry’s development (Dzhandzhugazova et al., 2016). Diversified innovative behavior contributes to the trend of innovation in the hospitality industry, ensuring the successful development of hotels (Zaitseva, 2013). Therefore, innovation is crucial in the pursuit for sustainable development (Kearney et al., 2009). Moreover, students’ innovative behaviors play a key role in the competitive environment of the hotel industry (Dzhandzhugazova et al., 2016).

The conceptual development of professional identity is an inherent aspect of professionalism (Dubar, 1991). The development of one’s professional identity requires the higher-order thinking process of generating self-awareness (Garrison et al., 2001). Marhuenda et al. (2004) believed that socialization is a key element in the improvement of tourism professional identity, which provides a sense of belonging to the group. Students’ professional identity is constituted by attitudes, values, knowledge, and beliefs about the profession (Adams et al., 2006), which are important factors that motivate students to continue in the profession. Fingerhut et al. (2021) stated that aesthetic taste is related to personal identity. While professional identity can be theorized in terms of emotions, attitudes, and values (Sabanciogullari and Dogan, 2015), aesthetic experience also represents personal attitudes, emotions, feelings, and values (Schellekens, 2009; Saito, 2017; Korpelainen, 2021). Therefore, the acquisition of aesthetic experience enhances the professional identity of personal attitudes and values. Aesthetic experience can contribute to the generation of innovative behaviors in students (Chang and Jaisook, 2021), and it is an important concept for sustainable development (Korpelainen, 2021).

Hospitality and tourism department students’ innovative behaviors are nurtured in school (Chang, 2018), which is an environment that fosters students’ aesthetic experience (Chang and Jaisook, 2021; D’Olimpio, 2021). Over time, a supportive

learning environment can promote students’ personal and professional identities. According to social identity theory (SIT), the social environment can change an individual’s behavior as long as the individual is able to modify their self-identity or self-concept that derives from the knowledge of and emotional attachment to social groups (Tajfel, 1971). Therefore, school climate may stimulate students’ professional identity (Bizumic et al., 2009; Reynolds et al., 2017), aesthetic experience (Caiman and Jakobson, 2021), and innovative behavior (Kleebua and Lindratanasirikul, 2021). Moreover, the interaction between school climate and students’ aesthetic experience may also affect students’ professional identity and innovative behavior.

However, as students are nested within classes or schools, appropriate analytical methods such as multilevel modeling and hierarchical linear modeling (HLM) must be used; otherwise, the data will be confounded by hierarchical relationships and lead to misleading findings (Raudenbush and Bryk, 2002). Therefore, considering that students’ aesthetic experience, professional identity, and innovative behavior are nested within school climate, HLM is used in this study. Little research has been conducted on hospitality department students’ professional identity and aesthetic experience in higher education institutions (HEIs), but this is important for their future engagement in the hospitality industry and their sustainable development. China’s HEIs include public degree-granting universities, vocational colleges, and junior colleges. Therefore, we investigated the influences of school climate and students’ aesthetic experience on professional identity and innovative behavior in the hospitality department of the HEIs in Hainan, China. This study will help students to join the hospitality industry after graduation and develop a long-term career in the industry.

Literature review

Professional identity and aesthetic experience

Professional identity can be theorized in terms of emotions, attitudes, and values (Sabanciogullari and Dogan, 2015). The development of a professional identity is an inherent aspect of professionalism, a self-awareness stemming from reflective practice (Dubar, 1991). According to the connotation of SIT proposed by Tajfel (1971), individual self-concept is composed of personal and social identities. The former refers to individual characteristics or personality, which is different for each person, and the latter refers to an individual’s perception of belonging to a certain social group. Social identity processes can also unite individuals through psychological associations with similar or shared social categories (James, 2015). Moreover, social processes are important for identity formation (Blue et al., 2011;

Cruess et al., 2015). Marhuenda et al. (2004) pointed out that social processes are essential also for tourism professionals' identity formation because a professional identity provides a sense of belonging to a group.

According to Wiles (2013), professional identity is not just about observing and demonstrating certain traits, competences, and values but also about the process by which students combine their own experiences and identify themselves as professionals. Therefore, personal experience, reflection on experience, and knowledge about one's discipline are powerful sources of professional identity (Henkel, 2005; Steinart et al., 2007). Whereas aesthetic experience is related to personal identity (Fingerhut et al., 2021), it also includes personal attitudes, feelings, and values (Saito, 2017; Korpelainen, 2021). Dangmei (2017) stated that aesthetics refer to sensory knowledge and the felt meaning of objects and experiences, and it includes information and meaning derived based on one's sensory experiences about feelings and emotions (Hansen et al., 2007). Aesthetic experience is also the conscious and subconscious experience that individuals have when they appreciate things of beauty (Maquet, 1986). To be a part of an aesthetic experience, beauty must transcend from its extrinsic to intrinsic values (Marković, 2012). In other words, ugly things can also elicit aesthetic experience (Eco, 2007), and good can be found in bad things (Chang and Jaisook, 2021). Thus, aesthetic experience is not only about viewing extrinsic beauty but also includes personal reflections, attitudes, and moral values (Garrison, 1997; Eaton, 2001). Aesthetic experience also encompasses emotion. Applied in education, teaching and learning signifies the importance of enlarging students' connections to self and others to become a part of "an expansive circle of relationships between ourselves and others" (Garrison, 1997, p. 38). The emotions elicited in aesthetics come not only from simple perceptions but also from the assessment of experiences through intra-community utterances (Maitlis et al., 2013). Yu and Wang (2018) argued that aesthetic experiences are unique means of knowing oneself and the world that can stimulate the discovery and formation of identity. Moreover, one's self-identity can be reflected and developed through powerful aesthetic experiences (Ferrucci, 2010; Yu and Wang, 2018).

School climate and professional identity

The school climate includes social processes such as teacher support, student support, and opportunities for autonomy in the classroom (Jia et al., 2009). Teacher support refers to the emotional, academic, and social support provided by teachers (Colarossi and Eccles, 2003). Student support is the perceived emotional support, trust, and concern between students (Loukas et al., 2006). Opportunities for autonomy in

the classroom are opportunities for students to make choices and decisions in learning and classroom activities. Loukas (2007) posited that the feelings and attitudes that are elicited by school environment are referred to as school climate, which encompasses physical, social, and academic measures. In the social identity approach, students' professional identity is considered a psychological mechanism that is shaped by the school climate and learning experience. School climate includes norms, values, and expectations (Haynes et al., 1997; Petrie, 2014) that affect students' learning, social adjustment (Brand et al., 2008), and mental health outcomes (Brand et al., 2003). Moreover, schools as holistic centers that usually emphasize academic priorities, support student-teacher relationships, and share values and approaches. Thus, school climate facilitates students' professional identity (Bizumic et al., 2009; Maxwell et al., 2017; Reynolds et al., 2017) and contributes to students' aesthetic experience (Caiman and Jakobson, 2021).

School climate, aesthetic experience, and innovative behavior

Schools provide the foundation for stimulating and nurturing students' aptitude for knowledge and innovation, and help them meet future employment challenges (Chang, 2018). Individual innovative behavior, however, refers to the individual behavior of identifying problems, generating innovative ideas or solutions, seeking support for innovative ideas, putting them into practice, and finally forming commercial products or services (Scott and Bruce, 1994). Kleysen and Street (2001) considered individual innovative behavior the implementation of ideas. Shalley et al. (2004) also argued that innovative behavior includes both the generation and implementation of new ideas. However, innovative behavior is related to unique factors such as motivation and organizational climate (Tierney and Farmer, 2011). Teachers are role models of creativity in the classroom and students learn from their teachers' creative personalities and behaviors (Cropley, 1994). A supportive and autonomous environment creates and maintains an atmosphere of mutual respect, inclusion, openness to criticism, and innovation (Gorshunova et al., 2014). Kleebua and Lindratanasirikul (2021) also found that the learning climate has a significant direct effect on students' innovative behavior (Chang and Yang, 2012).

Lussier (2010) stated that the acquisition of aesthetic experience by students is positive for the development of innovative behavior (Chang and Jaisook, 2021). After an individual's digestion, accumulation, and internalization of aesthetic experience, it may boost one's confidence to accept challenges and becomes an essential factor for the emergence of creative behaviors (Davies et al., 2009). Aesthetic experience involves a complex interplay of the interaction of cognitive

and emotional processes (Leder et al., 2004), and it consists of multiple processes that occur through interaction (Xenakis and Arnellos, 2014). Viewers absorb and internalize aesthetics through the process of contemplation and transform it into personal thinking and feedback experience, which becomes aesthetic experience and one's personal perception of beauty (Lussier, 2010; Chang and Jaisook, 2021). This can stimulate intrinsic motivation and self-confidence, enhance one's everyday imagination and creativity, and boost innovative behavior (Davies et al., 2009; Lussier, 2010). Aesthetic experience makes human reasoning possible, thus creating a new sense of reality. Emotions and imagination are integrated in the intellect at the time of an aesthetic experience (Garrison, 1997). Moreover, Webster and Wolfe (2013) also found that aesthetic experiences in the classroom affect students' ability to think, explore, create, and innovate. Researchers have studied individuals' creativity and innovative behavior from the perspective of the environment and found that the interaction between environment and individual cognition can impact individual creativity and innovative behavior (Hunter et al., 2007; Bammens, 2016). Learning contexts and aesthetics can stimulate curiosity, creativity, and innovation (Gurnon et al., 2013). In summary, school climate and aesthetic experiences affect students' professional identity and innovative behavior; students' aesthetic experiences may have a mediating effect between school climate with students' professional identity and innovative behavior; and school climate may also have a moderating effect. Therefore, this study investigates the relationships between school climate, students' aesthetic experiences, and professional identity and innovative behavior among the students from hospitality-related departments of colleges and universities.

Materials and methods

Research framework

This study aimed to investigate the effects of school climate and students' aesthetic experiences on professional identity and innovative behavior. We used SIT as the theoretical basis and HLM to conduct analysis. After the literature review, we proposed the research framework as follows (Figure 1).

Research subject and sampling method

The tourism industry in Hainan, China, has been developing rapidly in recent years—particularly the hospitality industry, which requires a large number of human resources, and hospitality department students are the main force of this industry. It is important that students be able to enter

the hospitality industry smoothly and sustain their careers in the industry.

This study selected students from hospitality-related departments of colleges and universities in Hainan, China, as the sample. The survey was conducted with the consent of teachers, who were asked to explain the purpose and procedure of the study to students willing to take the survey; further, teachers informed the participants that the survey was anonymous and voluntary. The survey was conducted in 25 classes of hospitality-related departments in 15 colleges and universities, with 15–20 students per class. A total of 426 students were surveyed. After removing the invalid questionnaires, there were 25 classes with 385 valid questionnaires.

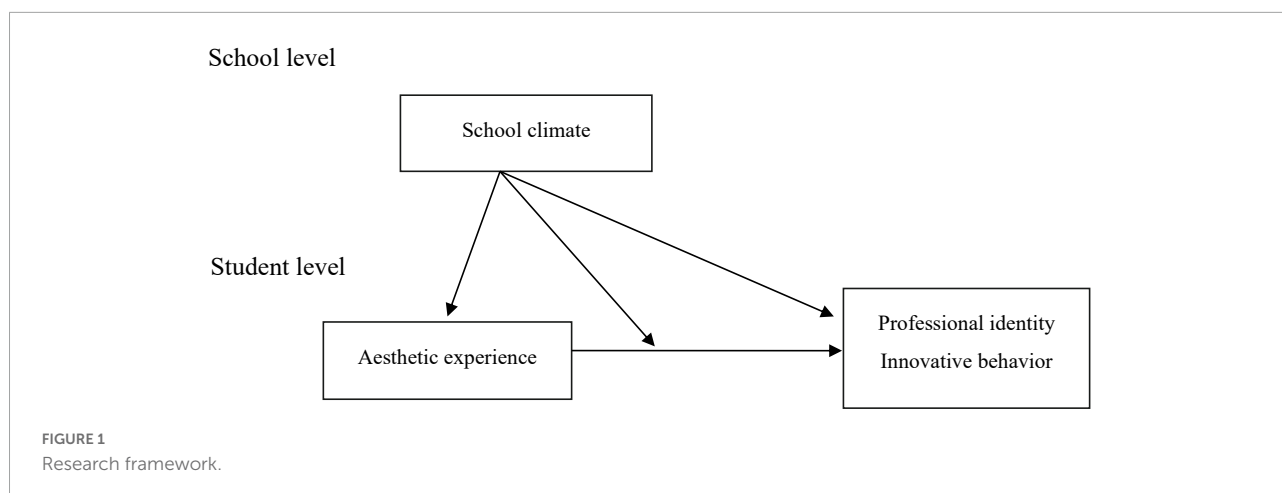
Research tools

School climate

The school climate scale proposed by Jia et al. (2009) was used. It comprises three dimensions: teacher support, student support, and opportunities for autonomy in the classroom. In the questionnaire, the reverse-worded items of the student support dimension were removed. A total of 18 questions were scored on a 5-point Likert scale. According to reliability analysis, the total Cronbach's $\alpha = 0.956$. The formal questionnaire was subjected to confirmatory factor analysis (CFA), in which the factor loadings of teacher support ranged from 0.730 to 0.837, with construct reliability (CR) = 0.923 and average variance extracted (AVE) = 0.630; the factor loadings of opportunities for autonomy ranged from 0.729 to 0.915, with CR = 0.925 and AVE = 0.711; and the factor loadings of student support ranged from 0.820 to 0.897, with CR = 0.947 and AVE = 0.749. The factor loadings of all the items were greater than 0.45, indicating that convergent validity had been achieved (Bentler and Wu, 1995). The CR values of all the items exceeded the evaluation criteria of 0.70, and the AVE values of all the items exceeded 0.50, indicating good composite reliability and construct validity (Fornell and Larcker, 1981). As for the overall goodness of fit (GOF) of the scale, standardized root mean square residual (SRMR) = 0.0612, $\chi^2/df = 5.057$, root mean square error of approximation (RMSEA) = 0.103, goodness fit index (GFI) = 0.837, adjusted goodness of fit index (AGFI) = 0.789, parsimony goodness of fit index (PGFI) = 0.646, normed fit index (NFI) = 0.896, incremental fit index (IFI) = 0.915, comparative fit index (CFI) = 0.915, parsimony normed fit index (PNFI) = 0.773, and parsimony comparative fit index (PCFI) = 0.789; thus, most of these values meet the criteria (Hair, 1998), indicating that the scale has adequate GOF.

Aesthetic experience

The students' aesthetic experience scale proposed by Chang (2017) was used in this study. It includes the following themes: "pleasure of beauty" and "aesthetic attitude," "understanding of



beauty,” and “full experience”; it comprises 21 questions and uses a 5-point Likert scale. The reliability analysis revealed that the Cronbach’s $\alpha = 0.976$. According to the CFA results, the factor loadings of pleasure of beauty ranged from 0.817 to 0.914, with CR = 0.947 and AVE = 0.750; the factor loadings of aesthetic attitude ranged from 0.836 to 0.931, with CR = 0.947 and AVE = 0.781; the factor loadings of understanding of beauty ranged from 0.847 to 0.876, with CR = 0.934 and AVE = 0.740; and the factor loadings of full experience ranged from 0.830 to 0.901, with CR = 0.932 and AVE = 0.733. As for the overall GOF of the scale, SRMR = 0.0412, $\chi^2/df = 4.774$, RMSEA = 0.099, GFI = 0.817, AGFI = 0.769, PGFI = 0.647, NFI = 0.907, IFI = 0.925, CFI = 0.925, PNFI = 0.790, and PCFI = 0.806; thus, most of the values meet the criteria.

Professional identity

The students’ professional identity scale proposed by Yu et al. (2021) was used. It has three dimensions, namely, “professional cognition,” “professional appraisal,” and “professional emotion”; the scale comprises 14 questions and uses a 5-point Likert scale. The reliability analysis showed that the total Cronbach’s $\alpha = 0.951$. According to the results of CFA, the factor loadings of professional cognition ranged from 0.803 to 0.894, with CR = 0.917 and AVE = 0.735; the factor loadings of professional appraisal ranged from 0.743 to 0.901, with CR = 0.896 and AVE = 0.685; the factor loadings of professional emotion ranged from 0.730 to 0.893, with CR = 0.934 and AVE = 0.705. As for the overall GOF of the scale, SRMR = 0.0524, $\chi^2/df = 5.922$, RMSEA = 0.113, GFI = 0.865, AGFI = 0.809, PGFI = 0.610, NFI = 0.910, IFI = 0.924, CFI = 0.924, PNFI = 0.740, and PCFI = 0.752.

Innovative behavior

The students’ innovative behavior scale proposed by Chang (2018) was used with a total of 12 questions scored using a 5-point Likert scale. The reliability analysis showed that the total Cronbach’s $\alpha = 0.955$. According to the results of

CFA, the factor loadings ranged from 0.661 to 0.876, with CR = 0.955 and AVE = 0.639. For the overall GOF of the scale, SRMR = 0.0592, $\chi^2/df = 9.432$, RMSEA = 0.148, GFI = 0.826, AGFI = 0.718, PGFI = 0.509, NFI = 0.897, IFI = 0.907, CFI = 0.907, PNFI = 0.652, and PCFI = 0.659.

Results

This study investigated the relationships between aesthetic experience and professional identity in school climate and students’ innovative behavior. Therefore, a cross-level research was conducted by using escalation of the unit of analysis (Kark et al., 2003), wherein students filled out the school climate scale and then elevated the completed school climate scale to the school level for analysis, which could reduce common method variance (Craighead et al., 2011).

Intra-class correlation coefficient statistics

In the study, the outcome variables were professional identity and innovative behavior, which were subjected to a null model test to calculate the intra-class correlation coefficient (ICC) so as to confirm the need for multilevel analysis (Raudenbush and Bryk, 2002). The analysis results, the ICC values of professional cognition, professional appraisal, professional emotion, and innovative behavior were 0.101, 0.097, 0.141, and 0.067, respectively, with Chi-square (χ^2) critical values ranging from 50.603 to 87.22, all reaching the significance level of 0.05. Thus, it was suitable for multilevel analysis. Before conducting HLM analysis, it was necessary to detect the presence of intergroup variation (Girod and Wong, 2002) in the data before individual-level data could be aggregated to the group level. The mean value r_{wgj} of school

climate was calculated to be 0.16, justifying this aggregation procedure.

Random parameter regression model

To understand whether students' aesthetic experience has a direct effect on professional identity and innovative behavior respectively, we conducted analysis using the following model. To keep the paper reasonably concise, we took only professional cognition as an example to elaborate. The effects of the rest of the dimensions on innovative behavior were analyzed in the same way.

Level-1: professional cognition_{ij} = $\beta_{0j} + \beta_{1j} \times (\text{pleasure of beauty}_{ij}) + \beta_{2j} \times (\text{aesthetic attitude}_{ij}) + \beta_{3j} \times (\text{understanding of beauty}_{ij}) + \beta_{4j} \times (\text{full experience}_{ij}) + r_{ij}$

Level-2: $\beta_{0j} = \gamma_{00} + u_{0j}$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

According to the analysis results (as shown in Table 1), in the professional cognition section, full experience in aesthetic experience reached a significant level ($\gamma_{40} = 0.501, p = 0.000$). In the professional appraisal section, understanding of beauty and full experience reached a significant level ($\gamma_{30} = 0.349, p = 0.008, \gamma_{40} = 0.395, p = 0.018$); in the professional emotion section, full experience reached a significant level ($\gamma_{40} = 0.387, p = 0.001$). In the innovative behavior section, understanding of beauty and full experience reached a significant level ($\gamma_{30} = 0.375, p = 0.000; \gamma_{40} = 0.271, p = 0.02$). As for the explained

variation (R^2) for aesthetic experience, at the individual level, it was calculated that in level-1, the R^2 values of professional cognition, professional appraisal, professional emotion, and innovative behavior were 41.39, 36.54, 38.74, and 52.28%, respectively.

Direct effect of school climate

To further verify whether the presence of the intercept term could be explained by the level-2 variable (i.e., school climate), we conducted analysis using the following model.

Level-1: professional cognition_{ij} = $\beta_{0j} + \beta_{1j} \times (\text{pleasure of beauty}_{ij}) + \beta_{2j} \times (\text{aesthetic attitude}_{ij}) + \beta_{3j} \times (\text{understanding of beauty}_{ij}) + \beta_{4j} \times (\text{full experience}_{ij}) + r_{ij}$

Level-2: $\beta_{0j} = \gamma_{00} + \gamma_{01} \times (\text{teacher support}_j) + \gamma_{02} \times (\text{opportunities for autonomy}_j) + \gamma_{03} \times (\text{student support}_j) + u_{0j}$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

According to the analysis results (as shown in Table 2), in the professional cognition section, teacher support in school climate reached the significant level ($\gamma_{01} = 0.758, p = 0.000$); and in the professional appraisal section, teacher support reached the significant level ($\gamma_{01} = 1.023, p = 0.001$); and in the professional emotion section, teacher support reached the significant level ($\gamma_{01} = 1.024, p = 0.002$). In the innovative behavior section, teacher support, opportunities for autonomy, and student support all reached the significant level ($\gamma_{01} = 0.335$,

TABLE 1 Summary of random parameter regression model.

Fixed effect	Professional cognition		Professional appraisal		Professional emotion		Innovative behavior	
	γ	SE	γ	SE	γ	SE	γ	SE
Pleasure of beauty γ_{10}	-0.072	0.13	-0.270	0.12	0.275	0.14	-0.027	0.09
Aesthetic attitude γ_{20}	0.060	0.09	0.122	0.11	-0.051	0.19	0.047	0.11
Understanding of beauty γ_{30}	0.227	0.12	0.349**	0.12	0.019	0.09	0.375***	0.09
Full experience γ_{40}	0.501***	0.10	0.395**	0.15	0.387**	0.098	0.271*	0.11
Random effect	Variance		Variance		Variance		Variance	
		p		p		p		p
γ_{ij}	0.285		0.323		0.274		0.164	
U_{1j}	0.232	>0.500	0.086	>0.500	0.309	0.034	0.066	0.108
U_{2j}	0.078	>0.500	0.060	>0.500	0.552	0.005	0.101	0.016
U_{3j}	0.177	0.155	0.128	0.221	0.033	0.400	0.084	0.228
U_{4j}	0.063	>0.500	0.302	0.008	0.047	>0.500	0.130	0.232
U_{0j}	0.069	0.000	0.067	0.000	0.084	0.000	0.037	0.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

$p = 0.014$; $\gamma_{02} = 0.365$, $p = 0.012$; $\gamma_{03} = 0.240$, $p = 0.036$). From the above, it is clear that in all cases, teacher support has a direct effect on professional identity, especially innovative behavior.

Multilevel mediating effect

The first step to test the multilevel mediating effects was to examine whether professional identity, innovative behavior, and aesthetic experience could be effectively explained by the overall level of school climate. In Equation 1, it was considered important that the estimated value of γ_{01}^c has a significant level; if γ_{01}^c is significant, it indicates that there is a mediating effect of school climate on pleasure of beauty in aesthetic experience. In Equation 2, it was considered important that the estimated value of γ_{01}^a has a significant level; only when it reached a significant

level could we proceed with the test. We listed only Equations 1, 2 for pleasure of beauty and professional cognition.

$$\text{Professional cognition}_{ij} = \beta_{0j}^c + r_{ij}^c$$

$$\beta_{0j}^c = \gamma_{00}^c + \gamma_{01}^c \text{ teacher support}_j + \gamma_{02}^c \text{ opportunities for autonomy}_j + \gamma_{03}^c \text{ student support}_j + U_{0j}^c \quad (1)$$

$$\text{Pleasure of beauty}_{ij} = \beta_{0j}^a + r_{ij}^a$$

$$\beta_{0j}^a = \gamma_{00}^a + \gamma_{01}^a \text{ teacher support}_j + \gamma_{02}^a \text{ opportunities for autonomy}_j + \gamma_{03}^a \text{ student support}_j + U_{0j}^a \quad (2)$$

According to the analysis results (as shown in Table 3), γ_{01} of professional cognition, professional appraisal, and professional emotion reached a significant level ($\gamma_{01}^c = 0.869$, $SE = 0.20$, $p = 0.000$; $\gamma_{01}^a = 0.964$, $SE = 0.30$, $p = 0.005$; $\gamma_{01}^e = 1.076$, $SE = 0.36$, $p = 0.007$); further, γ_{01} and γ_{03} of

TABLE 2 Summary of intercept prediction model.

Fixed effect	Professional cognition		Professional appraisal		Professional emotion		Innovative behavior	
	γ	SE	γ	SE	γ	SE	γ	SE
Pleasure of beauty γ_{10}	-0.143	0.14	-0.255*	0.12	0.252	0.14	-0.066	0.09
Aesthetic attitude γ_{20}	0.100	0.09	0.094	0.12	-0.056	0.17	0.041	0.11
Understanding of beauty γ_{30}	0.260*	0.11	0.396*	0.11	0.051	0.09	0.420***	0.08
Full experience γ_{40}	0.485***	0.09	0.348*	0.14	0.365**	0.10	0.261*	0.11
Teacher support γ_{01}	0.758***	0.13	1.023**	0.27	1.024**	0.29	0.335*	0.13
Opportunities for autonomy γ_{02}	0.246	0.15	-0.240	0.28	0.206	0.24	0.365*	0.13
Student support γ_{03}	0.176	0.12	0.024	0.19	-0.045	0.15	0.240*	0.11
Random effect	Variance	p	Variance	p	Variance	p	Variance	p
γ_{ij}	0.275		0.319		0.269		0.161	
U_{1j}	0.288	>0.500	0.104	>0.500	0.289	0.035	0.071	0.103
U_{2j}	0.067	>0.500	0.060	>0.500	0.527	0.004	0.117	0.013
U_{3j}	0.154	0.129	0.111	0.228	0.063	0.403	0.063	0.252
U_{4j}	0.055	>0.500	0.280	0.005	0.045	>0.500	0.166	0.209
U_{0j}	0.015	0.053	0.036	0.000	0.019	0.003	0.004	0.273

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 3 Summary of hierarchical linear modeling analysis of learning environment with professional identity and innovative behavior.

Fixed effect	Professional cognition		Professional appraisal		Professional emotion		Innovative behavior	
	γ	SE	γ	SE	γ	SE	γ	SE
Teacher support γ_{01}^c	0.869***	0.20	0.964**	0.30	1.076**	0.36	0.324*	0.15
Opportunities for autonomy γ_{02}^c	0.243	0.24	-0.40	0.35	0.146	0.28	0.286	0.16
Student support γ_{03}^c	0.010	0.19	-0.160	0.20	-0.047	0.20	0.339*	0.13
Random effect	Variance	p	Variance	p	Variance	p	Variance	p
γ_{ij}	0.482		0.509		0.446		0.335	
U_{0j}	0.000	>0.500	0.023	0.025	0.009	0.203	0.000	>0.500

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

innovative behavior reached a significant level ($\gamma'_{01} = 0.324$, $SE = 0.15$, $p = 0.040$; $\gamma'_{03} = 0.339$, $SE = 13$, $p = 0.014$). As shown in **Table 4**, in the pleasure of beauty section, γ_{01} and γ_{03} reached a significant level ($\gamma'_{01} = 0.486$, $SE = 0.20$, $p = 0.027$; $\gamma'_{03} = 0.645$, $SE = 14$, $p = 0.000$); in the aesthetic attitude section, γ_{01} and γ_{03} reached a significant level ($\gamma'_{01} = 0.350$, $SE = 17$, $p = 0.021$; $\gamma'_{03} = 0.752$, $SE = 10$, $p = 0.000$); in the understanding of beauty section, γ_{01} and γ_{03} reached a significant level ($\gamma'_{01} = 0.340$, $SE = 0.14$, $p = 0.025$; $\gamma'_{03} = 0.672$, $SE = 12$, $p = 0.000$); and finally, in the full experience section, γ_{03} reached a significant level ($\gamma'_{03} = 0.959$, $SE = 13$, $p = 0.000$).

The second step was to further put both the higher-level explanatory variables and the mediating variables into the equation to test the explanatory power of school climate and aesthetic experience on professional identity and innovative behavior. Our focus was on the significance test of γ'_{01} ($Z \rightarrow Y$) in Equation 3a. The model was as follows:

Professional cognition_{ij} = $\beta^b_{0j} + \beta^b_{1j} \times (\text{pleasure of beauty}_{ij}) + \beta^b_{2j} \times (\text{aesthetic attitude}_{ij}) + \beta^b_{3j} \times (\text{understanding of beauty}_{ij}) + \beta^b_{4j} \times (\text{full experience}_{ij}) + r^b_{ij}$

$$\begin{aligned} \beta^b_{0j} = & \gamma^b_{00} + \gamma'_{01} \times (\text{teacher support}_j) + \gamma'_{02} \\ & \times (\text{opportunities for autonomy}_j) + \gamma'_{03} \\ & \times (\text{student support}_j) + u^b_{0j} \end{aligned} \quad (3)$$

$$\begin{aligned} \beta^b_{1j} &= \gamma^b_{10} \\ \beta^b_{2j} &= \gamma^b_{20} \\ \beta^b_{3j} &= \gamma^b_{30} \\ \beta^b_{4j} &= \gamma^b_{40} \end{aligned} \quad (3a)$$

After adding mediating variables, the results were obtained from the intercept prediction model, as shown in **Table 2**. In terms of professional cognition, γ'_{01} of teacher support decreased to 0.758 and also reached a significant level ($t = 5.827$, $p = 0.000$), indicating a partial mediating effect. Among the mediated variables, only understanding of beauty and full experience reached a significant level ($\gamma^b_{30} = 0.260$, $t = 2.281$, $p = 0.032$; $\gamma^b_{40} = 0.485$, $t = 5.21$, $p = 0.000$). Thus, understanding of beauty and full experience had partial mediating effects between teacher support and professional cognition. In the professional appraisal section, γ'_{01} of teacher support increased to 1.023 and also reached a significant level ($t = 3.764$, $p = 0.001$); thus, it has no mediating effect. For the professional emotion section, γ'_{01} of teacher support decreased to 1.024 and reached a significant level ($t = 3.548$, $p = 0.002$); thus, it has a partially mediating effect. Among the mediating variables, only full experience reached a significant level ($\gamma^b_{40} = 0.365$, $t = 3.80$, $p = 0.001$). Thus, full experience has a partial mediating effect.

In the innovative behavior section, γ'_{01} of teacher support increased to 0.335 and also reached a significant level ($t = 2.683$, $p = 0.014$); thus, it has no mediating effect. γ'_{03} of student support decreased to 0.24 and reached a significant level ($t = 3.548$, $p = 0.002$); thus, it has a partial mediating effect. Among the mediating variables, understanding of beauty and full experience reached a significant level ($\gamma^b_{30} = 0.420$, $t = 5.051$, $p = 0.000$; $\gamma^b_{40} = 0.261$, $t = 2.328$, $p = 0.029$); thus understanding of beauty and full experience have partial mediating effects.

Moderating effect of school climate

To verify whether the presence of the slope term could be explained by the level-2 variable (i.e., school climate), we conducted analysis using the following model.

Level-1: professional cognition_{ij} = $\beta_{0j} + \beta_{1j} \times (\text{pleasure of beauty}_{ij}) + \beta_{2j} \times (\text{aesthetic attitude}_{ij}) + \beta_{3j} \times (\text{understanding of beauty}_{ij}) + \beta_{4j} \times (\text{full experience}_{ij}) + r_{ij}$

Level-2: $\beta_{0j} = \gamma_{00} + \gamma_{01} \times (\text{teacher support}_j) + \gamma_{02} \times (\text{opportunities for autonomy}_j) + \gamma_{03} \times (\text{student support}_j) + u_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11} \times (\text{teacher support}_j) + \gamma_{12} \times (\text{opportunities for autonomy}_j) + \gamma_{13} \times (\text{student support}_j) + u_{1j}$

$\beta_{2j} = \gamma_{20} + \gamma_{21} \times (\text{teacher support}_j) + \gamma_{22} \times (\text{opportunities for autonomy}_j) + \gamma_{23} \times (\text{student support}_j) + u_{2j}$

$\beta_{3j} = \gamma_{30} + \gamma_{31} \times (\text{teacher support}_j) + \gamma_{32} \times (\text{opportunities for autonomy}_j) + \gamma_{33} \times (\text{student support}_j) + u_{3j}$

$\beta_{4j} = \gamma_{40} + \gamma_{41} \times (\text{teacher support}_j) + \gamma_{42} \times (\text{opportunities for autonomy}_j) + \gamma_{43} \times (\text{student support}_j) + u_{4j}$

As shown in **Table 5**, in the professional cognition section, the interaction coefficient between aesthetic attitude and teacher support reached a significant level ($\gamma_{21} = -1.457$, $SE = 0.55$, $p = 0.016$). This indicates that teacher support in school climate has a negative moderating effect on the relationship between aesthetic attitude and professional cognition at the individual level. The interaction coefficient between full experience and student support was significant ($\gamma_{43} = 0.908$, $SE = 0.33$, $p = 0.013$). This indicates that student support has a positive moderating effect on the relationship between full experience and professional cognition. In the professional appraisal section, the interaction coefficient between full experience and student support was significant ($\gamma_{43} = 1.705$, $SE = 0.68$, $p = 0.021$). This indicates that student support has a positive moderating effect on the relationship between full experience and professional appraisal. In the professional emotion section, the interaction between full experience and teacher support is significant ($\gamma_{41} = 2.092$, $SE = 0.52$, $p = 0.001$). This indicates that teacher support positively moderates the relationship between full experience and professional emotion; that is, teacher support reinforces the relationship between full experience and professional emotion. The interaction coefficient between full experience and opportunities for autonomy is significant

($\gamma_{42} = -1.930$, $SE = 0.50$, $p = 0.001$). This indicates that the variable opportunities for autonomy has a negative moderating effect between full experience and professional emotion; that

is, opportunities for autonomy at the organizational level would weaken the relationship between full experience and professional emotion. In the innovative behavior section, there

TABLE 4 Summary of hierarchical linear modeling analysis of learning environment and aesthetic experience.

Fixed effect	Pleasure of beauty		Aesthetic attitude		Understanding of beauty		Full experience	
	γ coefficient	SE	γ coefficient	SE	γ coefficient	SE	γ coefficient	SE
Teacher support γ_{01}^a	0.486*	0.20	0.350*	0.17	0.340*	0.14	0.207	0.18
Opportunities for autonomy γ_{02}^a	-0.238	0.18	-0.041	0.18	0.064	0.17	-0.318	0.19
Student support γ_{03}^a	0.645***	0.14	0.752***	0.01	0.672***	0.12	0.959***	0.13
Random effect	Variance	p	Variance	p	Variance	p	Variance	p
γ_{ij}	0.410		0.413		0.386		0.368	
U_{0j}	0.000	>0.500	0.000	>0.500	0.000	>0.500	0.000	>0.500

* $p < 0.05$, *** $p < 0.001$.

TABLE 5 Summary of slope prediction model.

Fixed effect	PC		PA		PE		IB	
	γ	SE	Γ	SE	γ	SE	γ	SE
PBY ₁₀	-1.006	2.16	0.1556	2.32	-2.933	3.18	-3.219	1.49
AA γ_{20}	2.816	1.83	1.339	2.57	3.394	3.67	3.28	2.02
UB γ_{30}	3.494	2.02	2.546	2.12	2.547	1.60	2.06	1.41
FE γ_{40}	-4.183*	1.04	-4.396	2.65	-2.657*	1.08	-1.847	2.10
TS γ_{01}	0.878*	0.19	0.948*	0.30	1.045*	0.34	0.320*	0.15
OA γ_{02}	0.255	0.24	-0.022	0.35	0.173	0.27	0.285	0.16
SS γ_{03}	-0.022	0.18	-0.183	0.21	-0.053	0.19	0.344*	0.13
PB \times TS γ_{11}	0.982	0.80	0.035	0.85	1.147	1.25	0.866	0.68
PB \times OA γ_{12}	0.330	1.05	1.219	0.82	-0.991	1.24	-0.341	0.81
PB \times SS γ_{13}	-1.026	0.85	-1.272	0.84	0.650	1.00	0.305	0.78
AA \times TS γ_{21}	-1.457*	0.55	-0.773	1.01	-2.306	1.56	-1.535	0.92
AA \times OA γ_{22}	1.018	0.60	1.049	0.99	2.907	1.69	1.76	0.87
AA \times SS γ_{23}	-0.243	0.42	-0.543	0.80	-1.362	1.16	-0.992	0.75
UB \times TS γ_{31}	0.921	0.82	0.136	0.77	-0.802	0.60	0.077	0.60
UB \times OA γ_{32}	-1.515	0.75	-0.545	0.86	0.224	0.56	-0.768	0.48
UB \times SS γ_{33}	-0.304	0.46	0.079	0.55	-0.080	0.51	0.210	0.52
FE \times TS γ_{41}	-0.102	0.44	1.018	0.85	2.092**	0.52	0.290	0.89
FE \times OA γ_{42}	0.411	0.38	1.576	0.95	-1.930**	0.50	-0.696	0.79
FE \times SS γ_{43}	0.908*	0.33	1.705*	0.68	0.540	0.45	0.911	0.63
Random effect	Variance	p	Variance	p	Variance	p	Variance	p
γ_{ij}	0.275		0.318		0.267		0.158	
U_{1j}	0.257	0.223	0.078	0.353	0.380	0.018	0.106	0.068
U_{2j}	0.073	>0.500	0.104	>0.500	0.646	0.004	0.158	0.017
U_{3j}	0.157	0.104	0.172	0.165	0.039	>0.500	0.072	0.193
U_{4j}	0.023	>0.500	0.234	0.022	0.022	>0.500	0.164	0.113
U_{0j}	0.015	0.067	0.038	0.000	0.02	0.003	0.004	0.286

* $p < 0.05$, ** $p < 0.01$. TS, teacher support; OA, opportunities for autonomy; SS, student support; PB, pleasure of beauty; AA, aesthetic attitude; UB, understanding of beauty; FE, full experience; PC, professional cognition; PA, professional appraisal; PE, professional emotion; IB, innovative behavior.

was no interaction of school climate with aesthetic experience and innovative behavior.

Discussion

Influences of students' aesthetic experience on professional identity and innovative behavior

The study's results show that full experience in students' aesthetic experience helps improve students' professional identity, professional cognition, professional appraisal, and professional emotion. In other words, if students remember good things related to the past while engaging in creation and discuss good experiences with others, they would have a higher sense of professional identity, better understand their profession, and be more compatible with and enjoy their profession. Students can gain a stronger sense of professional identity through experience, reflection of experience, and their own disciplines (Henkel, 2005; Steinart et al., 2007). Students' understanding of beauty can enhance their professional appraisal. It includes conceptual knowledge, skills, feelings, attitudes, behaviors, emotions, and values, where values are the values or importance that individuals perceive after comparing with other professions (Girod and Wong, 2002). Thus, students can apply their understanding of beauty in professional appraisal to have a higher and better evaluation of the hospitality profession.

Students' understanding of beauty and full experience as part of aesthetic experience can enhance their innovation behaviors. Students can see the special and subtle aspects of beauty, express concepts and reasons for beauty, recall relevant beauty associated with creation, and share and discuss such experiences with others. Students will absorb, internalize, and transform these related aesthetics into personal thinking and experiences that can enhance intrinsic motivation and self-confidence and boost thinking, exploring the occurrence of contemplative, explorative, creative, and innovative behaviors (Davies et al., 2009; Lussier, 2010; Webster and Wolfe, 2013; Chang and Jaisook, 2021). Therefore, students with an understanding and experience of beauty would develop innovative behaviors.

Influences of school climate on students' professional identity and innovative behavior

Teacher support as part of school climate can enhance students' professional identity. Teachers' concern, trust in students, and help provided to students to solve problems make

students feel a sense of belonging, thereby enhancing their professional identity (Marhuenda et al., 2004). School climate (i.e., teacher support, opportunities for autonomy, and student support) contributes to the enhancement of students' innovative behaviors. Researchers have also pointed out the importance of a supportive environment for students' innovation behavior (Chang, 2018; Kleebbua and Lindratanasirikul, 2021). Teacher support, student support, and opportunities for autonomy in schools enable students to have more new ideas and practices and boost their innovative behaviors. Moreover, with teachers' support, students will be more confident in their studies and will identify more with their profession, capabilities, and values to join the hospitality-related professions in the future.

Mediating effect of students' aesthetic experience on the relations between school climate and professional identity on innovative behavior

Students' understanding of beauty and full experience have partially mediating effects on teacher support and professional cognition. Teacher support can enhance students' professional cognition through their understanding of beauty and full experience. This means that teacher support can enable students to have a deeper understanding of beauty, share beautiful experiences with others, discuss with others about careers for gaining a deeper understanding, and evaluate and increase their knowledge of the hospitality profession.

Students' understanding of beauty and full experience partially mediates the relationship between student support and innovative behavior. Student support can lead to innovative behavior through students' understanding of beauty and full experience. This means that mutual trust, liking, respect, and help among students at school make it easier for them to understand the styles, concepts, and special features of beauty, to discuss beauty with others, and perceive the beauty associated with creation—all of which contribute to their innovative behaviors.

Moderating effect of school climate on the relation between students' aesthetic experience and professional identity

Teacher support has a negative moderating effect between students' aesthetic attitude and professional cognition. However, teacher support can enhance students' professional cognition through students' understanding of beauty and full experience, while students' aesthetic attitude has no effect on professional cognition. This may be because when teacher support is

stronger, the relationship between students' aesthetic attitude and professional cognition is weakened, thus causing a negative moderating situation. This also reveals the importance of teacher support for hospitality department students' professional cognition.

Student support has a positive moderating effect on the relationships between students' full experience with professional cognition and professional appraisal. In other words, when students can help, trust and respect each other, as well as discuss and share good experiences with others, students' professional cognition and professional appraisal of the hospitality industry would be higher. Teacher support has a positive moderating effect on students' full experience and professional emotion. This indicates that teachers can help students solve problems, care about them, and believe in them, and students would recall good things about their teachers and share their good experiences with others. Thus, students evaluate the hospitality profession positively and are more willing to engage in hospitality-related work.

The variable opportunities for autonomy in school climate has a negative moderating effect on full experience and professional emotion, while full experience has a positive effect on professional emotion. The interaction between opportunities for autonomy and students' full experience has a negative effect on students' professional emotion. In other words, when students can decide rules in the classroom and discuss and share their good experiences with others, it decreases their satisfaction and evaluation of the hospitality profession. This may be because hospitality department students have fewer opportunities for autonomy, and opportunities for autonomy has no direct effect on full experience and professional emotion. Therefore, we should pay attention to the moderation of opportunities for autonomy in school climate.

Conclusion

It was found that teacher support in school climate and full experience in students' aesthetic experience are important for hospitality department students' professional identity and can enhance students' professional identity, which includes professional cognition, professional appraisal, and professional emotion. Students' understanding of beauty can also enhance their professional appraisal. School climate can enhance students' innovative behavior. Students' understanding of beauty and full experience in aesthetic experience can also enhance students' innovative behavior.

Furthermore, teacher support can enhance students' professional cognition and professional emotion through students' full experience. Teacher support can also enhance students' professional cognition through students' own understanding of beauty. Student support can enhance innovative behavior through students' understanding of beauty

and full experience. Therefore, understanding of beauty and full experience in students' aesthetic experience are important mediating variables for hospitality department students' professional identity and innovative behavior.

With regard to the moderating effect of school climate, teacher support negatively moderates the relationship between students' aesthetic attitude and professional cognition. Student support positively moderates the relationships between students' full experience with professional cognition and professional appraisal. Teacher support positively moderates the relationship between students' full experience and professional emotion. Opportunities for autonomy negatively moderates the relationship between students' full experience and professional emotion. Therefore, teacher support and student support in school climate have an important moderating effect on hospitality department students' professional identity.

In conclusion, for hospitality students, teacher support and student support in school climate and understanding of beauty and full experience in students' aesthetic experience are crucial for enhancing students' professional identities and innovative behaviors. Hospitality-related departments in colleges and universities should prioritize teacher support and student support in addition to students' understanding of beauty and full experience to enhance students' professional identity and innovative behavior. This will aid students to enter the hospitality industry swiftly after graduation and sustain their careers in the industry. Therefore, it is recommended that hospitality-related departments in colleges and universities should prioritize teacher support and student support and incorporate aesthetic-related courses to give students an understanding and full experience of beauty. The purpose is to improve students' identification with the hospitality profession, including professional cognition, professional appraisal, and professional emotion, and enhance their innovative behaviors. Accordingly, they can enter the hospitality industry swiftly after graduation and attain sustainable career development in the industry.

With respect to research recommendations, this study investigates the effect of school climate on the relation between hospitality students' professional identities and innovative behaviors among students at hospitality-related departments in colleges and universities during the COVID-19 pandemic in 2022, without directly examining the effect of COVID-19. Accordingly, follow-up studies can conduct investigations into the effect of COVID-19 on hospitality students to facilitate an understanding of the effects of COVID-19 on them.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

WL was responsible for suggesting revision to the concept and writing style of the manuscript. Y-CC was responsible for the conceptualization, investigation, methodology, and writing analyzing data for this manuscript. Both authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The relation between autonomy support and music enjoyment in online learning for music undergraduates in the post-COVID-19 era

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Music enjoyment is considered to predict music-related academic performance and career choice. Although relevant research in non-music fields has demonstrated the association between teachers' autonomy support and students' academic enjoyment, it remains unknown whether this association is valid in the music discipline. In addition, in the post-COVID-19 era, online education has become a common way of teaching and learning for music undergraduates. In the form of online learning, the mechanisms mediating teachers' music autonomy support and students' music academic enjoyment are also unknown. This study draws on Pekrun's theory of achievement emotions and control values to explore the mediating role of attributions and values in the association between autonomous support and academic achievement. In this study, 270 undergraduates majoring in music eventually completed the online surveys. Results from structural equation modeling indicated that autonomy support positively predicted music enjoyment and that attributions (i.e., internal attribution and external attribution) and values (i.e., intrinsic value, attainment value, utility value) mediated the association between autonomy support and music enjoyment. The findings also provide insights into possible avenue for promoting music enjoyment emotion during online teaching in the post-COVID-19 era. Implications and limitations are discussed in the study.

KEYWORDS

music major undergraduates, online learning, autonomy support, music enjoyment, post-pandemic era

Introduction

Since the outbreak of the COVID-19 pandemic, online education has become a common way of teaching and learning in higher education institution worldwide (Cucinotta and Vanelli, 2020). With the advent of the post-COVID-19 era, although the offline education mode is gradually recovering, online education is still one of the common modes of teaching and learning in Chinese universities (Ma et al., 2022; Syam and Achmad, 2022). However, unlike offline education where teachers and students can interact directly face-to-face, online education is characterized by the difficulty of physical and emotional interaction between teachers and students, which leads to problems such as limited student engagement and reduced interest in learning (Tsegay et al., 2022). Studies have found that in the higher education institutions, students' online academic engagement is significantly associated with their academic achievement (Omar et al., 2021), while achievement emotions have a stable positive effect on promoting students' online academic engagement (Deng et al., 2022). Hence, achievement emotions are thought to enhance students' online academic engagement and in turn benefit their learning outcomes (Leino et al., 2021). However, studies have shown that students who take online courses have fewer achievement emotions than those who take offline courses (Stephan et al., 2019). Therefore, it is important to promote students' achievement emotions during online education.

The control-value theory of achievement emotions suggests that characteristics of the learning environment are indirect predictors of students' emotions (Pekrun, 2006). Enjoyment as one of the achievement emotions is considered to be beneficial in enhancing students' interest, self-regulatory behaviors, deep learning strategies, and sense of accomplishment (Pekrun, 2006; Goetz et al., 2014). Teachers' autonomy support, as a component of the social environment, is one of the most important social antecedents of enjoyment emotions (Pekrun, 2006). As a component of cognitive appraisal, control appraisal and value appraisal are thought to operate as a mediator between the learning environment (e.g., autonomy support) and the achievement emotion (e.g., enjoyment) (Pekrun, 2006; Sorić et al., 2013; Goetz et al., 2014). Further, control attributions are in turn considered to be related to internal and external attributions (Pekrun et al., 2002; Pekrun, 2006; Pekrun and Perry, 2014). Thus, autonomy support is thought to further predict subsequent enjoyment emotions by mediating cognitive evaluations of attribution and value (Pekrun, 2006).

In music education, the aesthetic experience that music has produces aesthetic emotions which include enjoyment (Brattico et al., 2013). Enjoyment is therefore considered to be one of the important emotions in music education (Lee, 2009). Meanwhile, autonomy support has been recognized and used by music teachers for its potential to promote music learning (Evans, 2015). Although studies have demonstrated that teacher autonomy support in music education has a positive correlation with student enjoyment at the secondary level (Papageorgi and Economidou

Stavrou, 2021), there is limited research on the association between teachers' autonomy support and students' music enjoyment in the form of online music education and also at the higher education level (Bonneville-Roussy et al., 2013). Therefore, this study will use the control-value theory of achievement emotions as a theoretical framework to validate the relationship between autonomy support and music enjoyment, and the mediating role of attribution and value, to understand the antecedents and consequences of music majors' enjoyment of music in online education and its mechanisms of action.

Autonomy support and music enjoyment

Teacher autonomy support is one of the components of the teaching and learning environment (Pekrun, 2019a; Raccanello et al., 2022). It refers to students' perceived teachers' supportive behaviors towards students and includes all supportive behaviors of teachers that promote students' personal and academic development, describing the extent to which students perceive that teachers help and feel that teachers care about their learning process (Monteiro et al., 2017). More specifically, autonomy support is an instructional practice strategy that fosters student motivation by promoting a sense of self-acknowledged learning, by giving students meaningful choices, matching course content to students' interests and ability levels, providing students with explanations and justifications for their learning, and using non-controlled instructional language (Jang et al., 2016).

Students could experience a range of different achievement emotions, which are also referred to as emotional arousal directly related to achievement activities or achievement outcomes (Pekrun and Perry, 2014). Enjoyment, as one of them, is a positively high arousal emotion (Pekrun, 2006). Additionally, achievement emotions are key predictors of students' academic performance and career choices (Pekrun, 2019a) and are shaped by environmental, situational and personal factors of the school experience (Pekrun, 2006; Pekrun et al., 2017). Pekrun (2019a) categorized achievement emotions into three dimensions: (a) valence, which indicates whether the emotion is positive (e.g., pride) or negative (e.g., anger); (b) the degree of activation, which is the degree of physiological arousal and can be divided into activating emotions (e.g., joy) and deactivating emotions (e.g., sadness); (c) object focus, that is, whether the emotion is described as activity-related (e.g., enjoyment, anger) or outcome-related (e.g., pride, anxiety). Within the different categories of emotions, the enjoyment belongs to activity emotions, which refer to emotions arising from achievement-related activities. It is also a positive and activating emotion that contributes to problem-solving approach-oriented behaviors (Fredrickson, 2001; Pekrun, 2006). It has been shown to have an important role in promoting students' interests, self-regulatory behaviors, deep learning strategies and achievement (Pekrun, 2006; Goetz et al., 2014).

The control-value theory of achievement emotions suggests that shaping the educational environment in an appropriate way

can help change achievement emotions (Pekrun, 2006). As discussed earlier, autonomy support is one of the elements of the educational environment (Pekrun, 2006). Emotions are also considered to be related to the environment (Pekrun, 2006; Pekrun and Perry, 2014). Therefore, autonomy support is likely to be associated with emotions. In the case of enjoyment, research has shown a positive association between autonomy support and positive emotions (Barrable, 2020; Wang and Hu, 2022). Enjoyment, as a positive emotion, has also been shown to be positively associated with autonomy support (Simonton et al., 2021; Zimmermann et al., 2021).

For music education, the aesthetic experiences that occur in music education and enjoyment generate aesthetic emotions (Brattico et al., 2013). One of these aesthetic emotions is enjoyment (Brattico et al., 2013). Therefore, enjoyment is an important emotion in music education (Lee, 2009). Autonomy support also has many benefits for music education. For example, autonomy support is considered to promote students' intrinsic motivation for music learning and autonomy support from the music teacher is associated with students' harmonious enthusiasm for music learning (Bonneville-Roussy et al., 2013; Evans, 2015). Furthermore, researchers found that autonomy support and well-being among UK music undergraduates showed a positive association (Bonneville-Roussy et al., 2020). According to the PERMA framework, positive emotion is the element of well-being (Seligman, 2012, 2018), while enjoyment is one of the positive emotions (Pekrun, 2006). Thus, the autonomy support might positively predict music enjoyment. In fact, studies have focused on the association between autonomy support and enjoyment in music education. A study on music classroom education in secondary schools found a positive association between teachers' autonomy support and students' music enjoyment levels (Papageorgi and Economidou Stavrou, 2021). However, for music education, there is limited attention has been paid on the association between teachers' autonomy support and students' music enjoyment emotions in higher education and online education environment. In light of the above discussion, this study assumes that online learning in the field of music is in line with the general field of learning. Based on this, this study proposes the hypothesis that autonomy support might positively predict music enjoyment (H1).

Attribution as the potential mediation of autonomy support and music enjoyment

As discussed earlier, autonomy support is related to the educational environment, and enjoyment is one of the achievement emotions (Goetz et al., 2014; Pekrun, 2019a). Cognitive appraisal is considered the mediating factor between the learning environment and achievement emotions (Sorić et al., 2013). According to the control-value theory of achievement emotions, cognitive appraisal consists of control appraisals (Pekrun, 2006).

Control beliefs arise from individuals' subjective estimates of the extent to which they influence and predict outcomes and events throughout the lifespan (Chipperfield et al., 2016). It includes students' perceived control over behaviors and outcomes and is associated with personal assessment of competence, expected outcomes and success/failure attributions (Pekrun et al., 2002; Pekrun, 2006; Pekrun and Perry, 2014; Pekrun, 2019a). High control beliefs increase students' ability to perform and expectations of success (Pekrun et al., 2002; Pekrun, 2006), which is also associated with achievement, effort, intrinsic motivation and self-monitoring behavior in university students (Perry et al., 2001). Attribution of outcomes is a retrospective evaluation of the causes of success and failure (Pekrun, 2006). Success attributions are divided into internal reasons (i.e., reasons internal to the individual, e.g., ability, effort) and external reasons (i.e., reasons due to external factors, e.g., task difficulty, luck). Therefore, the control attributions in this study's hypothesis are divided into internal and external attributions.

Low control beliefs attribute success or failure to external sources or imply a lack of ability to produce the desired action (Perry et al., 2001; Pekrun, 2006, 2019a). It is assumed that if teachers attempt to allow students to make important learning decisions on their own, their belief appraisals will improve accordingly (Pekrun, 2006; Linnenbrink-Garcia et al., 2016). Research has shown that adopting an autonomy supportive teaching approach could facilitate the development of internal control beliefs (Pekrun and Perry, 2014). Furthermore, the research found that autonomy support positively predicts attributions (Pekrun, 2019a). Therefore, this study hypothesizes that autonomy support might negatively predict external attributions (H2-1) and positively predict internal attributions (H2-2), separately.

Control appraisals are predictors of achievement emotions (Pekrun et al., 2017; Simonton and Garn, 2020). In general, high levels of control beliefs predicted higher levels of positive emotions (e.g., enjoyment, pride) and lower levels of negative emotions (e.g., despair, anxiety; Elliot and Pekrun, 2007; Goetz et al., 2014). Enjoyment is positively associated with higher levels of perceived control (Goetz et al., 2010; Pekrun et al., 2011; Bailey et al., 2014; Hagenauer and Hascher, 2014). Therefore, this study hypothesizes that external attributions might negatively predict music enjoyment (H2-3) and internal attributions might positively predict music enjoyment (H2-4). To sum up, this study proposes the hypothesis that attribution might play a mediating role between autonomy support and music enjoyment (H2).

Value as the potential mediation of autonomy support and music enjoyment

In the same vein as control appraisal, value appraisal, as part of cognitive appraisal, is considered to be a mediating factor between the learning environment (e.g., autonomy support) and the emotion of achievement (e.g., enjoyment; Pekrun, 2006; Sorić

et al., 2013; Goetz et al., 2014). Value appraisal refers to the value and interest that individuals place on tasks and activities (Pekrun, 2019b; Wigfield and Eccles, 2020), including three types: attainment value, intrinsic value and utility value. Student control (Pekrun, 2019b; Wigfield and Eccles, 2020) and value appraisal are seen as mediators of the association between characteristics of the learning environment and different achievement emotion experiences (Pekrun and Perry, 2014). Attributions and values are two components of appraisal in the control value theory of achievement emotions, as well as mediators of environment and Emotion (Pekrun and Stephens, 2010). In the hypothesis of this study, the value appraisal is divided into three categories: achievement, intrinsic and utility value.

Beliefs of autonomy support are related to students' value status (PSimonton et al., 2021). The relationship between autonomy support and value appraisals has been examined in other educational settings. Studies have found that autonomy-supportive teaching increases students' evaluations of self-efficacy and intrinsic value (Buhr et al., 2019; Ekatushabe et al., 2021; Klee et al., 2022) and also positively predicts students' intrinsic value (Zimmermann et al., 2021). Thus, music students' perceived teacher online autonomy support can potentially be a predictor of value (Pekrun, 2006; Ng et al., 2016). Hence, this study hypothesizes that autonomy support might positively predict achievement value (H3-1), intrinsic value (H3-2) and utility value (H3-3).

Value appraisals are predictors of achievement emotions (Pekrun et al., 2017; Simonton and Garn, 2020). In general, high levels of value beliefs predicted higher levels of positive emotions (e.g., enjoyment, pride) and lower levels of negative emotions (e.g., despair, anxiety; Elliot and Pekrun, 2007; Forsblom et al., 2022). Enjoyment is positively associated with positive valuation (Goetz et al., 2010; Pekrun et al., 2011; Bailey et al., 2014; Hagenauer and Hascher, 2014). Some studies have shown a positive relationship between utility value and enjoyment (Putwain et al., 2021), as rewards and success can be seen as personal values. Students could experience enjoyment in the classroom and still be driven by utility values (Frenzel et al., 2007b). Higher values beliefs are strongly associated with positive emotions such as enjoyment (Pekrun, 2006, 2019b; Frenzel et al., 2007a). In a sample of high school students, control and value appraisals for physical education (PE) were positive predictors of enjoyment and negative predictors of boredom (Simonton1 et al., 2017; Zimmermann et al., 2021). Currently, limited research has focused on the mediating role of control and value on autonomy support as well as music enjoyment in music learning. Based on the existing studies, the present study hypothesizes that attribution and value are mediating variables for autonomy support and music enjoyment. Thus, the present study hypothesizes that achievement value (H3-4), intrinsic value (H3-5) and utility value (H3-6) might positively predict music enjoyment. In summary, this study proposes the hypothesis that value might play a mediating role between autonomy support and music enjoyment (H3).

The present study

The above studies discussed the relationship between autonomy support, enjoyment and control, and value in both music and non-musical domains. Based on Pekrun's (2006, 2019a) control-value theory of achievement emotions focusing on the antecedents and correlates of achievement emotions (Wang et al., 2017; Liu et al., 2018; Muwonge et al., 2018), we argue that the music domain's variables conform to the psychological patterns of the general domain. Based on the discussion above, this study hypothesized that there might be a positive predictive association between autonomy support and music enjoyment, and attribution and value might play a mediating role between autonomy support and music enjoyment. The hypothesis of this study are as follows:

H2-1: Autonomy support negatively predicts external attribution.

H2-2: Autonomy support positively predicts internal attribution.

H2-3: External attribution negatively predicts music enjoyment.

H2-4: Internal attribution positively predicts music enjoyment.

H3-1: Autonomy support positively predicts attainment value.

H3-2: Autonomy support positively predicts intrinsic value.

H3-3: Autonomy support positively predicts utility value.

H3-4: Attainment value positively predicts music enjoyment.

H3-5: Intrinsic value positively predicts music enjoyment.

H3-6: Utility value positively predicts music enjoyment.

Taken together, this study proposes the following hypothetical model of the association between autonomy support and music enjoyment (Figure 1):

H1: Autonomy support is positively associated with music enjoyment.

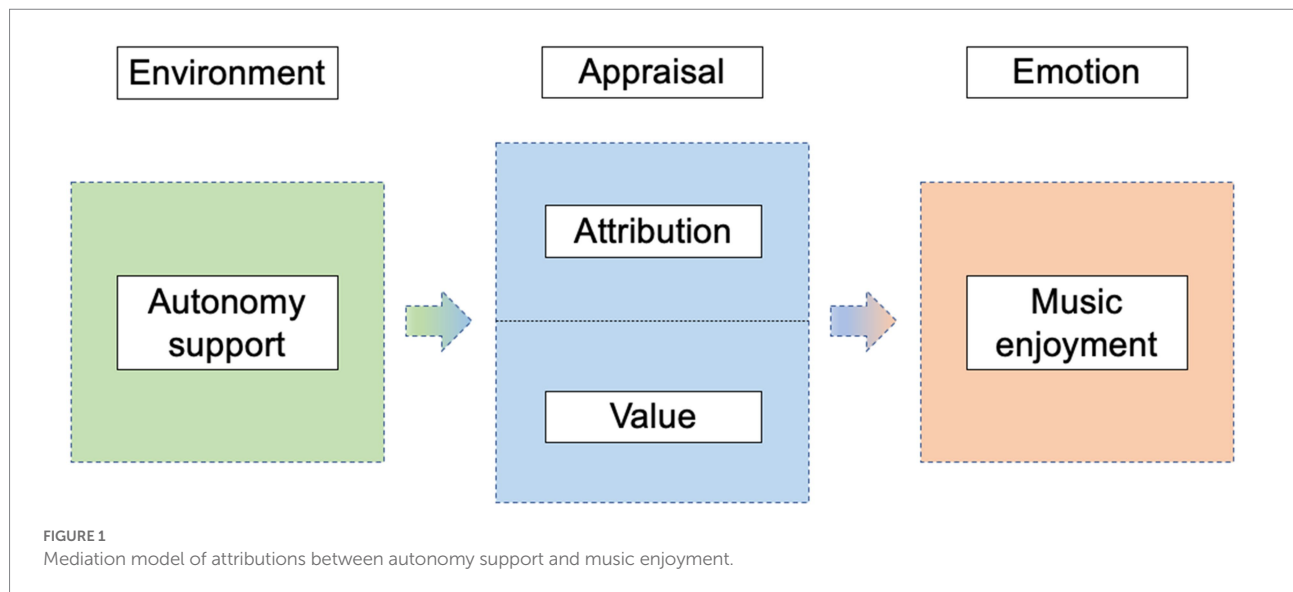
H2: Attribution is the mediation of autonomy support and music enjoyment.

H3: Value is the mediation of autonomy support and music enjoyment.

Materials and methods

Participants

This study conducted data collection by means of an online questionnaire from 300 university students majoring in music at a



university in the middle of China in September 2022, by using a whole group sampling (Cluster sampling) method. All participants participated voluntarily and were clearly informed of the purpose of the study, its significance, how the data would be kept confidential and what the data would be used for before participating in the study. There would be no rewards for participants. After removing incomplete or duplicate responses, 270 valid responses were used for data analysis. It included 71 male (26.3%) and 199 female (73.7%) students who were in their second ($N=116$, 43%), third ($N=70$, 25.9%) and fourth ($N=84$, 31.1%) years of the music major.

Measures

The questionnaire items were adapted from previous theories or researchers. In order to verify the accuracy of the questionnaire and to ensure its face validity, a forward-backward approach was used to professionally translate the original items into Chinese.

Although web-based questionnaire has some advantages such as less cost and less errors of data entry and coding, more rapidly return etc. (Van Gelder et al., 2010), there remains disadvantages that hamper the data collection (e.g., answering carelessly). Thus, optimizing the questionnaire design is important to enhance the reliability and validity of the data from web-based data questionnaires. In present study, we strictly controlled the survey length by decreasing item numbers and improve the and survey quality by setting careless detection items separately. In this way, the reliability of the web-based questionnaire has been guaranteed. The detailed results of reliability are as follows.

Questionnaire of autonomy support

The autonomy support questionnaire (Assor et al., 2002) was used to measure autonomy support for students during online

learning, with a total of 13 items divided into three dimensions, including providing choice (e.g., In music class, the teacher encouraged us to try to solve problems on our own), critique and reflection (e.g., The music teacher showed me how to solve problems on my own) and promoting understanding (e.g., The music teacher explained why it was important to learn some subjects). Participants scored on a 5-point Likert scale (1 = *never*, 5 = *always*), with higher scores indicating higher teacher AU for students. The model fit indices in this study showed good construct validity ($\chi^2/df=17.277/7$, CFI=0.972, TLI=0.939, RMSEA=0.074, SRMR=0.028), Cronbach's $\alpha=0.759$.

Questionnaire of external attribution

The external attribution questionnaire (Lefcourt et al., 1979) was used to measure students' external attributions of success in online teaching, with a total of six items. It was divided into two dimensions, including difficulty (e.g., I got high marks in music lessons a few times because the teacher scored too loosely) and luck (e.g., Success in music exams sometimes depends on a little bit of luck). Participants scored on a 5-point Likert scale (1 = *completely disagree*, 5 = *completely agree*), with higher scores indicating higher external attributions of success. The model fit indices in this study showed good construct validity ($\chi^2/df=17.277/7$, CFI=0.972, TLI=0.939, RMSEA=0.074, SRMR=0.028), Cronbach's $\alpha=0.759$.

Questionnaire of internal attribution

The internal attribution questionnaire (Lefcourt et al., 1979) was used to measure students' internal attributions of success in online learning, with a total of six items divided into two dimensions, including the ability (e.g., the most important factor in getting a good grade is my academic ability in music) and effort

(e.g., whenever I get a good grade, it is because I have studied hard in the subject). (e.g., whenever I get a good grade, it is because I have studied hard in the subject). Participants scored on a 5-point Likert scale (1 = *completely disagree*, 5 = *completely agree*), with higher scores indicating higher internal attributions of success and the model fit indices indicating good construct validity ($\chi^2/df=9.520/7$, CFI=0.993, TLI=0.985, RMSEA=0.037, SRMR=0.023), Cronbach's $\alpha=0.757$.

Questionnaire of values

The values questionnaire (Eccles and Wigfield, 1995) was used to measure students' perceptions of value in online teaching, with a total of nine items divided into three dimensions: attainment value, intrinsic value and utility value, include attainment value (e.g., I like what I learn in music lessons), intrinsic value (e.g., I do need more experience and I think about it a lot so I learn more) and utility value (e.g., I think it is important to understand what I learn in music lessons). Participants scored on a 5-point Likert scale (1 = *completely disagree*, 5 = *completely agree*), with higher scores indicating higher agreement with the value and model fit indices indicating good construct validity ($\chi^2/df=57.222/22$, CFI=0.968, TLI=0.947, RMSEA=0.077, SRMR=0.036), and good reliability (Cronbach's $\alpha=0.876$).

Questionnaire of music enjoyment

The music enjoyment questionnaire (Pekrun et al., 2011) was used to measure students' level of music enjoyment with a total of 3 items (e.g., I enjoy taking music classes). Participants rated their enjoyment on a 5-point Likert scale (1 = *completely disagree*, 5 = *completely agree*), with higher scores indicating higher levels of music enjoyment.

Convergent validity is an important part of construct validity which is assessed by averaging variance extracted (AVE). Hair et al. (2011) suggest that the AVE value should be higher than 0.50. In the present study, the AVE value of the autonomy support questionnaire and the internal attribution questionnaire are 0.534 and 0.644 separately, meaning these constructs has adoptable convergent validity.

Data analysis

Firstly, the mean, standard deviation, Kendall and Pearson correlation coefficients were described using SPSS version numbers. The hypothesized multiple mediation model (MCM) was tested by PROCESS macro (Bolin, 2014).¹ Additionally, a bias-corrected bootstrapping method was used to further examine the significance

of mediating and moderating effects, whose 95% confidence interval did not contain zero indicating a salient effect (Bolin, 2014).

Results

Common method bias test

Harman single factor test was conducted in the present study. Based on the standard of characteristic root greater than one, nine factors in the present results were extracted from unrotated factor analysis. Furthermore, the variation of maximum factor variance interpretation was 32.23%, less than the critical standard of 40% (Zhou and Long, 2004), so no serious common method bias remained.

Preliminary analysis

The results of the mean, standard deviation and correlation analyses are presented in Table 1 and show that among the demographic (age and grade) variables, only grade had a significant negative correlation (Negative correlation) for Autonomy support. Except for the demographic variables, all variables showed significant correlations as expected: (1) external attribution showed the expected negative correlations with the other variables ($|r|$ between 0.206 and 0.449, $p < 0.01$); (2) while the non-demographic variables other than external attribution showed significant positive correlations ($|r|$ between 0.299–0.670, $p < 0.01$).

Testing for the hypothetical model

Firstly, a direct model between autonomy support and music enjoyment was used to test hypothesis 1. The results indicated that autonomy support positively predicted music enjoyment ($\beta=0.560$, $p < 0.001$), and the findings supported hypothesis 1.

Secondly, a mediation model mediated by success attribution was constructed using the PROCESS macro (model No. 4), with success attribution divided into two dimensions, external attribution and internal attribution (Figure 2). As shown in Table 2, autonomy support had a significant negative predictive effect on external attribution ($\beta=-0.264$, $p < 0.001$), while external attribution also had a significant negative predictive effect on music enjoyment ($\beta=-0.295$, $p < 0.001$). In contrast, autonomy support had a significant positive predictive effect on internal attribution ($\beta=0.286$, $p < 0.001$), while internal attribution also had a positive predictive effect on music enjoyment ($\beta=0.159$, $p < 0.001$). The grade was not associated with any of these variables. In addition, the 95% confidence interval for external attribution was from 0.031 to 0.135 (not including zero) and the 95% confidence interval for internal attribution was from 0.011 to 0.093 (not including zero). The above results suggest that external

¹ <http://www.afhayes.com>

TABLE 1 Means, standard deviations, and correlations among the main variables.

Variables	<i>M</i>	<i>SD</i>	Autonomy support	External attribution	Internal attribution	Attainment value	Intrinsic value	Utility value	Enjoyment	gender	grade
Autonomy support	3.93	0.65	1								
External attribution	2.62	0.59	−0.290***	1							
Internal attribution	3.56	0.59	0.299***	−0.206**	1						
Attainment value	4.03	0.59	0.609***	−0.449***	0.343***	1					
Intrinsic value	3.89	0.57	0.512***	−0.317***	0.403***	0.589***	1				
Utility value	4.26	0.59	0.482***	−0.380***	0.348***	0.670***	0.543***	1			
Enjoyment	3.99	0.67	0.548***	−0.413***	0.324***	0.647***	0.539**	0.561**	1		
Gender	–	–	−0.076	−0.111	0.026	−0.023	0.019	0.106	0.013	1	
Grades	–	–	−0.189**	0.034	0.046	−0.064	−0.029	0.028	−0.067	0.114	1

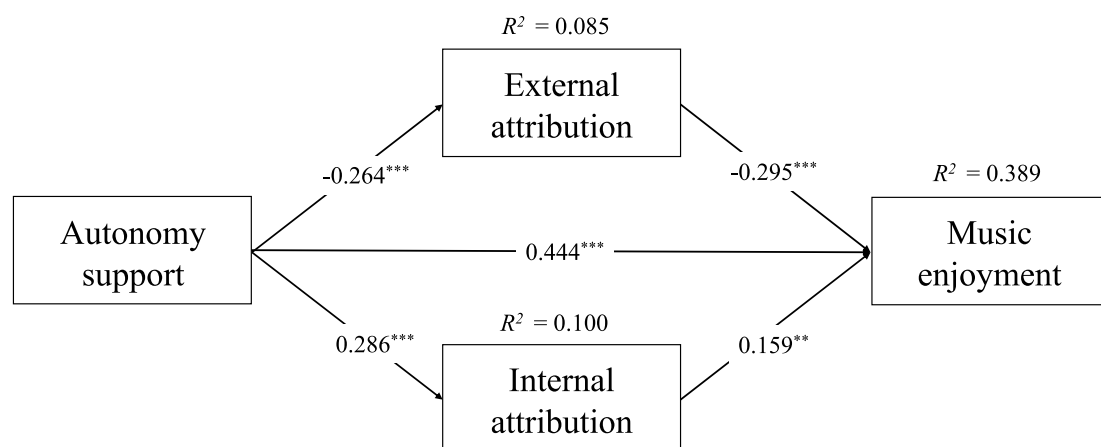
p* < 0.01, *p* < 0.001.FIGURE 2
Mediation model of attributions between autonomy support and music enjoyment.

TABLE 2 Mediation model of attributions between autonomy support and music enjoyment.

Predictors	External attribution			Internal attribution			Music enjoyment		
	β	<i>SE</i>	95% CI	β	<i>SE</i>	95% CI	β	<i>SE</i>	95% CI
Autonomy support	−0.264***	0.054	[−0.369, −0.158]	0.286***	0.053	[0.182, 0.390]	0.444***	0.054	[0.337, 0.550]
External attribution							−0.295***	0.058	[−0.408, −0.181]
Internal attribution							0.159**	0.058	[0.044, 0.273]
Grades	−0.015	0.041	[−0.095, 0.066]	0.727	0.040	[−0.007, 0.152]	0.014	0.038	[−0.062, 0.090]
<i>R</i> ²	0.085			0.100			0.389		
<i>F</i>	12.321			14.880			42.170		

Bootstrap sample size = 5,000; ***p* < 0.01, ****p* < 0.001.

attribution and internal attribution play a mediating role in the association between autonomy support and music enjoyment, and that research hypothesis 2 is supported.

Finally, the mediation model was constructed using the same PROCESS macro (model No. 4) with value as the mediator, with value divided into three dimensions: attainment value, intrinsic value and utility value (Figure 3). As shown in Table 3, autonomy support had a significant positive predictive effect on attainment value ($\beta = 0.557$, $p < 0.001$), while attainment value also had a

significant positive predictive effect on music enjoyment ($\beta = 0.357$, $p < 0.001$). Autonomy support also showed a significant positive predictive effect on Intrinsic value ($\beta = 0.459$, $p < 0.001$), while Intrinsic value also had a positive predictive effect on music enjoyment ($\beta = 0.188$, $p < 0.01$). Besides, autonomy support had a significant positive predictive effect on utility value ($\beta = 0.459$, $p < 0.001$), while utility value also had a positive predictive effect on music enjoyment ($\beta = 0.186$, $p < 0.01$). The grade was not associated with attainment value, intrinsic

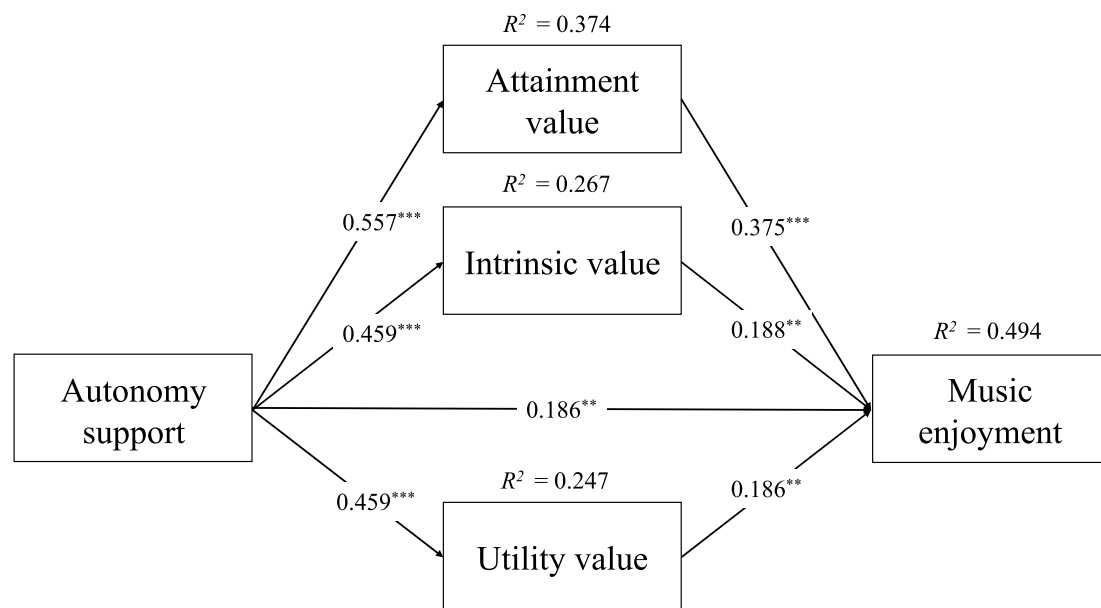


FIGURE 3
Mediation model of music values between autonomy support and music enjoyment.

TABLE 3 Mediation model of music values between autonomy support and music enjoyment.

Predictors	Attainment value			Intrinsic value			Utility value			Music enjoyment		
	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI
Autonomy support	0.557***	0.044	[0.450, 0.644]	0.459***	0.047	[0.368, 0.551]	0.459***	0.049	[0.362, 0.555]	0.186**	0.060	[0.069, 0.304]
Attainment value										0.375***	0.077	[0.224, 0.527]
Intrinsic value										0.188**	0.067	[0.056, 0.320]
Utility value										0.186**	0.069	[0.050, 0.322]
Grades	0.037	0.0339	[-0.030, 0.104]	0.047	0.036	[-0.023, 0.117]	0.086*	0.038	[0.012, 0.160]	-0.009	0.035	[-0.078, 0.060]
R^2	0.374			0.267			0.247			0.494		
F	79.797			48.614			43.893			51.527		

Bootstrap sample size = 5,000; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

value, and music enjoyment, while had a positive predictive effect on utility value ($\beta = 0.086$, $p < 0.05$). In addition, the 95% confidence interval for attainment value was 0.098–0.317 (not including zero), the 95% confidence interval for intrinsic value was 0.023–0.158 (not including zero), and the 95% confidence interval for utility value was 0.014–0.167 (not including zero). These results suggest that attainment value, intrinsic value and utility value play a mediating role in the association between autonomy support and music enjoyment, and that research hypothesis 3 is supported.

Discussion

This study focuses on the association between autonomy support and music enjoyment in the online learning of music

major undergraduates in the post-COVID-19 era. Based on Pekrun's (2006) control-value theory of achievement emotions, the study clarifies the positive predictive association of autonomy support on music enjoyment and the mediating role of attribution and value. The results support the whole hypothesis of this study. In summary, the findings of this study contribute to understanding the positive outcomes of autonomy support and provide insights into ideas for enhancing students' music enjoyment.

Autonomy support is positively associated with music enjoyment

The results show that autonomy support is positively associated with music enjoyment. That is, when students receive higher levels of autonomy support, music enjoyment is also higher. This also

supports the control-value theory of achievement emotions, which is consistent with previous research that autonomy support environments foster control and value beliefs that ultimately promote positive academic emotions (e.g., enjoyment; Simonton et al., 2021). In terms of teaching strategies, teachers' autonomy support conveys supportive interpersonal messages and attempts to understand from the students' perspective (Reeve, 2015). They offer students choices, make them feel understood and allow for critique. There was a significant indirect correlation between teachers' autonomy support and students' emotional responses to learning (Wang et al., 2017). In this study, the focus was on the music discipline. The results of this study provide evidence to support the cross-cultural application of the control-value theory of achievement emotions hypothesis, and it highlights the importance of promoting learners' academic emotions through teachers' autonomy support.

The mediating role of attribution and value

The results identified a mediating role for attribution and value. This is consistent with previous partial studies where the relationship between control, value and achievement emotions is largely in line with the predictions of the control-value theory of achievement emotions theory (Pekrun, 2006; Pekrun and Perry, 2014). It is also consistent with previous empirical studies consistent with previous empirical research that autonomy supports positive predictive evaluations of control and value in other academic contexts (Ng et al., 2016; Wang et al., 2017). For example, in a sample of university students who attended tennis courses, control and value appraisal mediated a positive indirect effect of teacher autonomy support on enjoyment, and a negative indirect effect on boredom (Simonton et al., 2021). Similarly, autonomy support provided by PE teachers was a positive predictor of PE-related cognitive evaluations, and control value evaluations were a significant predictor of PE-related achievement mood (Zimmermann et al., 2021). In a sample of secondary school students, students' intrinsic value in mathematics disciplines, as well as their self-efficacy, mediated the relationship between teacher autonomy support and boredom (Wang et al., 2017). In a sample of university students, the positive relationship between intrinsic value and enjoyment was empirically supported (Simonton and Garn, 2020). Control is positively related to enjoyment, and achievement value, internal value and utility value are positively related to enjoyment (Frenzel et al., 2007a; Pekrun et al., 2011; Hall et al., 2016; Putwain et al., 2021), with low intrinsic value amplifying the relationship between control and enjoyment, i.e., higher values at low control show protective effects at high levels of control and diminish at high levels of control (Hall et al., 2016; Putwain et al., 2021; Zimmermann et al., 2021). When attributions for performance and success tasks are specifically addressed in a learning environment, control may be more predictive of emotional experience (Perry et al., 2001; Pekrun and Perry, 2014). The present study, based primarily on the control-value theory of achievement emotions, confirms the role of attribution and value as mediators

between autonomy support and music enjoyment in the context of online music.

According to the results of this study, grades as the control variable is not associated with attributions. In the field of music education, Schmidt (1995) revealed that there is no significant association with attributions and grades when exploring secondary school choral students' perceived attributions of success to teacher feedback, which corroborates the results of this study. The results also show that the grade is not associated with attainment value and intrinsic value among the values. The findings were supported by studies conducted in the subjects of mathematics, German and English (Arens et al., 2019). Besides, the results of this study found no association between grades and music enjoyment. This is consistent with previous research that focuses on the students' enjoyment of physical activity, the research showing that there was no difference in the level of enjoyment of participating between the different grades (McMullan et al., 2012). Nevertheless, the results of the study showed a positive association between grades and utility value. Since utility value refers to the extent to which a task fits into an individual's future plans (Wigfield, 1994). Eccles (2005) explains that utility values can reflect that the activity relates to some important goals held by the person, such as obtaining a certain occupation. Therefore, such results may be due to the fact that the participants in this study are getting closer to their graduation year. The issues of employment or continuing education that are faced near graduation may make students focus more on utility values.

Implications

This study is one of the few studies in the post-COVID-19 era to examine the association between teachers' autonomy support strategies and students' enjoyment of music when taking music courses online for undergraduates who major in music. The study constructs the model by using appraisal as a mediator, and the indirect effects show that value is more relevant than attribution, which explains the role of appraisal as a mediator in detail. This study validates the applicability of the control-value theory of achievement emotions in the context of online music learning during the post-COVID-19 in China, extends the antecedents and mechanisms of action of online music enjoyment emotions, and fills a research gap in online music education.

Limitations and future study

There are several limitations to this study. Firstly, this study is a cross-sectional survey study and cannot explore the causal relationships between variables. This is one of the main concerns of this study for future research. Secondly, the data was obtained from a self-report questionnaire and although the methodology of this study is not biased, there may be some bias in the respondents' self-report. In the future, combining self-feedback with other objective records could be considered to improve validity through

triangulation (McMurray et al., 2004). Thirdly, the participants in this study were drawn from only one university in the middle of China, and the findings of this study should be extended with caution to a wider range of regions, cultural backgrounds, professions, academic segments or groups (e.g., older people). More groups of students could be involved in the future. Lastly, the sample size of this study could be further increased to enhance the external validity of the study, and future studies could be extended to more regions to explore the association between autonomous support and music enjoyment among music majors both in the forms of online and offline education.

Conclusion

Based on the context of the popularity of online education in the post-COVID-19 era, this study explored the association between teachers' autonomy support and students' music enjoyment in online music learning among undergraduates who major in music. The findings found that Autonomy support positively predicted Music enjoyment, mediated by attribution and value.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by The Ethics Committee of The Education University

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of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

Author contributions

YaZ, YuZ, YL, and XY: conceptualization and methodology. YaZ, YuZ, and YL: formal analysis and investigation and writing—original draft preparation. DT and XY: writing—review and editing, resources, and supervision. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Tears and cheers: A narrative inquiry of a doctoral student's resilience in study abroad

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The existing literature has revealed many issues related to Ph.D. students' wellbeing, such as anxiety and stress, which are likely to cause Ph.D. student attrition or dropout. As one of the key coping strategies against psychological burnout, resilience has received increasing attention among various teacher groups. However, it still lacks a systematic understanding of students, in particular overseas Ph.D. students. This article explores doctoral students' resilience through a narrative inquiry into the resilience-building process of a Ph.D. student in language and linguistics, Hongxia, in the United Kingdom. Drawing on the research methods and results of resilience from teachers, this study examines Hongxia's lived experience as a Ph.D. student throughout her 3 years of learning and research and uncovers the dynamic and multifaceted process of resilience building as the interplay between Ph.D. students' agency, peers, supervisors, academics, families, and friends. The current research supports the value of narrative inquiry, in particular critical story analysis, as a tool for studying the resilience-building processes in Ph.D. students during their candidature. It also hopes to provide insight for administrators, supervisors, and other related stakeholders on their intervention to support and facilitate the research journey of doctoral students.

KEYWORDS

doctoral student, Ph.D. student, resilience, study abroad, narrative inquiry

1 Introduction

Ph.D. or doctoral students are a special student group in higher education institutions who are confronted with an exceptionally long and difficult journey to the completion of their degree (Smith et al., 2006) as opposed to other postgraduate or undergraduate students. Research has revealed that this group of students is often associated with a poor status of wellbeing (Kismihók et al., 2022). Specifically, Ph.D. students normally need to undertake a range of demanding academic tasks such as finishing required courses, passing the candidate examination, and writing a thesis in order to be awarded a doctoral degree. Besides such intensive work, Ph.D. students often need to attend to other life responsibilities, such as family commitments, job

requirements, and financing issues (Smith et al., 2006; Moate et al., 2019). Struggling with these demanding requirements often brings about high levels of stress and negative emotions among Ph.D. students, posing severe challenges to their wellbeing (Kurtz-Costes et al., 2006; Stubb et al., 2011). The poor status of Ph.D. students' wellbeing, such as stress and anxiety, is claimed to be the typical reason for their high attrition rate (Nettles and Millett, 2006; Jiranek, 2010; Stubb et al., 2011). Such dropout of Ph.D. students often causes loss to higher education institutions, such as facility allocations, scholarship, supervisory time, and high-quality research outputs for universities (Dhirasasna et al., 2021).

The aforementioned condition enlightened us that it is of paramount importance to figure out the factor influencing Ph.D. students' wellbeing. As a psychological construct, wellbeing has been widely used to refer to "the state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity" (World Health Organization [WHO], 2022). Extant studies have explored a diverse range of factors related to Ph.D. students' wellbeing (Schmidt and Hansson, 2018), such as workload and control (Mackie and Bates, 2019), level of support (Sverdlik et al., 2018; Sverdlik and Hall, 2020), supervisory relationship (Barry et al., 2018), financial concerns (Metcalf et al., 2018), research progress (Schmidt and Hansson, 2018), and role conflicts (Guthrie et al., 2018; Yusuf et al., 2020). Other researchers have explored the impact of some demographic factors, such as race and gender, on the wellbeing of Ph.D. students (Paustian-Underdahl et al., 2017; Corvino et al., 2022). However, few studies to date have investigated how individual personality characteristics might affect the wellbeing of Ph.D. students (Perepiczka and Balkin, 2010; Moate et al., 2019). This is surprising, given the vital role of personality characteristics in influencing individuals' perception of experiences in life (Ghorpade et al., 2007). As one important personality construct, resilience of Ph.D. students warrants our special attention as it has been manifested to be instrumental in the performance and wellbeing of different populations, such as teachers (Johnson et al., 2014; Proietti Ergün and Dewaele, 2021; Chu and Liu, 2022) and general learners (Rosenbaum and Weatherford, 2017; Cleary et al., 2018). The overarching goal of this research is to explore the resilience-building process and its influencing factors through a narrative case study of a Ph.D. student during her candidature in a study abroad context.

2 A brief overview of research on resilience

As a construct originated in psychology to solve children's misbehaviors such as mental disorders due to severe hazards (Rutter, 1999; Fredrickson, 2004), resilience has also aroused an upsurge of scholarly attention in the field of positive psychology in recent years (Le Cornu, 2009; Gu and Day, 2013;

Liu and Chu, 2022; Meierdick and Fleischer, 2022). However, no consensus has been reached in terms of its exact definition. Overall, the notion of resilience has been conceptualized from an individual's innate attribute to cope with adversity or threat to "a dynamic process of positive adaptation whereby individuals mobilize internal and external resources" (Lu and Zhu, 2022, p. 3). Based on a critical overview of empirical research findings from a wide variety of disciplines, Gu and Day (2013) summarized three shared considerations in the way resilience is conceptualized: its presupposition of the presence of a threat to the *status quo*, its learned and acquired rather than innate and fixed nature, and its personal characteristics and relationships with the social environment where the individual works and lives. In a word, recent studies are inclined to see resilience as a developmental notion co-constructed by the individual and contexts, rather than an innate or static state.

Furthermore, Richardson et al. (1990) proposed a three-stage model of the resilience-building process in health profession. In the first place, an individual's organized state of life was broken by particular challenges. Second, the individual struggled against these challenges to reorganize life and regain equilibrium from traumatic experiences. Finally, the individual became more adept at coping strategies to challenges. This model revealed the dynamic nature of the resilience-building process, which is in line with the aforementioned developmental nature of resilience. An investigation of the experience of a doctoral student in a cross-cultural context in this research is informed by this three-stage model of resilience building and the growing literature on the significance of resilience in many aspects of our lives ranging from teacher wellbeing (Hascher et al., 2021) and career enjoyment (Proietti Ergün and Dewaele, 2021) to learner motivation and language learning proficiency (Kim and Kim, 2017; Kim et al., 2019).

In relation to the empirical research on resilience, a majority of studies conducted to date have been focused on teacher resilience (Beltman et al., 2011; Ainsworth and Oldfield, 2019). They include the exploration of relevant theories and theorization of teacher resilience (Ebersoehn, 2014; Mansfield et al., 2016; Drew and Sosnowski, 2019; Hascher et al., 2021), the significance of resilience for teachers (Gu and Day, 2007; Clara, 2017; Li and Lv, 2022), ways of fostering and sustaining teacher resilience (Wang, 2021; Kowitarttawatee and Limphaibool, 2022), and the investigation into resilient features of teachers from a range of sociocultural contexts and educational levels (Day and Hong, 2016; Peixoto et al., 2020; Gratacós et al., 2021; Xue, 2021; Chu and Liu, 2022; Gan et al., 2022; Wang and Lo, 2022; Wang et al., 2022). By contrast, the resilience of students is still an underexplored area. Among the limited number of studies on student resilience, a majority have adopted a quantitative approach based on a range of scales such as the Connor–Davidson Resilience Scale (CD-RISC) (Connor and Jonathan, 2003), the Resilience Scale (Wagnild and Young, 1993), and the scale by Kim and Kim (2017). A common

observation from these studies is that resilience has a positive correlation with language competence and second language enjoyment (Wei et al., 2022).

Taken together, the aforementioned literature has added to our knowledge of the vital role of resilience in students' academic performance. Yet, much research is warranted in this under-represented line of inquiry, in particular concerning the specific group of doctoral students. Inspired by these gaps in the literature and the significance of resilience in influencing individuals' performance and wellbeing, the present research was designed to explore the following two research questions:

1. How do the doctoral students build their resilience during their Ph.D. research?
2. What are the factors influencing doctoral students' resilience-building process?

3 Materials and methods

3.1 Participant

In order to provide a rich description of individuals' lived experiences (Clandinin and Connelly, 2000; Barkhuizen et al., 2014), this research adopted a narrative inquiry approach to explore the resilience-building process of a doctoral student, Hongxia (pseudonym), as she pursued her Ph.D. research at a research-oriented university in the United Kingdom. Before her Ph.D. study, Hongxia worked as a teaching assistant and then as a lecturer at a comprehensive university in China for 7 years. As a university lecturer with a degree of master of arts, she was occasionally warned by her department director and other senior colleagues of the necessity of doing a Ph.D. and receiving a doctoral degree. The university where she worked stipulated that those lecturers who were less than 40 years should hold a doctoral degree to get promoted to an associate professor. "Almost in every weekly meeting, our dean would emphasise this requirement for younger teachers who were in their 30s, including me" (from interview).

Under such circumstances, some of the younger teachers in Hongxia's department began to pursue their Ph.D. studies in mainland China, Hong Kong, or some other places around the world, such as the United Kingdom, the United States, Australia, Canada, and Malaysia. One of her colleagues, who was also her prior classmate in university, went to do a Ph.D. at a university in Hong Kong. She was also encouraged by this and was thus determined to do a Ph.D. So she began to prepare the application for her Ph.D. study abroad, specifically at a university in the United Kingdom. After considerable effort, she succeeded in the application and was also awarded the joint scholarship provided by the China Scholarship Council and the university in the United Kingdom.

3.2 Data collection

The current research and its data collection procedures were approved by and monitored by the institutional ethical review board of the university where she studies. The primary data for this study involved an interview and reflective journals. Specifically, in order to obtain a nuanced understanding of the participant's resilience-building experiences, a retrospective semi-structured interview was conducted at the end of Hongxia's Ph.D. research (see Appendix A for the interview guideline). In addition, Hongxia was requested and agreed to write reflective journals to note down what she thought were critical incidents pertinent to her research work or life. When doing this research, the author was also doing a Ph.D. in language and linguistics at the same school as Hongxia. As Hongxia was the researcher's Ph.D. colleague and they had close contact during daily study and life, the researcher and the participant had built rapport with each other during the research process, thus facilitating the data collection for the present research.

As the researcher and the participant were studying in the same department and had similar research interests, they also had much daily contact with each other. Therefore, the current research was also enlightened by some other informal data. For instance, the researcher and the participant usually had some ordinary conversations in terms of their research as well as participated in many daily activities together. The researcher also noted down some ethnographic observations of the research activities the participant took part in, such as attending some research-related seminars, workshops, or conferences held in and out of the university. In addition, the researcher also collected some other pieces of information related to the participant, such as the WeChat moments the participant posted, which showed her daily thoughts and lives in the forms of texts, pictures, and videos, to inform and triangulate the analysis and findings of the present study.

3.3 Data analysis

The data analysis, or the storytelling and re-storytelling process of the present study, was informed by a qualitative thematic analysis (Guest et al., 2012). Meanwhile, the analytical process was also enlightened by the three-dimensional narrative approach (Connelly and Clandinin, 2006), taking account of the dimensions of interaction, continuity, and situation.

Specifically, the whole process followed the four major procedures, as shown in Figure 1, and the data were first sorted chronologically from the participant's commencement of her Ph.D. journey to the end of the last year of her Ph.D. research when she submitted her Ph.D. thesis for examination. Second, the data were then segmented according to the adversities she encountered. For example, the difficulties or cheers she experienced during different stages of her

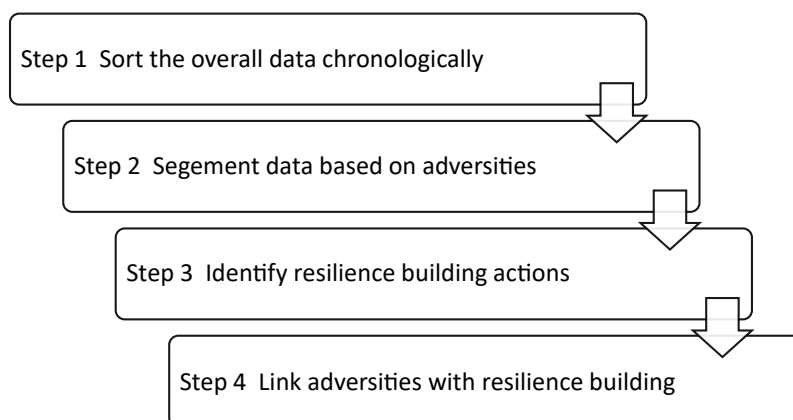


FIGURE 1
Procedures of data analysis in the present study.

Ph.D. research, that is, the first, second, and third years, were identified. Third, the corresponding resilience-building actions for handling the adversities were identified. Finally, the data were analyzed by linking the adversities with resilience-building processes in different stages of her Ph.D. research. By this means, three themes were identified for the participant's resilience-building process.

Notably, during the analytical process, another researcher was invited to independently code the data and then discuss the disputed parts until a consensus was reached. Furthermore, the analysis and interpretation of the study were also sent to the participant for member checking. These measures were taken to better ensure the rigor and trustworthiness of the study.

4 Hongxia's resilience-building stories

An analysis of the data resulted in three main themes of the resilience-building process by the participant, as shown in Figure 2. The following three narratives describe the challenges that Hongxia had encountered in various stages of her Ph.D. research and the ways in which she was engaged to exercise her agency and build her resilience against those challenges.

4.1 Homeostasis-breaking process

As noted earlier, Hongxia had worked at a university in China for 7 years before she commenced her Ph.D. research at a university in the United Kingdom. Thus, she was arguably to be in her mid-career professional life phase based on Gu and Day's (2007) classification of the three scenarios of teachers' professional stages. This was also embodied in her personal life. When she began her Ph.D. study, she had got married and had a

baby who was then only 10 months old. She had to go to the university by herself and leave her baby at home due to her uncertainties about the upcoming study in a nation where she had never been. This turned out to be very hard, both physically and emotionally, for her as a mother who was used to the days of being together with her family, in particular with the baby. Such emotional challenges were compounded by the seemingly endless days she could then foresee in doing a Ph.D. during the early stages when she arrived at the university in a different country.

When she arrived in the United Kingdom, life was totally different from what she experienced back at home in China. She had undertaken her teaching work and taken care of the baby with the help of her family, which was, in general, with a rather slow pace. However, her life of doing a Ph.D. was in a completely new style, either in daily life or in the research study. This was particularly true in the first year when she was exposed to a new living environment. With the help of a friend, she got the chance to rent and live in a homestay, together with the landlord couple and another undergraduate girl student from the United Kingdom. More importantly, she had to work on

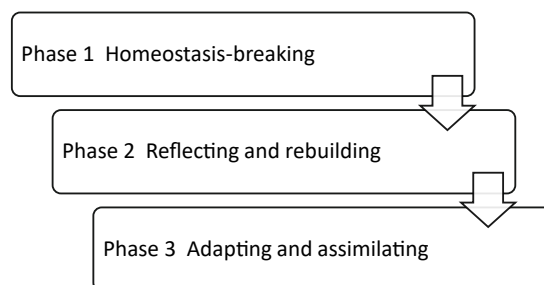


FIGURE 2
Hongxia's resilience-building process.

her research under the guidance of her supervisors and attend a range of lessons related to her research, such as research methods and second language acquisition. Thus, it was of paramount importance for her to become accustomed to the new study and life habits in a new environment.

Indeed, this sudden change in her lifestyle and environment formed a big shock to her despite that she had some emotional and psychological preparations in advance. In particular, her life seemed to be imbued with study and work at the time. Being far away from home, she felt particularly guilty that she had no opportunity to take care of her child as when she was at home before. Every time when she was tired of the study and needed a break, her feeling of guilty was stronger as she thought she should have spent the time fulfilling her family commitments.

Such a paradoxical feeling increased her emotional pressure and even led to some other new problems in her life. She became very sensitive to the environment around her, which she claimed rarely happened to her before. For example, she felt very disturbed and annoyed by the showering noise made by her flatmate every mid-night, and even could not fall asleep every night until 1 or 2 o'clock after everything was quiet.

The girl took a shower at about twelve or one o'clock every night. And the showering room was just next to my bedroom. It somehow made strange noise every time she took a shower. That really annoyed me and caused increasing tension in my nerves. I tried to tell her but it seemed to be not easy to change as she said that she was used to taking a shower before going to bed. Everyday my nerves were very stressful, increasingly more sensitive to any sound around me. I tried to adjust myself, tried to use ear plug, to listen to music, and to do more exercise during the daytime, but they all seemed to be in vain. So after living there for six months, I left that house and moved to a new place although I could not get my deposit back because I did not live there for one year as initially agreed on with the landlord. (from interview)

In addition, issues pertinent to study and research also posed a big challenge to her. For instance, being used to a daily noon nap at home, Hongxia found it hard to adapt herself to the schedule of the lessons. The classes she attended were often scheduled from 9 or 10 o'clock in the morning to 1 or 2 o'clock in the afternoon, with very limited time intervals at noon for lunch, let alone the nap she usually did when she was at home before. She could not help feeling sleepy every class in the afternoon. "No sleeping at noon ruined the whole afternoon" (from Hongxia's reflective journal). Furthermore, as she read the literature related to her proposed topic for the Ph.D., she also began to notice that some of the ideas in her proposal might not be feasible enough, and she might need to adjust it for her future research work.

In short, it turned out that the comprehensive issues related to Hongxia's psychological tension caused by the imbalance between life and work, her inadaptability to the new homestay environment, and the new challenges arising from her study and research work resulted in her inefficiency in work during the daytime. Such inefficient work, in turn, aggravated her feeling of guilt, which seemed to form an incompatible circle. This initial incompatibility in the early stage of her doctoral life represented a homeostasis-breaking process, which featured adversity and disruption in an individual's resilience-building process (Richardson et al., 1990). In such an adverse situation, various challenging factors, such as stressors and riskers, broke the well-established state of her life. However, this could also serve as a reflecting and motivating factor for agentic individuals to work through the problems and learn new skills from the disruptive experience (Xue, 2021), as noted by Hongxia:

Are there any other things worse than what happened during these days? People say things would get better if it cannot be worse. I do think something needs to be changed and hope it would get improved in the future. (from Hongxia's reflective journal)

4.2 Reflecting and rebuilding

Hongxia endeavored to make every effort to change this situation after she realized the potential danger of this paradoxical status and the necessity of an improvement in her emotional and psychological states. During the daily video call with her family, she sometimes talked about her feelings with her husband. Her husband constantly helped her analyze her condition and encouraged her to learn to relax from the *status quo*. He also suggested some ways of improvement, such as doing more exercise and trying to communicate thoughts with other people. Encouraged by her husband, she began to reflect on the ways of doing her research in an effective and efficient way. She became aware of and came to recognize the necessity of striving for a balance between work and leisure. So she gradually went out of her office and tried to temporarily leave her study to communicate with people around her, such as talking to her friends and Ph.D. colleagues. She expressed the unstinting support of her husband in helping her out of the tensions she experienced, in particular during her Ph.D.:

I felt very hard during the first few months when I came to UK. Homesickness, especially the strong longing for my son, coupled with the difficulties in studying, rendered me to thinking of giving up this study and returning home. I think I was lucky, as during this process, my husband gave me endless and unstinting support. I really couldn't thank

him more. He took care of our son during the night, and went to work during the daytime, from the time when my son was ten months old. About one year after that, he told me that the first night when they slept after I was in UK, he couldn't help feeling very upset, as he thought that our son was so young that he couldn't live together with his mom. And my husband was also not sure whether he could take very good care of our baby, such a little baby, you know. But he didn't tell me this until after almost one year when we all seemed to be more used to this kind of life. He always tells me the good news, encourages me and tries every effort to make me feel relaxed. This is really a great support for me to continue my PhD. (from interview)

As noted earlier, she moved out of the homestay due to the seemingly irreconcilable living habits between her and the flatmate and then rented a new flat together with her friend. This move has, to a large extent, improved her sleeping quality and brought new possibilities to her life. "Things changed a lot after I left the homestay environment, or maybe it is my own mental or psychological problem, I had a very sound sleep every night after moving to the new flat" (from interview). The close contact with her new flatmate also further cheered her up and motivated her to take more exercise. Her new flatmate's regular swimming exercise also aroused Hongxia's interest in learning to swim. Then Hongxia and several other friends learned together from her flatmate how to swim. This was not only one skill learning activity but also a social opportunity for Hongxia, which offered considerable help in her effort to strike a balance between work and life.

I had learned many times during the past few years how to swim but did not succeed. So swimming was a big challenge for me. But with my flatmate's encouragement, I could finally manage it. This was indeed cheerful and fulfilling for me, not just because I learned a new skill, but also enhanced my confidence of working on something I had thought impossible. Since then, I also had a regular exercise activity and sometimes went to swimming by myself. (from interview)

In addition, with the conclusion of the lessons she took after two terms, she could arrange her time for research more flexibly, such as taking a nap during the noon when she wanted to. More importantly, she also gradually developed her thoughts and decided on the specific topic she would do for her Ph.D. research. Her two supervisors are also very supportive, scheduling their meetings regularly to ensure if she was on track. She could also communicate more effectively with her supervisors, knowing what help she could expect and how to ask for feedback from each of them. For example, after knowing Hongxia had difficulty in finding related participants for her Ph.D. research, her supervisors made use of their personal and

work relations to help her. Finally, she had enough participants. Also her second supervisor was a psychologist and also the mental health officer of the school. She was good at solving mental problems. So Hongxia turned to her for help when she encountered some disruptive issues, as noted in the following text:

I seemed to be rather seriously disturbed by other people's messages for requesting me to do something, for example, asking me to translate some abstract for them, to buy something for them when going back home, or even to buy milk for their babies, and so on. If I refused to help them, they would probably be angry with me. However, if I agreed to help them, that would make me feel very distracted and stressful. I was so overwhelmed by these things that I could not concentrate appropriately on my research. I felt greatly relieved after that and also learned how to deal with such a situation. (from interview)

It went without saying that she encountered a number of difficulties and adversities germane to her research. However, she felt that she became gradually accustomed to the environment and learned to resort to the rich resources and affordances the university provided to enrich her knowledge and skills and adjust her psychological state of mind. Through active participation in a variety of activities in addition to doing her research, such as workshops, seminars, forums, or informal discussions with other Ph.D. colleagues or academics, she had been engaged in a dynamic process of reflecting on her research and life and rebuilding her identity and resilience as a Ph.D. student. For example, she attended one workshop related to the life of doing a Ph.D. and was deeply impressed by saying that "Ph.D. is a journey full of tears and cheers". She felt she could not agree more with this vivid expression. Such a recognition of doctoral students' normal life, echoed by other Ph.D. colleagues and academics, enhanced her identity and sense of belonging within the research community in which she was embedded, thus contributing to her resilience building during the Ph.D. process.

4.3 Adapting and assimilating

Although full of ups and downs, Hongxia's Ph.D. journey largely proceeded smoothly as scheduled, and she became more adaptive to the research study routine. As she stepped into the third year, Hongxia had collected the required data, made an analysis of them, and moved to the writing-up stage. She could more efficiently manage her time and keep a balance between work and leisure. She could write the thesis as planned and felt much more fulfilled than ever. Her state of mind has had considerable change compared with the initial stage of her Ph.D. She was equipped with more technological skills in

handling her data by attending a range of workshops provided by the school and the university. She reported her progress to her supervisors at regular intervals and discussed relevant emerging questions with them. This cheerful experience can be evidenced by one of her WeChat moments, in which she wrote, “The blue and bright sky after meeting with my supervisors” and attached a photo she took when she went out of her supervisor’s office.

Her improved adaptability can also be evidenced by her ways of adjusting herself when confronted with difficulties during this stage of her Ph.D. There was once when she talked with her Ph.D. colleague about their progress of the research. After feeling a little upset about her slow progress compared with the Ph.D. colleague, she composed the following two different versions of episodes (from Hongxia’s reflective journal), which she claimed to be a mini-drama to depict this phenomenon in doctoral students’ life:

Episode 1

A	How is your research going?
B	Ummm: it’s...okay... hmmm slowly... I use a mixed method research. Now I’ve just finished my quantitative data analysis, but haven’t begun the qualitative part yet.
A	(hm good! I am not alone on the slower side) Which year are you now in your Ph.D.?
B	I am approaching the end of my third year.
A	You are doing fine. You know, most Ph.D. students need four years. (Oh, yeah! I’m in the beginning of my second year, and I’ve already completed the quantitative section of the mixed method analysis)

Episode 2

A	How is your research going?
B	Well, it goes very well. I use a mixed method research. Now I’ve just finished my quantitative data analysis, and will begin to do the qualitative part.
A	(Oh, no! I must be the slowest one. I’m so upset) Which year are you now in your Ph.D.?
B	I am in the beginning of my second year.
A	You are going very fast. (Oh, No! I’m approaching the end of my third year of my Ph.D., but I’m still doing the quantitative section of the mixed method analysis)

With the progress in her research, she also became more assimilated into academia. In addition to writing her Ph.D. thesis, Hongxia attended postgraduate forums and conferences to present her research. To her great surprise, her abstract was accepted by the British Association for Applied Linguistics conference. This greatly encouraged her and enhanced her confidence in her research. During the conference presentation, she received many informative questions, comments, some

suggestions for her research from Ph.D. colleagues and scholars in other institutions. Her communication with them also motivated her to further reflect on her own research, providing new affordances to her Ph.D. journey. This assimilation culminated in her publication of a research article in the third year of her Ph.D. research.

Furthermore, as she had a rather clear planning for and control of her upcoming life in doing the Ph.D., Hongxia also invited her family to join her. Her husband and kid arrived in the United Kingdom to join her for half a year. During that time period, Hongxia was filled with great happiness and satisfaction with her life.

In the first few days, my son’s jet lag seemed to be completely adjusted. When he woke up in the middle of the night, he always hugged me over and over again and said, “Mom, I like you.” These actions of my son made me feel happy but also a little sad: after over two years’ intermittent separation, how much he missed his mother... After my husband arrived, he did almost all the cooking and other chores, took care of me and my son in every possible way, and gave me great support. (from interview)

Overall, Hongxia’s Ph.D. research and life transited into a steadier stage through her persistent resilience-building process with the help of supervisors, Ph.D. colleagues, academics, and families. Irrespective of ups and downs, she was more adaptive to the doctoral research study and daily routines, considering “tears and cheers” as integrative components of the Ph.D. journey. She established a good relationship with her supervisors and received the support and guidance from them. She became more capable of adjusting her state of mind and handling difficulties and disruptive experiences with an optimistic viewpoint. Her effort in doing the research was echoed and reconfirmed by her Ph.D. colleagues and academics in and out of the university through her participation in various academic activities, such as the aforementioned forums and conferences. Through this means, she felt being assimilated into academia and reconfirmed her identity as an early career scholar in the research community. These relationships, alongside her family support, all contributed to her resilience-building process and her professional identity as a scholar in the making.

5 Discussion

The earlier section has outlined the three stages of resilience-building process by the participating Ph.D. student, Hongxia. Throughout the varying stages, some concomitant threads of factors influencing how the participant had gradually built her resilience also emerged from the data analytical process. This section discusses the major representative influencing factors as evidenced by the current research. Taken together, these factors

consist of the Ph.D. student's relationship with the constellations of others and her individual agency.

First, relationships with crucial others in the institutional settings also contributed to the Ph.D. student's resilience building. In this case, the Ph.D. participant Hongxia moved out of her homestay and gradually made good friends with her peers. She and her friends went out together to learn to swim from her flatmate. This had a positive effect on her resilience-building process. Such friendship from peers assisted the Ph.D. student's recovery from adversity and adjustment to work and life. More importantly, supervisors are also an instrumental factor in helping the students' resilience building. The student reported her supportive supervisors in helping her through various difficulties, such as finding appropriate research participants in her data collection process, dealing with psychological problems, and discussing emerging issues related to research. All these supports acted as significant empowerment for the Ph.D. student during the doctorate journey. In addition, the university also provided necessary workshops, seminars, and forums for the Ph.D. student related to her research, which are useful affordances for her resilience building. Such intra-institutional factors, alongside the broader inter-institutional conferences, were conducive to the reflecting, rebuilding, adapting, and assimilating processes of the Ph.D. student and ensured her survival in the demanding journey of a Ph.D. research. They constituted the wider social networks of the Ph.D. student (Cullen et al., 1994; Francis, 2007) and also corroborated existing research on the role of relationships in mediating Ph.D. students' experience and their transition to independent scholars (Baker and Pifer, 2011; Adams, 2019).

In addition, the family was observed as a critical factor influencing the Ph.D. student's resilience building. In the initial stage of her Ph.D. in this study, participant Hongxia left her family at home and commenced her Ph.D. research in a study abroad context. This shift in environment and focus on life has caused a considerable shock to her emotional and psychological wellbeing. In particular, the Ph.D. student's imbalance between life and work, her inadaptability to the new homestay environment, and the new challenges arising from her study and research work caused her paradoxical feeling of guilt and lower efficiency. This represented a homeostasis-breaking stage in her resilience-building process. During this process, her family provided her considerable psychological support, which stimulated and motivated her to make a change to such a status. This indicates the role of family members in Ph.D. students' resilience building. Indeed, the support of the participant's family was obvious in every stage of her resilience building. It offered further support to previous research, which argued the significance of work-life balance to the wellbeing of graduate students informed by the work/family border theory (Yusuf et al., 2020).

Furthermore, the Ph.D. student's resilience building was also influenced by her capabilities to navigate through the

anticipated and unanticipated adversities in her professional and personal lives. The stories presented earlier in section "Hongxia's resilience-building stories" were, in essence, a portrait of how the Ph.D. student Hongxia exercised her agency in the active building of resilience. Across the different stages of her Ph.D. research, she was confronted with various types of difficulties and adversities. Despite the importance of crucial others, individuals' active response and reaction are of paramount significance in the resilience-building process. Disruptive adversities can also become an opportunity for agentic individuals to work through the problems and learn new skills from the disruptive experience. For example, the imbalance between life and work, her inadaptability to the new homestay environment, the new challenges arising from her study and research work, and her difficulty in soliciting appropriate research participants all stimulated her determination and action in changing her *status quo* by herself or her seeking necessary assistance from crucial others. This echoes the prevalent conceptualization of agency as an intentional act and a socioculturally mediated capacity (Tao and Gao, 2017) and its role in dealing with adverse situations (Gu et al., 2022).

6 Conclusion

The present study explored the resilience-building process of a Ph.D. student in a British higher education institution. The analysis identified three stages of the participant's resilience building: the initial homeostasis-breaking phase, the reflecting and rebuilding phase, and ultimately the adapting and assimilating stage. It also discussed the influencing factors that may impact how the participant built her resilience along with the "cheers and tears" during her candidature. Notably, resilience in doctoral students is not a static or innate nature but is affected dynamically by a range of factors, such as their professional and personal relationships with their peers, supervisors, friends, and families. It is also influenced by their capabilities to navigate through the anticipated and unanticipated adversities in their professional and personal lives.

This research has important implications for researchers, educators, and administrators who are responsible for Ph.D. students' education and wellbeing in higher education institutions. In light of the earlier findings, an important task for those concerned is not only to have a better understanding of the factors that may influence doctoral students' resilience over the course of their research but also to sustain these factors that may be conducive to their resilience building in the contexts in which the doctoral students are embedded. Considering these findings, efforts can be made to help doctoral students, from their induction phase, to be aware of the potential adversities and rewards, or the tears and cheers they will likely experience, and the resources, affordances, and means that they can count

on to go against the odds and build their resilience. As such, they may be better prepared for the doctoral research journey. As the current research indicated, it can be developed through personal, school, and institutional support, which will ensure that doctoral students sustain their capacity to be resilient and reach their research potential.

As with many other narrative approaches to individual case studies, the present study did not aim to generalize its findings to other cases of contexts but to add to our understanding and knowledge to a particular context, that is, doctoral students' resilience-building process in this study. Nevertheless, it is also noteworthy that this is merely one doctoral student's lived experience of resilience building at a particular period of time; therefore, other students or the same student at a different time will likely have different resilience-building experiences. Having said that, the present study has added to the current limited body of research on resilience involved in promoting doctoral students' wellbeing. The thick description of the resilience-building process by the participant may provide insights for Ph.D. students in similar contexts, no matter which country they may come from. As previously indicated, such individual psychological characteristics are underexplored. Hence, more studies of such lines of inquiry, in particular those involving more participants and longer time duration, are warranted in future.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the University of Aberdeen. The patients/participants provided their written informed consent to participate in this study.

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Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix A: An interview guideline

1. How was your life prior to the Ph.D. research and study?
2. How do you describe your research and study in different stages of your Ph.D.?
3. How do you describe your life in different stages of your Ph.D.?
4. What difficulties or problems have you encountered during your Ph.D.?
5. How did you go through, handle or solve the difficulties or problems?
6. What cheerful things have you experienced during your Ph.D.?



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Learning engagement in massive open online courses: A systematic review

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Although massive open online courses (MOOCs) increase the number of choices in higher education and enhance learning, their low completion rate remains problematic. Previous studies have shown that learning engagement is a crucial factor influencing learning success and learner retention. However, few literature reviews on learning engagement in MOOCs have been conducted, and specific data analysis methods are lacking. Moreover, the internal and external factors that affect learning engagement have not been fully elucidated. Therefore, this systematic literature review summarized articles pertaining to learning engagement in MOOCs published from 2015 to 2022. Thirty articles met the inclusion and quality assurance criteria. We found that (1) learning engagement can be measured through analysis of log, text, image, interview, and survey data; (2) measures that have been used to analyze learning engagement include self-report (e.g., the Online Learning Engagement Scale, Online Student Engagement Questionnaire, and MOOC Engagement Scale) and automatic analysis methods [e.g., convolutional neural network (CNN), bidirectional encoder representations from transformers-CNN, K-means clustering, and semantic network analysis]; and (3) factors affecting learning engagement can be classified as internal (learning satisfaction, etc.) or external (curriculum design, etc.). Future research should obtain more diverse, multimodal data pertaining to social engagement. Second, researchers should employ automatic analysis methods to improve measurement accuracy. Finally, course instructors should provide technical support ("scaffolding") for self-regulated learning to enhance student engagement with MOOCs.

KEYWORDS

learning engagement, MOOCs, measurement methods, analysis methods, influencing factors

Introduction

Massive open online courses (MOOCs) provide online learning opportunities for learners worldwide (Gallego-Romero et al., 2020), allowing them to learn anytime and anywhere (Shen et al., 2021). In addition to the high flexibility of learning whenever and wherever, MOOCs also enable the sharing and open access of high-quality, top university course resources (Atiaja and Proenza, 2016), which promotes educational equity.

During the coronavirus 2019 (COVID-19) pandemic, MOOCs provided higher education options and enhanced learning outcomes (Alamri, 2022), making it become an important means of education and training. However, the completion rate of MOOCs remains low (Reich and Ruipérez-Valiente, 2019; Kizilcec et al., 2020).

Bolliger et al. (2010) suggested that the low completion rates of MOOCs may be attributable to a lack of face-to-face interaction with others, leading to isolation and, potentially, failure to complete the course. Meanwhile, the cognitive effort and participation of students are crucial for MOOCs learning, for instance, the number of students' videos watched and posts are closely related to their MOOCs completion rate (Pursel et al., 2016). Compared with traditional learning, self-paced learning requires higher learning engagement such as a deeper understanding of knowledge and lasting positive emotion to achieve good results (Chaw and Tang, 2019). Such learning is characterized by the maintenance of attention, interest, passion, interactions, participation, and self-control during the learning process (Fisher et al., 2018), and relates to psychological engagement (Krause and Coates, 2008; Sun and Rueda, 2011). Previous studies showed that higher learning engagement is often associated with higher MOOC completion rates (Hone and El Said, 2016) and better academic achievement (De Barba et al., 2016). Assessing the learning engagement of students enrolled in MOOCs helps educators monitor the learning process, and can guide course instructors (Fisher et al., 2018); in this manner, the high dropout rate of MOOCs could be reduced.

Although learning engagement in MOOCs has received extensive attention from researchers, few reviews have focused on quantifying students' learning engagement, and an academic consensus has not been reached on the data of four sub-dimensions of learning engagement (Deng et al., 2019), nor on the optimal data collection (Khalil and Ebner, 2016; Chaw and Tang, 2019) and measurement methods (Atapattu et al., 2019; Zhou and Ye, 2020). Clarifying the data of four sub-dimensions of learning engagement in MOOCs is essential to effectively measure students' engagement in MOOCs, which provides a basis for instructors' perception of students' learning state. Research on analysis methods for learning engagement data may help us understand how to better monitor the engagement of students enrolled in MOOCs, and future researchers can also learn from it to select appropriate analysis methods. Finally, studies have mainly focused on internal factors that affect learning engagement (Veletsianos et al., 2015; Barak et al., 2016), although external factors also play a crucial role in learning engagement (Khalil and Ebner, 2016). Compared with internal factors, external factors are easier to improve, which can be an effective way for instructors to promote students' learning engagement.

This systematic literature review aimed to identify the various types of data and analysis methods associated with learning engagement, and to clarify the external and internal

factors affecting learning engagement in MOOCs. The specific goals were to provide a reference for future research aiming to measure and analyze students' learning engagement in MOOCs.

Related works

MOOCs

MOOCs are open-access online learning platforms facilitating peer interaction and knowledge-sharing (Kop, 2011). In recent years, especially after the outbreak of COVID-19, MOOCs have become more popular worldwide (Liu et al., 2021). Many researchers believe that MOOCs are important for educating more people (Luik and Lepp, 2021). Moreover, they transcend geographic and social boundaries, granting access to educational resources to people all over the world (Hone and El Said, 2016). Compared with traditional classroom teaching, MOOCs have distinct advantages including "any-time" learning and the potential to enroll diverse groups of international learners (Lazarus and Suryasen, 2022).

However, MOOCs also have some limitations. For example, students may feel lonely when studying alone for protracted periods. Moreover, because of the minimal feedback provided during the MOOC learning process (Li and Moore, 2018) and the low quality of some MOOCs (Hone and El Said, 2016), high dropout rates and poor academic performance are becoming increasingly problematic. Jordan (2014) reported a completion rate for MOOCs of only 6.5%. To solve these problems, many researchers have performed studies, some of which found that learning engagement can have a positive impact on students' learning behavior and outcomes (Deng et al., 2020b). Students with high learning engagement, especially behavior engagement, tend to view more course resources, complete more assignments or quizzes (De Barba et al., 2016; Tseng et al., 2016), and interact with peers and inductors frequently. Therefore, they are more likely to complete a course and achieve better grades (Deng et al., 2020b).

Learning engagement in MOOCs

Learning engagement of students enrolled in MOOCs is essential to minimize dropout rates (Bezerra and Silva, 2017). Learning engagement is widely characterized in terms of the behavioral, cognitive, emotional, and social connections that MOOC participants make with the course content, instructor, and other learners (Deng et al., 2020a). Although some studies have classified learning engagement into behavioral, cognitive, and emotional engagement, this study argues that it is better to quantify learning engagement using a four-category approach that uses behavioral, cognitive, emotional, and social engagement. Because a MOOC is more like a diverse community

than a traditional course, in which many learners engage in learning activities through interactions with course content, peers, or instructors, additional attention needs to be paid to learners' social engagement. Specifically, behavioral engagement refers to students' degree of involvement in educational activities (Jimerson et al., 2003), reflected in paying attention, asking questions, and participating in discussions during MOOCs (Jung and Lee, 2018). Behaviorally engaged individuals tend to comply with course requirements (Bingham and Okagaki, 2012), such as watching videos, completing assignments on time, and participating in extracurricular activities. Cognitive engagement refers to psychological investment in learning and relates to the use of self-directed strategies to improve one's understanding (Fredricks et al., 2004). Cognitive engagement is reflected in learners' efforts to acquire complex information or skills during the MOOC learning process (Jung and Lee, 2018). Emotional engagement refers to students' attitudes, interests, and values (Fredricks et al., 2004), and is reflected in the forging of emotional connections with institutions, instructors, peers, and the course content itself (Jimerson et al., 2003; Jung and Lee, 2018). Social engagement is reflected in student-student and student-teacher interactions; it is sometimes considered a subcategory of behavioral engagement, given that engagement may be viewed as a type of behavior. In many studies, however, social engagement is considered a fundamental component of students' perceptions and is measured separately from behavioral, cognitive, and emotional engagement (Deng et al., 2020a). A recent review of 102 empirical studies showed that engagement is among the major topics in the MOOC literature (Deng et al., 2019).

Some studies have measured learning engagement in the context of MOOCs and suggested indicators to quantify the level thereof. Among the current MOOC learning engagement measurement methods, the self-report method is the most common. Many studies have used scales to quantify student engagement. For example, Deng et al. (2020a) used the MOOC Engagement Scale (MES) to measure students' behavioral, cognitive, emotional, and social engagement. Since MOOCs can provide rich data (log data, text data, etc.), there is an opportunity to quantify learning engagement. Many works used log files as their primary data source to explore engagement in MOOCs (Bonafini et al., 2017). Text data (i.e., discussion forum posts made by students) have been analyzed to measure learning engagement (Liu et al., 2022). With the development of multimedia technology, more data sources allowing for the measurement of learning engagement have become available, such as image data obtained during MOOCs. One study used facial analysis technology and machine learning algorithms to automatically measure student engagement (Batra et al., 2022). However, the advantages and characteristics of various algorithms for measuring and analyzing learning engagement have not been systematically reviewed.

Learning engagement in the context of MOOCs has received extensive attention, with many researchers reviewing the factors that affect it. Paton et al. (2018) found that well-designed assessment tasks, learner collaborations, and certification enhance learners' engagement and retention. However, almost all of the factors considered were external factors; internal factors such as self-regulation ability and prior knowledge were not analyzed. Meanwhile, Alemayehu and Chen (2021) explored the factors promoting and hindering learners' engagement from the perspectives of both instructors and students, but ignored the impact of external factors such as technical support. The influence of external factors on learning engagement should not be ignored because such factors can be modified to improve learning outcomes (Gallego-Romero et al., 2020).

To address the gaps in past research, this study investigated learning engagement data types and analysis methods, as well as the factors that promote engagement in MOOCs, by reviewing 30 empirical studies on learner engagement in MOOCs published between 2015 and 2022. The research questions were as follows:

- RQ1: What data are analyzed to measure learning engagement in MOOCs?
- RQ2: What analysis methods are used to quantify learning engagement in MOOCs?
- RQ3: What factors influence learning engagement in MOOCs?

Materials and methods

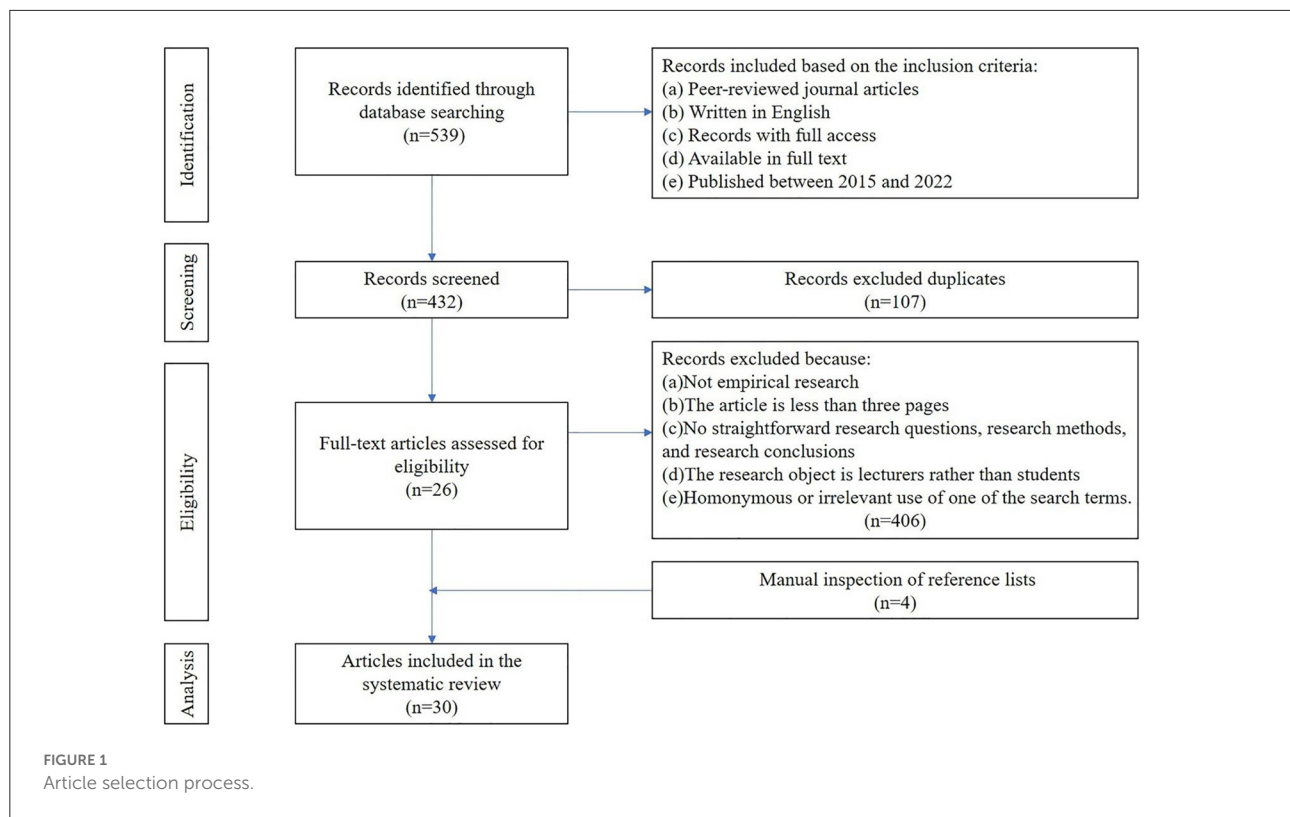
To answer the above questions, a systematic review was conducted using a replicable search strategy. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) statement guided this study (Page et al., 2021a,b). The PRISMA 2020 statement comprises:

- A 27-item checklist address the introduction, methods, results, and discussion sections of a systematic review report. This study strictly follows the above contents.

TABLE 1 Keyword combinations used in database searches.

Search terms
Student engagement AND MOOC
Learning engagement AND MOOC
Behavioral AND engagement AND MOOC
Emotional AND engagement AND MOOC
Cognitive AND engagement AND MOOC
Social AND engagement AND MOOC

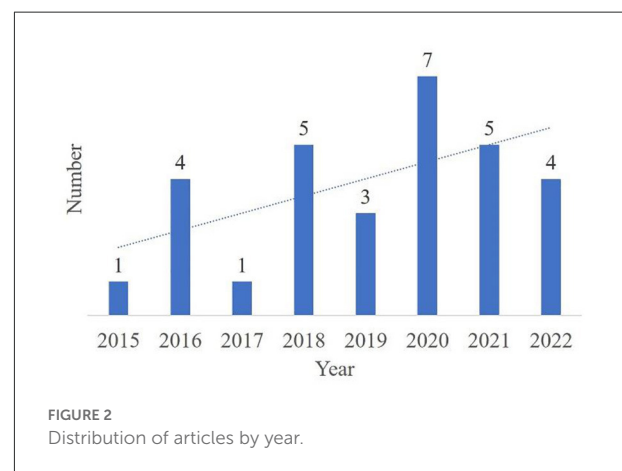
MOOC, massive open online course.



- A flow diagram depicts the flow of information through the different phases of a systematic review, it will be shown in detail in Section Article selection.

Search strategy

Five databases were searched for relevant studies: EBSCO ERIC, Elsevier ScienceDirect, Springer Link, Web of Science, and Wiley Online Library. Six keyword combinations were searched for in the title, keyword, and abstract fields, according to the search criteria of each individual database (Table 1). The last search was conducted on April 27, 2022.



Article selection

In total, 539 articles were retrieved from the five online databases. Figure 1 illustrates the articles selection process, the number of articles retained at each stage, and reasons for article exclusion. Thirty articles that met the selection criteria were included in the final analysis.

Data distribution

Figure 2 shows the distribution of the selected articles by year. We hope to summarize the research on the measurement and analysis of learning engagement in MOOCs in the past 10 years. But no articles published in 2013 and 2014 met the selection criteria. Thus 2015 is the starting year for article selection.

TABLE 2 Overview of the studies of learning engagement and influencing factors included in our review.

Authors	Years	Measurement and analysis methods	Data type*	Learning engagement domains discussed				Influencing factors discussed
				Behavioral	Emotional	Cognitive	Social	
Xiong et al.	2015	Structural equation modeling	Log	✓	–	–	–	–
Sunar et al.	2016	Descriptive statistical analysis	Log	–	–	–	✓	✓
Hew, K. F.	2016	Descriptive statistical analysis	Text	–	–	–	–	✓
Walji et al.	2016	Descriptive statistical analysis	Log, text, interview	–	–	–	✓	–
Khalil et al.	2016	Nb-Clust package-based analyses	Log	✓	–	–	–	✓
Bonafini et al.	2017	Descriptive statistical analysis	Log, text	✓	–	–	–	–
Lim et al.	2018	SNA	Text	✓	–	–	–	–
Liu et al.	2018	MLR, k-means, LSA	Log	✓	–	✓	–	✓
Jung and Lee	2018	Self-report	Survey	✓	–	–	–	–
Almutairi and Su	2018	Self-report	Survey	✓	✓	–	–	–
Williams et al.	2018	χ^2 test; multinomial logistic regression	Log, survey	✓	–	–	–	–
Chaw and Tang	2019	Self-report	Survey	–	–	–	–	✓
Atapattu et al.	2019	Doc2Vec + cosine similarity	Text	–	–	✓	–	–
Vayre and Vonthron	2019	Self-report	Survey	–	✓	–	–	–
Lan and Hew	2020	Self-report	Survey	✓	✓	✓	–	✓
Perez-Alvarez et al.	2020	Descriptive statistical analysis	Log	✓	–	–	–	✓
Rincón-Flores et al.	2020	Self-report	Survey	–	✓	✓	✓	✓
Gallego-Romero et al.	2020	Descriptive statistical analysis	Log	✓	–	–	–	✓
Deng et al.	2020a	Self-report	Survey	✓	✓	✓	✓	–
Li and Zhan	2020	CNN (VGG-16)	Log, image	✓	✓	✓	–	–
Deng et al.	2020b	Self-report	Survey	✓	✓	✓	✓	–
Chan et al.	2021	Self-report	Survey	✓	✓	✓	✓	✓
Pérez-Sanagustín et al.	2021	Descriptive statistical analysis	Log	✓	–	–	–	✓
Deng	2021	MLR	Survey	✓	✓	✓	✓	–
Shen et al.	2021	CNN	Image	–	✓	–	–	–
Kuo et al.	2021	Self-report	Survey	✓	✓	✓	–	–

(Continued)

TABLE 2 (Continued)

Authors	Years	Measurement and analysis methods	Data type*	Learning engagement domains discussed				Influencing factors discussed
				Behavioral	Emotional	Cognitive	Social	
Wang et al.	2022	Self-report	Survey	–	✓	–	–	✓
Batra et al.	2022	SVM, DenseNet-121, ResNet-18, MobileNetV1	Image	–	✓	–	–	–
Liu et al.	2022	BERT-CNN	Text	–	✓	✓	–	✓
Alamri et al.	2022	Self-report	Survey	✓	✓	✓	–	

SNA, semantic network analysis; LSA, lag sequential analysis; MLR, multiple linear regression; CNN, convolutional neural network; SVM, support vector machine, BERT, bidirectional encoder representations from transformers; Survey data refers to both scale data and non-scale questionnaire data.

*Refers to the type of data analyzed to measure learning engagement. We focus on self-report and automatic analysis; descriptive statistical analysis is not within the scope of this study, and any follow-up research will not analyze such data.

Previous studies distinguished among behavioral, cognitive, emotional, and social engagement (Deng et al., 2020a); Table 2 provides details of the articles reviewed herein. Several authors explicitly indicated the dimensions of learning engagement they discussed in their articles, which were directly followed for this study. If the researchers did not indicate the dimensions of learning engagement, the three reviewers divided them independently according to the definitions of the four dimensions (see Section Learning engagement in MOOCs). When the three reviewers had different opinions, a final agreement would be reached through negotiation.

Results

RQ1: What data are analyzed to measure learning engagement in MOOCs?

Of the 30 articles analyzed in this review, only 28 measured learning engagement and clearly delineated the measurement methods: one study did not report the learning engagement data types or analysis methods (Chaw and Tang, 2019), and another measured learning engagement based on a literature review (Hew, 2016). However, as both of those studies identified factors that influence learning engagement in MOOCs through empirical research, they were included in the final analysis (Table 2).

Behavioral engagement

To measure behavioral engagement in MOOCs, the reviewed studies mainly analyzed pre-class planning, course learning, and after-class activities. Sample items are shown in Table 3. In Tables 3–6, the sentences in the “Examples” column which are enclosed in quotation marks represent actual text

extracted from the studies in the “References” column, or express similar meanings to those studies.

Emotional engagement

In some of the reviewed studies, the researchers stated that assessing students’ overall attitudes toward in-class learning is necessary, while others aimed to closely examine students’ views on curriculum content (i.e., knowledge, tasks, and assignments). Finally, some of the studies measured students’ emotional experience during classes, rather than relying on self-report measures obtained thereafter (Table 4).

Cognitive engagement

Repeated learning according to the course plan was a focus of some of the studies measuring cognitive engagement. In addition, efforts that go beyond the course plan were regarded by some researchers as indicative of high-level cognitive engagement (Table 5).

Social engagement

There are two critical points to consider in the measurement of social engagement: the types of interactions that students have with others in or after classes pertaining to the knowledge acquired in MOOCs, and the associated emotional experience (Table 6).

Figure 3 shows the number of items used to assess the four dimensions of learning engagement. The total number of items exceeds 28 because many studies involved more than one of the various aspects of engagement (behavioral, cognitive, emotional, and social). Moreover, there were significantly more studies on behavioral, cognitive, and emotional engagement than social engagement; we explain the reasons for this in the Section Discussion.

TABLE 3 Categories of behavioral engagement.

Categories	Examples	References
Pre-class planning	"I set aside a regular time each week to work on my MOOC"	Deng et al. (2020a,b), Deng (2021)
	"I make sure to study on a regular basis"	Almutairi and White (2018)
Course learning	"I follow the progress of the online class"	Jung and Lee (2018), Kuo et al. (2021)
	"I pay attention and listen carefully in class"	Almutairi and White (2018), Jung and Lee (2018), Lan and Hew (2020)
	"I complete videos and exercises on time"	Kuo et al. (2021)
	"I take notes while studying for my MOOC"	Deng et al. (2020a,b), Deng (2021)
	"I participate in class discussions"	Lan and Hew (2020)
	"I participate actively in small group discussions"	Almutairi and White (2018)
	Number of videos viewed and reviewed, video completion rate	Xiong et al. (2015), Khalil and Ebner (2016), Bonafini et al. (2017), Liu et al. (2018), Pérez-Sanagustín et al. (2021)
	Frequency of participation in tests, classroom interaction, after-school tasks, and autonomous learning activities	Xiong et al. (2015), Khalil and Ebner (2016), Williams et al. (2018), Gallego-Romero et al. (2020), Pérez-Álvarez et al. (2020), Pérez-Sanagustín et al. (2021)
After-class activities	Number of comments and posts made by students	Xiong et al. (2015), Khalil and Ebner (2016), Bonafini et al. (2017), Lim et al. (2018)
	"I complete all homework assignments"	Almutairi and White (2018), Jung and Lee (2018)
	"I check for mistakes in my work"	Kuo et al. (2021)
	"I review my notes when preparing for MOOC assessments"	Almutairi and White (2018), Deng et al. (2020a,b), Deng (2021)

MOOC, massive open online course.

RQ2: What analysis methods are used to quantify learning engagement in MOOCs?

There are two main methods for measuring and analyzing learning engagement in MOOCs: self-report and automatic analysis (Tables 7, 8, respectively).

Self-report

The most commonly used method for measuring learning engagement in MOOCs is self-report, and the most widely used self-report scales are the Online Learning Engagement Scale (OLE), Online Student Engagement Questionnaire (OSE), and MOOC Engagement Scale (MES) (Table 9).

The strengths and limitations of the scales listed in Table 9 are presented in Table 10.

Automatic analysis

Automatic analysis of learning engagement involves many algorithms, such as K-means clustering, lag sequential analysis (LSA), semantic network analysis (SNA), support vector machine (SVM), convolutional neural network (CNN), bidirectional encoder representations from transformers

(BERT)-CNN, etc. These algorithms can be applied for feature analysis, classification, calculation, and regression analysis of learning engagement (Table 11).

Feature analysis of learning engagement

Feature analysis of learning engagement involves exploring and analyzing the features of learning engagement, for example *via* LSA, SNA, and K-means clustering algorithms. Clustering allows us to understand the learning behavior of learners exhibiting different levels of engagement. Liu et al. (2018) applied K-means clustering to video recordings of MOOC events to categorize students according to learning engagement. To understand user engagement in MOOCs, this study employed LSA to identify the behavioral patterns of students who passed and failed their MOOCs. Khalil and Ebner (2016) used the Nb-Clust package to cluster university students into four categories: "dropouts," "perfect students," "gaming the system," and "social." They then made different recommendations for these various categories of students. Lim et al. (2018) measured associations between MOOC transcription and forum text data, and conducted a correlation analysis between the semantic network metrics and student performance to determine the impact of student engagement on course performance.

TABLE 4 Categories of emotional engagement.

Categories	Examples	References
Overall attitude	"I like taking online classes"	Jung and Lee (2018), Deng et al. (2020a,b), Deng (2021), Kuo et al. (2021)
	"I find ways to make the course interesting"	Almutairi and White (2018)
	"When we are working on something in class, I feel interested"	Lan and Hew (2020)
	"I am enthusiastic about my studies"	Wang et al. (2022)
	"I have a strong desire to learn"	Almutairi and White (2018), Lan and Hew (2020), Wang et al. (2022)
	"My studies have meaning and purpose"	Wang et al. (2022)
	"Competing to win a trophy was exciting"	Rincón-Flores et al. (2020)
Views on curriculum content	"I am finding ways to make the course material relevant to my life"	Almutairi and White (2018)
	"I am interested in the online class assignments"	Jung and Lee (2018), Kuo et al. (2021)
	"The MOOC inspired me to expand my knowledge"	Deng et al. (2020a,b), Deng (2021)
	"I talk with people outside of school about what I am learning in the online class"	Kuo et al. (2021)
	"I think about the course between classes"	Almutairi and White (2018)
Direct measures of emotional experience	Students' facial expressions in class	Li and Zhan (2020), Shen et al. (2021), Batra et al. (2022)
	Text published online by students pertaining to the course	Liu et al. (2022)
	change video	Liu et al. (2018)

MOOC, massive open online course.

Classification of learning engagement

Classification of learning engagement can be used to measure learners' engagement. This method usually divides learning engagement into several categories. For example, Shen et al. (2021) proposed a new facial expression recognition method based on a CNN using domain adaptation; their network can recognize the four most common facial expressions (understanding, neutral, disgust, and doubt). Then, they applied a formula to classify students according to learning engagement (high, moderate, or low). Their results showed the effectiveness of the proposed method for assessing learning engagement in real time, indicating that it could also be suitable for MOOCs. Batra et al. (2022) suggested that screenshots of videos can shed light on student engagement. They used the WACV dataset, which divides students into three categories: disengaged, partially engaged, and engaged. They used CNN and SVM methods, among others; deep learning algorithms including a densely connected convolutional network (DenseNet-121), residual network (ResNet-18), and MobileNetV1 were used for training the models and enhancing accuracy, with final classification accuracies of 78, 80, and 66%, respectively.

Quantification of learning engagement

Some researchers process data using algorithms that output specific values. This allows for more direct and objective

quantification of learning engagement. For example, Liu et al. (2022) constructed a BERT-CNN model to process learners' forum text data; the model output scores for cognitive and emotional engagement. The results showed that the BERT-CNN outperformed other base models, and would be well-suited for processing MOOC text data. Atapattu et al. (2019) used a neural word-embedding (Doc2Vec) language model and cosine similarity to measure learners' cognitive engagement in MOOCs based on a dataset of online community posts and course materials. The results demonstrated that cognitive engagement was influenced by the nature of the MOOC task. Finally, Li and Zhan (2020) proposed a convolution neural network model (VGG-16) to analyze learning engagement using infrared images and log data. Strong agreement between the model results and a traditional online scale of student engagement was seen. However, their method requires temporal contiguity between the two data types.

Regression analysis of learning engagement

To explore the relationship between learning engagement and other factors, some studies conducted a regression analysis, which can be used to examine the relationship between dependent and independent variables. Liu et al. (2018) and Williams et al. (2018) both used multiple

TABLE 5 Categories of cognitive engagement.

Categories	Examples	References
Study according to the course plan	Record of mouse operations	Li and Zhan (2020)
	Use of the progress bar	Liu et al. (2018)
	"I often searched for further information when I encountered something in the MOOC that puzzled me"	Jung and Lee (2018), Deng et al. (2020a,b), Deng (2021), Kuo et al. (2021)
	When I had trouble understanding a concept or example, I went over it again until I understood it.	
	If there was a video lecture that I did not understand at first, I watched it again to make sure I understood the content"	
	"I put in a lot of effort, and was so involved that I forgot everything around me, I wish we could continue to work for a while longer"	Lan and Hew (2020)
Make efforts that go beyond the course plan	"I learn the online course material even when there are no quizzes that week"	Jung and Lee (2018), Kuo et al. (2021)
	"If I do not understand a concept encountered during the online class, I take action to address this"	Kuo et al. (2021)
	"I look for course-related information in videos, new articles, etc."	Jung and Lee (2018), Kuo et al. (2021)
	Repeats or interprets concepts and ideas, expresses new ideas, asks peers original questions, comments on the ideas of others, expresses new ideas based on those of peers	Atapattu et al. (2019), Liu et al. (2022)

MOOC, massive open online course.

TABLE 6 Categories of social engagement.

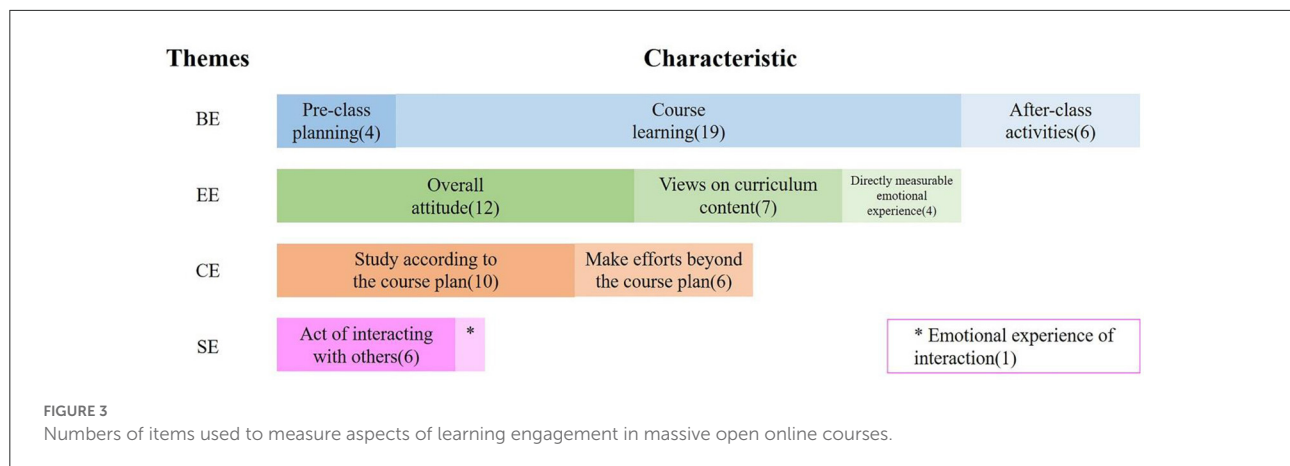
Categories	Examples	References
Types of interactions with others	"I often responded to other learners' question"	Deng et al. (2020a,b), Deng (2021)
	I contributed regularly to course discussions"	
	I shared learning materials with other classmates enrolled in the MOOC"	
	Posting a comment online, replying to a comment, likes received	Sunar et al. (2016)
	Interaction in the presence of the teacher, social learning (engaging with others outside the course setting), peer learning	Walji et al. (2016)
Emotional experience of interactions	"Seeing the leaderboard motivated me to solve the gamified task"	Rincón-Flores et al. (2020)
	"Seeing my results and those of classmates on the leaderboard motivated me to solve more exercises of this kind"	
	"I would have liked to have solved the gamified task with the help of another classmate"	
	I would have liked my colleagues to read my alternative proposal to solve the gamified task"	

MOOC, massive open online course.

regression analysis to determine whether students' learning engagement is affected by discipline, sex, education level, age, and learner goals. Both studies found that discipline and age predicted engagement. Meanwhile, Deng (2021) applied multiple linear regression (MLR) analysis to explore the relationship between learner satisfaction with MOOCs and learning engagement based on data such as video view counts and the number and content of online posts. Behavioral, cognitive, and emotional engagement, but not social engagement, were significant predictors of satisfaction.

RQ3: What factors influence learning engagement in MOOCs?

Aiming to enhance learners' learning engagement in MOOCs, it is also crucial to explore the factors that influence learning engagement. By analyzing existing research, we identified internal and external factors affecting learning engagement (Table 13). Internal factors refer to the innate attributes of learners, these attributes are usually stable, and some of them will alter under the influence of external conditions, such as learners' emotions, attitudes, knowledge



levels, and cognitive abilities. While external factors refer to the elements of the course that are not related to the attributes of the learners themselves, such as design, challenges, use of technology, etc.

Internal factors

After reviewing the literature, we identified five internal factors: (1) learning satisfaction, (2) perceived competence, autonomy, and sense of relevance (self-determination theory; SDT), (3) academic motivation and emotions, (4) academic achievement and prior knowledge, and (5) self-regulated learning (SRL).

Learning satisfaction

Chan et al. (2021) found that improving learning satisfaction was key to enhancing students' learning engagement in specific online learning courses. MOOC learning satisfaction is also affected by interactive and discussion-based activities, *via* the effects of such activities on learning engagement. For example, Dixon (2015) found that interactions and conversations with peers can help students fill gaps in their knowledge, promote satisfaction, and encourage greater participation in MOOCs.

Perceived competence, autonomy, and sense of relevance (SDT)

Lan and Hew (2020) found that all components of the SDT model had significant effects on behavioral, emotional, and cognitive engagement. Perceived ability had the most significant positive impact on all types of engagement, followed by perceived autonomy.

Academic motivation and emotion

Chaw and Tang (2019) revealed that negative and positive motivation promoted passive and active engagement in learners, respectively. In addition, Liu et al. (2022) found that both positive and "confusing" emotions correlated with higher

TABLE 7 Self-report measures of learning engagement in massive open online courses.

Data type	Tools (scales)
Survey[1]	Online learning engagement scale (OLE)
	Online student engagement questionnaire (OSE)
	MOOC engagement scale (MES)

levels of cognitive engagement; the opposite was seen for negative emotions.

In summary, each algorithm has its strengths and limitations (see Table 12), which should be used in specific contexts according to data type and purpose.

Academic achievement and prior knowledge

In addition to learning engagement, some studies used students' academic performance as an independent variable when exploring MOOC performance and engagement. For example, Pérez-Sanagustín et al. (2021) found that students with moderate grade point averages (GPAs) were more engaged with course curricula than those with relatively low or high GPAs.

Self-regulated learning

Some studies have shown that SRL directly impacts learners' activities in the context of MOOCs. For example, Pérez-Sanagustín et al. (2021) found that compared with a group without SRL scaffolding, a group with scaffolding was significantly more engaged, and showed more accurate and strategic learning. Pérez-Álvarez et al. (2020) found that learners' final outcomes were positively correlated with the use of self-reflection-based SRL strategies; such strategies allow learners to be more engaged with the curriculum.

TABLE 8 Automatic analysis measures of learning engagement in massive open online courses.

Application	Algorithm	Data type	Collection tool
Feature analysis	K-means, LSA, SNA	Log, text	Online platform
Classification	CNN, SVM, DenseNet-121, ResNet-18, MobileNetV1	Image	Online platform camera
Calculation	BERT-CNN, Doc2Vec + Cosine similarity CNN (VGG-16)	Text log	Online platform
Regression analysis	MLR	Log, survey	Online platform, questionnaire

LSA, lag sequential analysis; SNA, semantic network analysis; CNN, convolutional neural network; SVM, support vector machine; BERT, bidirectional encoder representations from transformers; MLR, multiple linear regression.

TABLE 9 Scales used to measure learning engagement in massive open online courses.

Scale	Article information			Scale characteristics			Sample demographics		
OLE	Sun and Rueda	2012	212	15	3	BE, CE, EE	203	✓	✓
OSE	Dixon	2015	17	19	4	SE1, EE, BE, PE	251	✓	✓
MES	Deng et al.	2020a	34	12	4	BE, CE, EE, SE2	940	✓	✓

OLE, online learning engagement scale; OSE, online student engagement questionnaire; MES, MOOC engagement scale; VE, vigor engagement; DE, dedication engagement; AE, absorption engagement; BE, behavioral engagement; CE, cognitive engagement; EE, emotional engagement; SE1, skills engagement; P/IE, participation/interaction engagement; PE, performance engagement; SE2, social engagement; N/A, not available.

External factors

External factors refer to elements of the curriculum such as design, challenges, use of technology, etc. We identified four external factors: (1) interaction with teachers, peers, and course content, (2) curriculum design and structure, (3) challenges, certificates, medals, etc., and (4) technical support.

Interaction with teachers, peers, and course content

Similar to the traditional classroom, interactions with teachers and peers promote engagement in MOOCs. Tseng (2021) found that teacher notes enhanced students' behavioral and cognitive engagement, while Wang et al. (2022) demonstrated that learner-content and learner-learner interactions predicted online learning engagement by enhancing enjoyment and reducing boredom.

Curriculum design and organizational structure

Gallego-Romero et al. (2020) listed some interventions that can improve learners' engagement in the curriculum: (1) providing step-by-step activities to simplify the learning process; (2) promoting a "growth" mindset among learners; (3) providing questions to be discussed in online forums and encouraging learners to contribute (Sunar et al., 2016); and (4) implementing innovative learning activities that extend beyond the MOOC itself (Hew, 2016).

Challenges, certificates, and medals

Khalil and Ebner (2016) reported that the use of grades, certificates, or badges encourages students to make progress and achieve better learning outcomes. Meanwhile, Rincón-Flores et al. (2020) found that the use of game-based challenges constituted an innovative strategy to evaluate the effectiveness of gamification as a teaching method for MOOCs.

Technical support (scaffolding)

Active learning in MOOCs can be promoted by the use of external tools. For example, Gallego-Romero et al. (2020) used the integrated development environment (IDE) to explore the impact on learners' engagement and behavior of third-party web-based code integrated into three MOOCs on Java programming: learners registered with the third-party "code board" were more engaged, spent more time writing code, and made more changes to the basic code.

Discussion

Addressing research questions

Measurement of learning engagement in MOOCs

Behavioral engagement is often regarded as analogous to learning engagement in studies measuring the latter (Williams et al., 2018; Gallego-Romero et al., 2020; Pérez-Sanagustín et al., 2021). Behavior is the most intuitive

TABLE 10 Summary of the strengths and limitations of the various scales.

Scale	Strengths	Limitations
Online learning engagement scale (OLE)	Tailored to online courses	Unequal item distribution
	Items divided into three widely used categories	
Online student engagement questionnaire (OSE)	Tailored to online courses	Measurement dimensions different from those typically used
	Provision of specific evaluation criteria	
MOOC engagement scale (MES)	Tailored to MOOC	Relatively few items under each dimension
	Comprehensive measurement dimensions	

MOOC, massive open online course.

TABLE 11 Summary of applications of automatic analysis.

Application	Algorithm	Input	Output	References
Feature analysis	K-means	Behavioral log data	Behavioral categories	Khalil and Ebner (2016), Lim et al. (2018), Liu et al. (2018)
	LSA	Behavioral pattern data	Behavioral categories	
	SNA	MOOC transcripts and discussion forum data	Semantic network metrics	
Classification	SVM	Video screengrabs	Disengaged, partially engaged, and engaged categories	Shen et al. (2021), Batra et al. (2022)
	CNN	Video screengrabs, facial expressions	Disengaged, partially engaged, and engaged categories high-, middle-, and low-engagement categories	
	Deep neural networks: DenseNet-121, ResNet-18, MobileNetV1	Video screengrabs	Disengaged, partially engaged, and engaged categories	
Calculation	BERT-CNN	Forum text	Numeric data (0–1)	Atapattu et al. (2019), Li and Zhan (2020), Liu et al. (2022)
	CNN(VGG-16)	Infrared images, log data	Numeric data (0–1)	
	Doc2Vec + cosine similarity	Community posts and course materials	Numeric data [–1 (“constructive”) to +1 (“active”)]	
Regression analysis	MLR	Independent and dependent variables	Regression coefficients	Liu et al. (2018), Williams et al. (2018), Deng (2021)

LSA, lag sequential analysis; SNA, semantic network analysis; SVM, support vector machine; CNN, convolutional neural network; MLR, multiple linear regression; BERT, bidirectional encoder representations from transformers; MOOC, massive open online course.

measure of the degree of learner engagement, and data thereon (such as the number of videos watched and exams taken) are very easy to obtain. This may explain why behavioral engagement is the most studied form of learning engagement. Many studies divided learning engagement into behavioral, emotional, and cognitive subtypes (Jung and Lee, 2018; Liu et al., 2018; Lan and Hew, 2020), social engagement is a less frequently used subtype of engagement. Since plenty of researchers have directly followed this way of defining the concept of learning engagement in their research, social engagement is the least frequently measured engagement dimension.

Whether learning engagement only subsumes behavioral, emotional, and cognitive engagement (Kuo et al., 2021), or should also include social engagement (Deng et al., 2020a), is debated. It has been suggested that peer learning should be classified into behavioral (Almutairi and White, 2018), cognitive (Liu et al., 2022), and social engagement subtypes (Walji et al., 2016; Deng, 2021). Attempts have been made to refine the concept of learning engagement by reference to specific categories (Vayre and Vonthron, 2019).

Figure 3 shows the main types of learning engagement identified in this literature review. Most researchers (Xiong et al., 2015; Khalil and Ebner, 2016; Lan and Hew, 2020)

TABLE 12 Strengths and limitations of algorithms used to analyze learning engagement.

Algorithm	Strengths	Limitations
K-means	Can process large amounts of log data	Cannot directly output values quantifying learning engagement
	Data do not need to be labeled in advance	
LSA	Can test for significant differences in learning patterns between different groups of learners	/
SNA	Can explore “text-to-text” relationships	/
MLR	Can analyze the relationship between learning engagement and other variables	/
SVM	Suitable for classification tasks	Requirement to extract features
	Applicable to both log and text data	
Deep neural network: CNN, DenseNet-121, ResNet-18, MobileNetV1	Widely used in image recognition tasks, more accurate than general deep learning and machine learning models	Low interpretability of output, time-consuming
BERT-CNN	Effectively captures multi-semantic information and keyword features of text data	/
Doc2Vec	Captures semantics	/

LSA, lag sequential analysis; SNA, semantic network analysis; MLR, multiple linear regression; SVM, support vector machine; CNN, convolutional neural network; BERT, bidirectional encoder representations from transformers.

TABLE 13 Factors affecting learning engagement in massive open online courses.

Factor category	Factors	Reference
Internal	Learning satisfaction	Dixson (2015) , Chan et al. (2021)
	Perceived competence, autonomy and sense of relevance (SDT)	Lan and Hew (2020)
	Academic motivation and emotions	Chaw and Tang (2019) , Liu et al. (2022)
	Academic achievement and prior knowledge	Pérez-Sanagustín et al. (2021)
	Self-regulated learning	Pérez-Álvarez et al. (2020) , Pérez-Sanagustín et al. (2021)
External	Interactions with teachers, peers and course content	Tseng (2021) , Wang et al. (2022)
	Curriculum design and organizational structure	Hew (2016) , Sunar et al. (2016) , Gallego-Romero et al. (2020)
	Challenges, certificates and medals	Khalil and Ebner (2016) , Rincón-Flores et al. (2020)
	Technical support (“scaffolding”)	Gallego-Romero et al. (2020)

SDT, self-determination theory.

believe that measures of behavioral engagement should focus on students’ behavior in the context of curriculum learning. However, learning plans devised by students before class, and efforts made to complete homework, notes, and after-class tests, have gradually emerged as more important indices of behavioral engagement ([Deng et al., 2020a](#); [Kuo et al., 2021](#)). These findings can serve as a reference for researchers aiming to accurately quantify learning engagement (see [Table 3](#)).

Methods used for measuring and analyzing learning engagement in MOOCs

Two methods are used to measure learning engagement. Learning engagement in MOOCs is still mainly quantified *via*

self-reported methods. It is typically measured using scales applied in traditional teaching; research has involved middle school and college students. Furthermore, some scales were not designed to address the widely recognized behavioral, cognitive, emotional, and social subtypes of engagement, and scales specifically focused on online learning or MOOCs have not been widely applied.

The second way to measure learning engagement is through automatic analysis. In terms of data, log, text, and image data are needed for automatic analysis. Log data can shed light on learning engagement if subjected to clustering analysis. For text data, SNA, BERT-CNN, Doc2Vec, and cosine similarity can be applied for data processing and analysis. Furthermore, using text data to train

BERT-CNN models, semantic features can be identified to analyze learning engagement subtypes. Doc2Vec and cosine similarity are used to calculate semantic similarity, and the strength of correlations provides insight into the degree of learning engagement. As for image data, we can get information on students' emotional engagement through image emotion recognition.

In terms of algorithms applied, which can be divided into machine learning methods or deep learning methods. SVM is a typical machine learning classification algorithm that needs to extract features. Using SVM, researchers can analyze text, log or image data to acquire engagement classification. In addition, *K*-means is an excellent algorithm that can carry out cluster analysis on students' learning behavior to distinguish groups with different levels of learning engagement, which is convenient for instructors to carry out classified teaching later. Furthermore, CNN, DenseNet-121, ResNet-18, and MobileNetV1 deep learning algorithms have also been successfully applied to process image data. These methods are fast and highly accurate, but the interpretability of the output is low. In addition to these algorithms, MLR allows for determining the variables influencing learning engagement and the effect of it on other variables, such as learning satisfaction and academic achievement.

However, existing methods for analyzing learning engagement have several limitations, as follows: (1) poor ability to combine all types of data used for measuring and analyzing learning engagement; (2) self-report and automatic analysis methods are usually not applied in real-time; (3) the granularity of learning engagement assessments has not been optimized; and (4) primarily focused on behavioral and emotional engagement, with less attention paid to cognitive engagement. Further study needs to explore a comprehensive approach to analyze and measure multimodal data (such as text, log, image, and voice data) for a more precise evaluation of learning engagement. And researchers can also attempt to detect students' learning engagement in real-time through log data, video image data, etc., and give feedback to learners to help them learn. Furthermore, further studies on measuring learning engagement should go deeper. For example, researchers can break down negative emotions into anxiety, tension, depression, sadness, etc. In this way, emotional engagement can be precisely analyzed. Finally, researchers should pay more attention to mining students' cognitive engagement from existing data.

Factors affecting learning engagement in MOOCs

Factors affecting learning engagement in MOOCs can be classified as internal or external, as stated above. Regarding internal factors, this study demonstrated that students' learning satisfaction and motivation could affect learning engagement,

consistent with [Sahin and Shelley \(2008\)](#); a high level of satisfaction can motivate students to persist with their studies and improves learning engagement. Learning satisfaction is an important indicator that can influence students' MOOCs learning. When students are more satisfied with the structural design, learning experience, and learning outcomes of the course, they are more likely to be spontaneously engaged in MOOCs learning. Also, we observed a correlation between negative emotions and cognitive engagement, consistent with [Obergruesser and Stoeger \(2020\)](#) reducing the former enhances the latter to some extent. Negative emotions often affect students' learning status, and when they are depressed, it is difficult for students to concentrate, let alone engage in high levels of cognitive activity. Finally, SRL is a vital concept when exploring the impact of curriculum design; this aligns with [Littlejohn et al. \(2016\)](#), who showed that learners with higher SRL proficiency tend to be more engaged in activities and materials related to their needs or interests. This is because learners with higher levels of SRL can often rationalize and manage their learning time and effort, develop a learning plan that suits their needs, and carry out learning activities accordingly. In this way, they tend to be more engaged in the course because they know exactly what they want to learn and how to achieve it through their learning.

Regarding external factors, we found that learner feedback and well-designed activities enhance engagement; this is consistent with [Choy and Quek \(2016\)](#), who found that student engagement depends on the discussions between lecturers and students, as well as the learning environment and course structure. On the one hand, a well-structured and logical design of course activities can attract students to participate in the course activities and make them receive a more systematic knowledge construction process, thus increasing their behavioral and cognitive engagement to a certain level; on the other hand, interaction and feedback with peers and instructors can allow students to view problems from different perspectives and gain a sense of recognition and satisfaction from interacting with others, thus increasing their social and emotional engagement. In addition to the non-directive incentives of well-designed activities and peer interaction, the direct incentives of challenges, certificates ([Radford et al., 2014](#)), and technical support ([Bond et al., 2020](#)) can also be a good way to enhance student engagement in courses. First, appropriate challenges can stimulate learners' interest in learning and attract them to invest more effort in the course. Second, learners' need for course certificates also motivates learners to engage in course activities. Finally, when learners encounter challenges or difficulties, practical technical support can serve as a valuable scaffolding to help learners apply what they have learned in practice and thus increase their learning engagement.

By reviewing the existing literature, we found that most of the existing studies explore the factors affecting

students' learning engagement separately from both internal and external perspectives. There are relatively few studies that combine internal and external factors to analyze how to enhance learning engagement. As Bond et al. argue, the use of advanced technologies of the 21st century alone does not guarantee the desired learning outcomes (Bond et al., 2020), and it is necessary to ensure students' learning motivation and initiative while improving the technical means of MOOC platform development.

Pedagogical implications

This systematic literature review provides pedagogical implications from two perspectives to assist MOOC designers in designing and developing MOOCs activities and help instructors monitor students' learning process. From the perspective of course design, MOOC designers should pay more attention to students' learning satisfaction. For example, a link to a survey on learning satisfaction could be provided after each class to obtain real-time data related to the learning experience. This would enable instructors to promptly focus on students with low learning satisfaction and solicit suggestions for course improvement, thereby increasing student engagement and thus helping them to improve their academic performance. In addition, because it is challenging to change student characteristics significantly, MOOC designers can pay close attention to designing better instructional activities for the course. For example, it is possible to improve students' behavior and social engagement by setting more forum discussion tasks or using incentives such as medals, rankings, and certificates; it is possible to enhance students' emotional engagement by uploading vivid and interesting micro-videos; it is possible to promote cognitive engagement among students by assigning tasks such as note-taking and quizzes.

From the perspective of learning processing, designers and instructors can use algorithms to analyze students learning engagement so that they can identify whether there are some students out of good learning. For instance, (1) they can classify different students of learning engagement by *k*-means clustering to provide personalized instruction to students better; (2) they can directly quantify students' learning engagement to find individuals with low learning engagement (such as not completing course assignments, not participating in forum discussions and not watching course videos), giving supervision and warning; (3) they can improve their course content and activities according to overall students' learning engagement level. Moreover, during the learning process, instructors can post announcements and messages to remind students to take the course on time,

helping facilitate students' behavioral engagement. At the same time, it is a good chance for them to interact with students in the discussion forum, which can enhance students' social engagement.

Conclusion

Thirty articles were included in our literature review, which explored learning engagement data and analysis methods, and summarized the internal and external factors influencing engagement in MOOCs. Four dimensions of learning engagement in MOOCs were identified. For example, behavioral engagement is reflected in observable actions such as after-class activities. Additionally, log, text, image, interview, and survey data can all be collected and subjected to self-report and automatic analysis methods (e.g., CNN, BERT-CNN, K-MEANS, SNA, etc.). This study also found that internal and external factors affect learning engagement, which could guide MOOC designers and teachers. Learning engagement is an excellent indicator of the learning condition. Based on this, designers and teachers can carry out more personalized learning support for different students and reflect their course design. However, this systematic literature review also had some limitations. First, the study selection criteria precluded the inclusion of literature published in certain languages, as well as conference papers. Moreover, we only searched five databases and thus may have missed some relevant articles. Therefore, future research should expand the search scope to obtain more exhaustive information.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The idea for the article: RW. Literature search: RW and JC. Data coding: JC and YX. Drafted and revised the work: RW, YX, and JC. Final check: YL. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

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Antecedents of continuance intention in online learning systems among vocational college students: The moderating effect of gender

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Background: The primary objective of this study is to ascertain whether the Expectation Confirmation Model can be expanded by external variables including computer anxiety, social interaction, and self-efficacy to better understand the intention to continue using online learning systems in the post-pandemic era among vocational college students. Moreover, this research argues that the intention to continue using online learning systems among students may be gender-sensitive.

Methods: The researchers surveyed 482 students from eight vocational colleges in Jiangxi Province using a structured questionnaire. Partial Least Squares Structural equation modeling is used to verify the research model.

Results: The outcomes demonstrate that the proposed model adequately explains the continuous use intention for online learning systems at a 76.6% confidence level. All of the newly introduced variables in the ECM are shown to be significant and relevant to explicate continuous use intention. Our survey results show that gender differences in intention to continue using online learning systems exist objectively, but this difference is not a natural difference.

Conclusion: This research fills a void in the current literature on online learning and probes into how learning may be made more long-lasting in intricate environments.

KEYWORDS

intention to continue using online learning, anxiety, computer self-efficacy, social interaction, expectation-confirmation model

1. Introduction

The devastation caused by the COVID-19 pandemic has reached approximately every sector of society around the globe, and vocational colleges are no exception (Xu et al., 2017; Zapata-Cuervo et al., 2022). It has led to the interruption of most traditional teaching methods and compelled both the teaching and learning processes to undergo unpredictable and rapid shifts, such as the traditional teaching and learning activities of more than 1,300 vocational colleges and nearly 11,000 vocational high schools in China have had to be discontinued and transferred to an online model (Han et al., 2021). Accordingly, educational institutions have re-established plans to begin offering online courses in a relatively short amount of time (Persada et al., 2021; Soria-Barreto et al., 2021; Wut et al., 2022). Online learning is a form of synchronous learning in different places that is based on networking technology and realizes cross-border human-computer, interpersonal communication, and long-distance interaction through information technology (Ferreira et al., 2018). Compared to conventional learning, online learning has numerous benefits. For example, firstly, the cost of education is lowered for students because of the widespread availability of high-quality educational resources that may be shared among them through online learning (Mushtaque et al., 2022). Secondly, online learning is conducive to communication and cooperation between students and allows them to share their ideas with others in a timely manner (Wut et al., 2022). Thirdly, online learning allows for personalized learning and flexible scheduling of learning progress (Besser et al., 2022). In general, the advantages of online learning are more prominent during the epidemic.

Numerous academics have studied online learning in recent decades from a variety of angles based on Technology Acceptance Model (TAM), Information System Continuance (ISC), and other theories (Karaoglan Yilmaz and Yilmaz, 2020; Karaoglan Yilmaz, 2022). The majority of these studies concentrate on the adoption and satisfaction of online learning, but García-Morales et al. (2021) argue that the sustainable development and service of online learning in the future will become the focus of post-epidemic education. As a result, the model of expectation confirmation will serve as the foundation for this research, which will investigate the factors that influence vocational college students' decisions on whether or not they will continue using online learning in the post-epidemic age.

Scholars conducted research on the factors that affect students' continuous use of online learning in various scenarios (Li and Zhao, 2021; Persada et al., 2021; Soria-Barreto et al., 2021). It is concluded that the interactivity of online learning systems is the key to ensure the quality of online learning and improve the intention to use online learning systems continuously. For instance, Wut et al. (2022) considered that the focus of the future online and offline learning debate is student experience. And interactivity is the most essential element affecting the online learning experience. A learning system with good experience can reduce the cognitive load of students when using the system and

improve their intention to use it continuously. Li and Zhao (2021) extended the expectation confirmation model by including social interaction and quality to investigate the factors that influence the intention to continuously use online learning. In addition to studying the external factors of learners, researchers are also increasingly interested in their psychological traits (Karaoglan Yilmaz and Yilmaz, 2020; Karaoglan Yilmaz, 2022; Karaoglan Yilmaz, 2022; Yilmaz et al., 2022). For example, Self-determination theory (SDT) was used by Luo et al. (2021) to build a model that elaborate the links between students' basic psychological needs, intrinsic and extrinsic motivation, and continued intention to use online self-regulated learning. Sharma et al. (2022) explored the relationship between self-congruity, perceived enjoyment, and the intention to continue using e-learning. The above literature review demonstrates that there is a close relationship between online learners' psychological factors and their intention to continue using online learning.

However, few studies have been conducted on the effects of emotional elements like computer self-efficacy and anxiety on online learners' continued intentions. This could be interpreted as a gap in the existing literature that requires more investigation. Bao (2020) points out that this transition to online learning occurs suddenly, so the degrees of anxiety that learners experience need to be alleviated in order to verify the efficiency of online learning. Meanwhile, the survey reveals that students at vocational colleges have a hard time maintaining focus while studying online for extended periods of time (Panigrahi et al., 2018; Baber, 2021; Soria-Barreto et al., 2021). Consequently, one of the methods to boost the vocational college students' intention to continue using online learning systems is to enhance learners' self-efficacy and decrease students' anxiety level regarding the usage of online learning systems (Niu et al., 2022).

Compared with previous studies, the innovations of this study mainly include the following three points: Firstly, it adapts the expectation confirmation model by introducing three new context-specific elements, namely, computer anxiety, computer self-efficacy, and social interaction. Secondly, most of the prior studies treated samples as a homogenous group (Panigrahi et al., 2018; Chung et al., 2020; Wang S. et al., 2021). However, as the audience of online learning systems is becoming an increasingly diverse group, a differentiated strategy is required to encourage continuous user participation. Therefore, this study explores whether there are gender differences in the intention to use online learning systems (Ferreira et al., 2018; Mouakket, 2018; Albelali and Alaulamie, 2019). Thirdly, this research selects vocational college students as samples. The majority of past research has concentrated on the fields of higher education (Cranfield et al., 2021; Leo et al., 2021), elementary education, and secondary education (Christakis et al., 2020). In spite of the importance of online learning for students at vocational colleges, most studies conducted during the pandemic ignored this sector.

The purpose of this study is to develop a "continued usage intention model for online learning" that would account for the factors that influence students' continued usage intentions of

online learning systems. These are the sorts of issues that this research begs to address:

- (1) What factors affect vocational college students' intention to continue using online learning system?
- (2) How well do the influencing factors account for the intention to continue using online learning?
- (3) Are there gender differences in the influencing factors of students' intention to continue using online learning?

The remaining five portions of the research are as follows: The second part is a literature review of the relevant theory and puts forward the theoretical model of this study as well as hypotheses about the relationships between various variables. The third part describes in detail the methods used in this study and the analysis of the results, followed by a discussion. Finally, the limitations of the study are discussed, along with some recommendations for additional research that could be done in the future.

2. Literature review and hypothesis development

2.1. Computer anxiety and expectation confirmation model

When faced with a stressful situation, it is normal for people to feel anxious (Fenton et al., 2020).

Anxiety related to using computers is known as “computer anxiety” (CA), which is a form of concept-specific anxiety and a special psychological phenomenon (Saade and Kira, 2006). In this study, “computer anxiety” is defined as a situational fear or anxiety that can be changed when an individual anticipates or actually uses a computer (Sun et al., 2008). The adoption of online learning systems is significantly influenced by anxiety. Individuals who are anxious or unsettled about the prospect of adopting online learning are less likely to use it.

Some researchers have recognized the significance of CA in the intention to use technology continuously (Chou et al., 2012; Purnomo and Lee, 2013; Zarafshani et al., 2020; Seolah et al., 2021). For example, Purnomo and Lee (2013) consider that the fun of playing games on the computer has disappeared when faced with the learning of professional knowledge, which can lead to anxiety and fear in the long run and dampen students' perceived usefulness of the online learning systems. Hai et al. (2020) pointed out that using new technology tends to evoke more apprehension for users with CA because new technology requires users to learn new terminology, which is more difficult and time-consuming than technology with less complexity. Lu et al. (2019) found that in the online learning environment, students frequently suffer from anxiety when using computers since they are not proficient enough in information technology, fear of poor learning performance, and other reasons. Since perceived usefulness is the most powerful predictor of behavioral intention to use, students

with high computer anxiety will indirectly affect their continued use of online learning systems (Niu and Wu, 2022). According to a comprehensive review of the relevant literature (Tri and Hafiz, 2018; Samydevan et al., 2020; Lee and Xiong, 2022), it can be concluded that online learning under the influence of anxiety and fear cannot make them experience the usefulness of online learning (Persada et al., 2021) as well as the unpleasant emotions caused by users' use of new technologies are unlikely to be alleviated, so it is impossible to form a positive confirmation (Feng et al., 2019). As a result, this research hypothesizes:

H1: CA has a negative effect on PU of an online learning system.

H2: CA has a negative effect on CON of an online learning system.

2.2. Expectation confirmation model

ECM was first proposed by Bhattacherjee (2001), and it is grounded in Oliver's (1980) expectation confirmation theory (ECT). Perceived usefulness (PU; sometimes called post-adoption expectation), the extent of their confirmation, and satisfaction are the three factors that the ECM posits as determining whether or not users will continue using the technology (Bhattacherjee, 2001; Lee, 2010). Confirmation, when applied to the realm of online learning, refers to the degree to which a learner's expectations about their online learning experience match their actual online learning experience. According to ECM, after using any technology, users evaluate their performance perception in comparison to their prior expectations and then decide the level of confirmation (Wang and Wang, 2019). Users construct a post-acceptance, also known as a usefulness perception, depending on their usage experience and the level of confirmation. These perceptions of usefulness may differ from or coincide with the users' initial anticipations. The subsequent formation of satisfaction is caused by the confirmation of expectations and the perception of usefulness (Rahi et al., 2022). Finally, a high degree of technical satisfaction will form a continuous intention (Rabaa'i et al., 2021; Anjum et al., 2022; Huang et al., 2022).

Previous research has demonstrated the relationship between various variables related to ECM (Daneji et al., 2019; Cheng, 2020a,b; Persada et al., 2021; Zuniga-Jara, 2021). Persada et al. (2021) demonstrated that the powerful indicator of users' continuous intentions is satisfaction. Zuniga-Jara (2021) indicated that perceived usefulness is found to be the most powerful predictor of continuous intention. Bhattacherjee (2001) found that confirmation is the key factor influencing a user's satisfaction. If online learning systems help users improve their academic performance, they are usually perceived as useful (Baber, 2021; Persada et al., 2021). Confirmation will lead to user satisfaction

when users believe it is beneficial and their real use experience matches or surpasses their original expectations (Tan and Kim, 2015; Xu et al., 2017). (Akter et al., 2020) considered that because users' perceptions of the usefulness of online learning systems can commonly serve as a baseline against confirmation judgments, more useful online learning systems will be more likely to be perceived as satisfactory. Previous empirical studies have also shown that this satisfaction is an important indicator for predicting the intention to continue using online learning systems (Yang, 2018; Chen, 2021; Si et al., 2022). In addition, students who have a positive attitude toward online learning are more likely to use it all the time if they see an improvement in their academic achievement as a result of utilizing the systems (Fang et al., 2017; Wang et al., 2017; Widjaja et al., 2021). Based on a large number of literature analyses, the hypotheses are derived as follows:

H3: CON will positively affect SAT with online learning systems.

H4: PU will positively affect SAT with online learning systems.

H5: PU will positively affect CI of online learning systems.

H6: SAT will positively affect CI of online learning systems.

2.3. Social interaction and expectation confirmation model

Interaction has been recognized for a very long time as one of the important factors. Although there is no clear definition of interaction at present, its basic feature is behavior involving two or more subjects sharing information and opinions with each other. The definition of interaction in online learning is proposed by various researchers, and it claims that learner–learner, instructor–learner, and content–learner are all possible types of interaction that might take place during online learning (Abrami et al., 2011; Alqurashi, 2018; Baber, 2021). The first two interactions are what we refer to as social interaction. The key to a successful learning experience for students is interactions, which is at the core of the learning process (Keskin et al., 2020).

Numerous studies have examined the link between students' SI and CI (Lugonzo, 2020; Baber, 2021; Byun et al., 2021; Yoon et al., 2021). For example, using mediator factors like imagery and flow, Rodriguez-Ardura and Mesequer-Artola (2016) discover that the continual learning behavior of students can be encouraged through frequent interaction. Research by Molinillo et al. (2018) demonstrates the positive effects of learner-to-learner and learner-to-instructor interactions on students' emotional involvement, which in turn enhances students' active learning and their

intention to continue using online learning. Holland (2019) found that when students communicate with each other in online learning, social interaction is fostered by the communication process. Higher levels of satisfaction with online learning are experienced by students who interact more with their teachers and peers. Consequently, social interaction in online learning will enhance the intention to continue using the systems (Panigrahi et al., 2018; Chung et al., 2020; Li and Zhao, 2021). The following is how the hypothesis is formed from an analysis of the available literature:

H7: SI will positively affect CI with online learning systems.

2.4. Computer self-efficacy and expectation confirmation model

Self-efficacy refers to “the individuals having the ability and belief to complete a specific task, as well as the confidence to cope with future challenges” (Sánchez and Hueros, 2010). In this study, computer self-efficacy is a specific definition of self-efficacy, which refers to the individual's judgment of their ability to use the online learning system (Venkatesh and Morris, 2000). Individuals who have a higher computer self-efficacy (CSE) magnitude are more likely to believe that they are able to successfully complete challenging computing activities and to believe that they are able to function with a smaller amount of support and assistance than people who have a lower CSE magnitude. In other words, a person's level of self-efficacy will affect whether or not they participate in activities, how much effort they put into finishing those activities, and how persistent they are in doing so (Bandura and Watts, 1999).

Previous research has suggested that relevant on CSE is linked to CI (Hermawan et al., 2021; Nurhikmah et al., 2021; Putra, 2021). For example, Mushtaque et al. (2022) took 369 newly enrolled medical students as samples to investigate whether or not medical students would like to use the online learning systems during the COVID-19 pandemic. The findings showed that CSE significantly reduced the negative impacts of technological stress and increased the intention to use online learning systems among medical students. Putra (2021) also discovered that CSE had a direct positive influence on students' continued intention to use online learning. In conclusion, CSE is a critical predictor of the intention to continuously use online learning.

CSE is directly linked to individual confidence in one's own competence and knowledge in a given area (Hsu et al., 2018; Ren et al., 2018). Relevant research results show that students can feel confident when using online learning systems if they possess the requisite level of competence or knowledge, which helps reinforce the perception of its usefulness (Fathema et al., 2015; Kanwal and Rehman, 2017; Salloum et al., 2019). Thus, students with high CSE may have a higher PU of online learning systems. However, low computer self-efficacy students will experience tension and

anxiety when using computers, which will lower their judgment of their usefulness (Rahi et al., 2022). Analysis based on the above literature review, the hypotheses are derived as follows:

H8: CSE will positively affect PU with online learning systems.

H9: CSE will positively affect CI with online learning systems.

2.5. The moderating effect of gender

The literature on social psychology suggests that there are substantial gender-based disparities in how people behave in a variety of decision-making contexts (Bandura, 1986). Meanwhile, it has long been widely accepted that there are significant gender differences in information technology use (Grint et al., 1995; Sandelowski, 2000; Brussevich et al., 2018). A lot of research shows that the online learning motivation of females shows a strong sense of self-guidance and responsibility and that they are more satisfied with the online learning experience (Albelali and Alaulamie, 2019; Malik et al., 2020; Wongwatkit et al., 2020). In addition, some studies have indicated that gender has no influence on online learning satisfaction and learning achievements (Martin and Bolliger, 2018; Alghamdi et al., 2020; Dubois et al., 2020). However, whether gender affects the intentions to use online learning continuously needs to be further clarified.

It has been reported that male and female students may view their own computer self-efficacy differently (Assaker, 2020; Yorulmaz, 2021; Bailey, 2022). Among a group of university freshmen, Yorulmaz (2021) finds that the males are more confident in their abilities to use computers than the females. Recent research into gender disparities in CSE suggests that the difference may be due to the perceived masculinity of the activity in question (Alghamdi et al., 2020; Yorulmaz, 2021). It appears that the gender difference in CSE is caused by the complexity of the task. The perceived masculinity element increases as the activity becomes more difficult, and men demonstrate more self-efficacy for such activities, which in turn affects their intentions to use online learning in a sustained manner. This study thus hypothesizes:

H10a: There is difference between male and female in CSE and CI.

According to the available literature, males are more susceptible to utility and expected performance because they are more task-oriented (Assaker, 2020; Pal and Patra, 2021; Kaur and Kaur, 2022). In particular, Kaur and Kaur (2022) found that the correlation between PU and CI is stronger for males than for females, which suggests that gender moderates the relationship. We anticipate that the relationship between PU and CI will be stronger for males in the context of online learning. Males are

more task and result-oriented, and they care more concerned with the advantages or utilities they get from using online learning systems. Following this reasoning, the following hypothesis is established:

H10b: There is difference between male and female in PU and CI.

The technical aspects of online learning are helpful in accomplishing their learning objectives, thus affecting their SAT with online learning (Brussevich et al., 2018; Alghamdi et al., 2020; Dubois et al., 2020). Therefore, SAT has a greater impact on men's CI because it depends more on the technical characteristics of online learning than on social characteristics. As males are task-oriented, their SAT with online learning will be more significant. We predict that the difference between men's and women's SAT with online learning will affect their CI. The hypothesis is proposed as follows:

H10c: There is difference between male and female in SAT and CI.

Males and females are products of two evidently distinct cultures, and as a result, they develop very distinctive approaches to the social interactions appropriate to their respective genders (Wood-Downie et al., 2021). Sian et al. (2020) point out that, in terms of the number of interactions, male students interact more with teachers and peers, and teachers tend to pay more attention to male students, whether it is criticism or encouragement. Males show a more positive attitude in SI, and they are more willing to continue to use online learning. The hypothesis is proposed as follows:

H10d: There is difference between male and female in SI and CI.

Figure 1 displays all of the hypotheses that are included in the model. Gender is used as a grouping variable to conduct a multi-group analysis of the differences between males and females in vocational college students' intentions to continue using online learning systems.

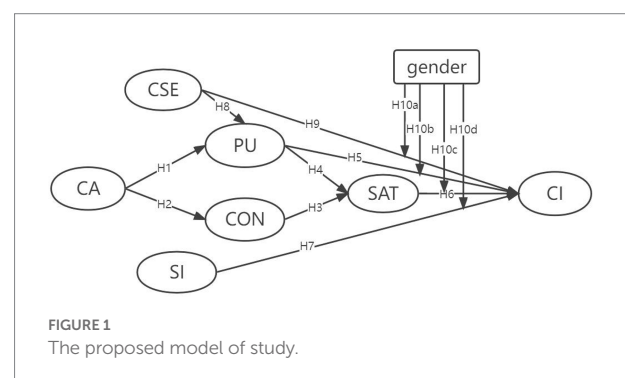


FIGURE 1
The proposed model of study.

TABLE 1 Demographic information of the sample.

Characteristics	Item	Frequency	Percentage
Gender	Male	239	49.6%
	Female	243	50.4%
Academic year	Freshman	134	27.8%
	Sophomore	152	31.5%
	Junior	196	40.7%
Major	Humanities major	177	36.7%
	Social science major	138	28.6%
Age	Natural science major	167	34.6%
	18–20	166	34.4%
	20–22	142	29.4%
	22–24	174	36.1%

3. Methodology and materials

3.1. Participants

The questionnaire is designed as an online survey with links distributed to the target population through WeChat or email. In the current study, 524 questionnaires were distributed among the students of the eight vocational colleges by using a random sampling method. Therefore, the acquired samples are extremely representative and fit the requirements for this study. A total of 482 valid questionnaires were collected. The descriptive statistics in this study were calculated using SPSS 26.0. There are approximately 243 female respondents, making up 50.4% of the total, as opposed to 239 male respondents, who make up 49.6% of the total (Table 1). The population in the sample ranges in age from 22 to 24 years old the most (36.1%), followed by those aged 18 to 20 years old (34.4%). The students are predominantly humanities students (40.7%). The mean education level is junior in college (27.8% freshmen, 31.5% sophomores, 36.7% juniors).

3.2. Instruments

Questionnaires were used to collect information for this study, with the majority of measurement items derived from previously developed scales and modified to fit the current research content. The content design of the questionnaire consists mainly of demographic variables and specific measurement scales. The demographic variables of age, academic year, major, and gender are used to conduct an investigation into the characteristics of the people who took part in this study.

In addition to the demographic information of the participants, the questionnaire consists of seven different constructs, which are presented in Table 2. The questions on the questionnaire used in this study were modified from an earlier study (see Table 2). To measure continued intention, the Chiu and Wang (2008) and Liao et al. (2009) questionnaires are used with three items. Confirmation is assessed with three questions, which are taken from the questionnaire provided by Kang et al. (2009) and Liao et al. (2009). The three-item satisfaction questionnaire developed by Liao et al. (2009) and Chiu and Wang (2008) is used for this research. The questionnaire items on perceived usefulness are adapted from Lee (2006); The items on computer anxiety are from Sun et al. (2008). The items for measuring computer self-efficacy are borrowed from Compeau and Higgins (1995). The social interaction is measured with a four-item scale developed by Molinillo et al. (2018) and Robinson and Hullinger (2008). Every item is rated on a Likert scale of 1–5, with 1 denoting “strongly disagree” and 5 denoting “strongly agree.”

3.3. Procedure

To begin, eight vocational colleges were chosen at random in the province of Jiangxi, and the informed consent form was distributed to the teachers in charge of each major with the approval of the principals of each school. Secondly, after obtaining the teacher's permission, students from vocational colleges of all majors will take the main test. At the same time, under the premise of firmly ensuring that responses are kept anonymous, the electronic questionnaire is made available to students by means of the platform provided by www.wjx.com. Finally, when the questionnaire is distributed, the requirements for filling in the questionnaire and precautions are explained. In addition, guide the filling of the questionnaire in a timely manner, and make it clear that the data will never be used for anything other than study in the academic sphere. The data was gathered between August 10 and October 5, 2022.

4. Results

The data is analyzed with the assistance of the Smart-PLS 3.0 software (Ringle et al., 2015), which is a multivariate method that belongs to the second generation. This requires conducting an analysis in two stages, which are as follows: (1) the measurement models (2) the structural model or inner model.

4.1. Measurement model assessment

Construct reliability, convergent validity, and discriminant validity are estimated to determine the measurement model's overall quality in this research.

TABLE 2 Questionnaire items.

Construct	Items	Source
Confirmation (CON)	CON1: My experience with using the online learning environment is better than I expected	Kang et al. (2009) and Liao et al. (2009)
	CON2: The service level provided by the online learning environment exceeds my expectations	
	CON3: Overall, the majority of my expectations for the online learning environment have been confirmed	
Continue intention (CINT)	CINT1: I intend to continue using the online learning in the foreseeable future	Chiu and Wang (2008) and Liao et al. (2009)
	CINT2: I will continue using the online learning in the future	
	CINT3: I will regularly use the online learning in the future	
Satisfaction (SAT)	SAT1: I am satisfied with the performance of the online learning	Chiu and Wang (2008) and Liao et al. (2009)
	SAT2: I am delighted with the experience of using the online learning	
	SAT3: My decision to use the online learning is a rational one	
Perceived usefulness (PU)	PU1: Using an online learning system improves my learning effectiveness	Lee (2006)
	PU2: Using the online learning system will enhance my learning performance	
	PU3: I believe online learning contents are informative	
Computer anxiety (CA)	CA1: Working with a computer is something that would give me a lot of anxiety	Sun et al. (2008)
	CA2: I get depressed when I think of trying to use a computer	
	CA3: Computers make me feel uneasy and confused	
	CA4: I feel apprehensive about using the computer system	
Social interaction (SI)	SI1: The teacher or instructor of an online learning system fosters a positive environment and makes opportunities for students to interact with one another	Molinillo et al. (2018) and Robinson and Hullinger (2008)
	SI2: The online learning system teacher/instructor encourages communications between learners and teachers	
	SI3: I communicate with other students while studying online	
	SI4: I converse and share opinions with other students during online learning	
Computer Self-efficacy (CSE)	CSE1: Despite the fact that nobody was around to direct me, I feel confident working on the computer	Compeau and Higgins (1995)
	CSE2: I'm competent at resolving computer issues	
	CSE3: I'm not nervous about using software I've never used before	

Cronbach's alpha and composite reliability are used to assess the internal consistency of multi-item scales, guaranteeing that all items on the scale are measuring the same construct. As can be seen from Table 3, all of the CA and CR values for the constructs are greater than the minimum threshold of 0.7, indicating a high degree of reliability (Holmes-Smith, 2001).

Convergent validity denotes the degree of correlation between the factor loadings of a variable. According to (Hair et al., 2016), Since AVE is more than 0.5, it may be deduced that the convergent validity of the variables meets the requirements. The findings presented in Table 3 provide evidence that the constructs have satisfactory levels of convergent validity.

The discriminant validity should be examined to estimate the degree to which one concept and its indicators are distinct from

those of another concept and their indicators (Bagozzi et al., 1991). It could.

be evaluated by the Fornell-Larcker scale (i.e., the square root of AVE) and the Heterotrait-Monotrait ratio of correlations (HTMT). According to Fornell and Larcker (1981), the first criterion for discriminating validity is that the correlation between items in any two structures should be less than the square root of the AVE shared by items within a construct. The results in Table 4 demonstrate sufficient discriminant validity.

The HTMT serves as the second criterion for evaluating discriminant validity. It is the ratio of the mean value of the index correlation between different constructs to the mean value of the index correlation between the same constructs (Henseler et al., 2016). Markus (2012) propose that the HTMT should be <0.85, indicating good discrimination validity. The findings are presented

TABLE 3 Measurement model assessment.

Dimension	Items	CR	AVE	CA
CI	CI1	0.886	0.598	0.943
	CI2			
	CI3			
CON	CON1	0.852	0.603	0.937
	CON2			
	CON3			
SAT	SAT 1	0.850	0.645	0.940
	SAT 2			
	SAT 3			
PU	PU1	0.838	0.589	0.934
	PU2			
	PU3			
CA	CA1	0.879	0.645	0.929
	CA2			
	CA3			
	CA4			
CSE	CSE1	0.875	0.579	0.885
	CSE2			
	CSE3			
SI	SI1	0.898	0.622	0.879
	SI2			
	SI3			

CA, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted; CI, continuance intention; CON, confirmation; SAT, satisfaction; PU, perceived usefulness; CA, computer anxiety; CSE, computer self-efficacy; SI, social interaction.

TABLE 4 Fornell-Larcker.

	CA	PU	CON	SAT	SE	SI	CI
CA	0.796						
PU	0.523	0.875					
CON	0.488	0.433	0.854				
SAT	0.566	0.322	0.336	0.788			
CSE	0.476	0.565	0.422	0.354	0.841		
SI	0.514	0.478	0.534	0.409	0.563	0.886	
CI	0.204	0.534	0.421	0.331	0.452	0.426	0.798

The diagonal values in bold are the square roots of AVE.

in Table 5, which demonstrates that every value meets the requirement.

In conclusion, the measurement models have high reliability, discriminant validity, and convergent validity, which can be used to evaluate the structural model.

TABLE 5 HTMT.

	CA	PU	CON	SAT	SE	SI	CI
CA	0.456						
PU	0.223	0.305					
CON	0.188	0.287	0.424				
SAT	0.266	0.322	0.336	0.388			
CSE	0.176	0.265	0.222	0.354	0.291		
SI	0.014	0.278	0.334	0.209	0.163	0.286	
CI	0.204	0.134	0.121	0.331	0.252	0.226	0.198

4.2. Structural model assessment

For structural models, the important evaluation indices are the coefficient of determination (R^2), predictive accuracy (Q^2), collinearity, model fit, and the size of the structural path coefficient and its statistical significance.

4.2.1. Collinearity test

Concerning the structural model, it is essential to perform an analysis to determine whether or not there is collinearity between the independent variables. The variance inflation factor (VIF) is used to investigate whether there is collinearity among the predictor constructs, which must be <5 (Sarstedt et al., 2011). The findings shown in Table 6 demonstrate that the VIF values are appropriate.

4.2.2. Coefficient of determination (R^2)

The method to evaluate the explanatory power of structural models uses the coefficient of determination (R^2). A latent variable's R^2 value is a measurement of the relationship between its explained variance and its total variance. Values around 0.670 are regarded as substantial, 0.333 as moderate, and 0.190 as weak (Chin, 1998). In the research, the R^2 value of the intentions to continue using online learning systems reached 0.766 (substantive). In addition, the R^2 values of satisfaction, perceived usefulness, and confirmation also reached above the medium level (Table 7).

4.2.3. Predictive relevance

This study uses Stone-Geisser's cross-validation method to calculate the Q^2 value in order to analyze the predictive relevance of the model (Vinzi et al., 2010). Table 8 shows that Q^2 values are >0 , so the constructs should be acknowledged as having sufficient predictive relevance (Hair et al., 2019a).

4.2.4. Absolute model fit indices

Model fit can be evaluated with the use of a statistic known as the Standardized Root Mean Square Residual (SRMR; Nayernia, 2020). According to Table 9, the SRMR value of 0.058 that was calculated using Smart-PLS 3 is lower than the required value of 0.08, which further demonstrates that the overall model developed

TABLE 6 Collinearity test.

	CA	PU	CON	SAT	SE	SI	CI
CA		2.091	3.788				
PU				3.599			4.056
CON				2.786			4.623
SAT							3.886
CSE		3.865					3.666
SI							2.674
CI							

TABLE 7 Coefficient of determination.

Construct	R^2	Results
PU	0.552	Moderate
CON	0.501	Moderate
SAT	0.522	Moderate
CI	0.766	Substantive

for this investigation exhibits a level of fit that is acceptable (Cepeda-Carrion et al., 2018; Hair et al., 2019b).

4.2.5. Hypothesis tests

In this part of the study, the research hypothesis is tested, which revolves around the relationship between constructs. The relationship will be considered statistically significant if the values of the t -statistic are higher than 1.96. Path coefficients are used in the analysis process in order to determine the influence of each independent component on the dependent variable. Therefore, the value of the path coefficient determines the extent to which it has an effect, and the larger its value, the more significant its effect. Table 10 displays a summary of the results of the hypothesis.

In terms of the first hypothesis, CA and PU have a positive and statistically significant correlation ($\beta=0.133$, $t=2.956$, $p<0.001$). The second hypothesis is also supported by the data, which show a positive relationship between CA and CON ($\beta=0.711$, $t=13.415$, $p<0.001$). The third hypothesis is negatively supported, between CON and SAT ($\beta=-0.454$, $t=7.206$, $p<0.001$). The fourth hypothesis assumes a positive and statistically significant relationship between PU and SAT ($\beta=0.071$, $t=2.029$, $p<0.05$). PU and CI demonstrate a significant association ($\beta=0.664$, $p<0.001$), supporting hypothesis 5. The sixth hypothesis asserts that there is a positive and significant link between SAT and CI ($\beta=0.322$, $t=7.217$, $p<0.001$). The relationship between SI and CI is significant ($\beta=0.141$, $t=2.660$, $p<0.05$), which supports the seventh hypothesis. There is a significant relationship between CSE and PU ($\beta=0.372$, $t=6.642$, $p<0.001$), which supports the eighth hypothesis. The hypothesis states that there is a strong positive correlation between CSE and CI ($\beta=0.432$, $p<0.001$), supporting hypothesis 9.

4.3. Multi-group analysis

There are three stages to a multi-group analysis: Data groups are generated in Step 1, and MICOM analysis is performed in Step 2 using the standard three-step process. Step 3 involves evaluating the outcomes of multi-group comparison statistical tests.

The first step is to form a data set. Aiming to evaluate dissimilarities among different groups. Groups are divided into males and females according to the purpose of the study (Lohmöller, 1989). However, results from statistical tests may be skewed, if the disparity in sample sizes between the two groups is $>50\%$ (Hair Jr. and Page 2015). There are 239 men and 243 females, respectively, representing a difference of $<50\%$. Consequently, the statistical findings have no bias.

Secondly, Henseler et al. (2016) state that it is essential to carry out the MICOM before performing the multigroup analysis. The purpose of this MICOM is to provide empirical evidence to support that the difference between the two groups is due to the structural model rather than the measurement model (Henseler et al., 2016).

There are three steps involved in MICOM: (1) ensuring configuration invariance; (2) ensuring compositional invariance; and (3) ensuring the composite mean values and variances are equal. Firstly, diverse groups use totally consistent measurement items, methods for processing data, and approaches for analyzing data. In light of this, the data for the male and female groups has been established for configuration invariance. Secondly, a permutation test is used to determine whether or not compositional invariance exists. The compositional invariance test requires that the original correlations should be equal to or greater than the 5.00% quantile correlations. The last step is to determine whether or not the variances and mean values of the groups are equal. According to Table 11, compositional invariance exists.

The difference between the composite's mean and variance ratio results must fall within the 95% confidence interval. Tables 12, 13 both show evidence of partial invariance. Actually, PLS-MGA can be used for multi-group analysis to compare the structural paths between groups even when only partial measurement invariance is present (Henseler et al., 2016).

Finally, to test if significant statistical differences exist between males and females, we employ the PLS-MGA. The path coefficient and mean difference of the composite are shown in Table 14. At the same time, the study reveals that male and female data sets have distinct differences in the impact of perceived usefulness on the intention to continue using online learning systems. Other path hypotheses show no significant difference (Table 15).

5. Discussion

Due to the rapid spread of the pandemic, there was a drastic transition in teaching methods, with traditional classroom

TABLE 8 Predictive accuracy.

Construct	Q^2
PU	0.595
CON	0.345
SAT	0.486
CI	0.620

TABLE 9 Model fit.

Construct	Acceptable value	Actual value
SRMR	<0.08	0.065

education was supplanted by education delivered *via* the internet in a relatively short amount of time (Mushtaque et al., 2021).

The goal of this study is to determine what elements influence vocational college students' intention to continue using online learning systems. Furthermore, this study also explores whether there is a gender difference among these factors in light of the growing interest in online learning. In order to better understand the causal mechanism of students' intention to continue using online learning, this study constructs a model to explore the causal relationship between variables.

The research results could fall into two distinct parts. First, this study sheds light on the relationships between the ECM variables. Results from our analysis show that in addition to the significant negative correlation between CON and SAT, other hypotheses about the relationship between ECM variables PU, SAT, CON and CI are supported. It's clear that our findings align with those of Mushtaque et al. (2022), which conclude that SAT, CON, and PU all have a role in shaping vocational students' continuation intentions toward online learning systems. The following is a detailed description:

There is a negative relationship between CON and SAT. These findings are inconsistent with preceding ECM-based studies, as they reported that learners' initial expectations of the online learning system are positive predictors of satisfaction (Chong, 2021; Barroso et al., 2022; Si et al., 2022). It's likely that people's expectations for the system are based on their previous experiences with similar systems, and this could be one reason. Due to the impact of the epidemic, the traditional face-to-face learning mode has changed to online learning, while vocational college students lack online learning experience.

It is possible that the correlation between PU and SAT can be explained by the fact that when students' performance is improved through the use of an online learning system, they typically demonstrate high levels of satisfaction. This finding is unanimous with the outcomes of prior research (Chen and Keng, 2019; Ashraf et al., 2020; Soria-Barreto et al., 2021). As reported by Olasina (2018), students pay greater attention to their individual needs while using online learning systems. Students may be satisfied with online learning systems if they have the

perception that those systems can enhance their capabilities, work performance, or the effectiveness of their learning.

The empirical findings confirm the considerable impact of SAT on CI in online learning settings.

Previous research has found the same results (Panigrahi et al., 2018; Chung et al., 2020; Yoon et al., 2021). Satisfaction is related to learners' learning experiences. According to the research conclusion, learners' learning experiences are highly correlated with their computer anxiety during the learning process. Therefore, reducing the difficulty of online learning systems and improving their self-confidence are particularly important for promoting learners' intentions to continue to participate in online learning.

The findings show that students' intentions to continue using online learning systems are significantly impacted by PU. The results corroborate those of earlier research (Bawack and Ahmad, 2021; Han and Du, 2021; Barroso et al., 2022). The perception of usefulness is mainly reflected in the fact that using online learning systems to learn can improve learning effects and efficiency, and the improvement of usefulness will directly affect their intentions to continue using online learning systems to learn in the future.

Second, the findings have demonstrated that all of the hypotheses pertaining to the relationships between the various external variables and PU, SAT, CON, and CI are supported.

This study found that CA has a negative impact on PU. This suggests that perceived usefulness decreases as anxiety levels increase. These results are consistent with what was found by Chang et al. (2017) and Wu and Wang (2020). With the continuous accumulation of experience in using online learning systems, users' perception of anxiety will also be reduced. Teachers should therefore focus more on and mentor students with limited computer abilities in online learning to help them achieve better, so as to improve their perception of the usefulness of online learning.

The results of this study show that anxiety has a prominent influence on vocational college students' confirmation. Having anxiety makes it more difficult to confirm, as the relationship is negative. Previous research has supported this relationship (Lee et al., 2009; Rabaa'i et al., 2021; Barroso et al., 2022). The anxiety generated by students in the online learning process will inhibit the positive expectations of the system.

Prior researches points out to that CSE is a critical factor in determining whether someone chooses to use computers (online learning systems) through PU (Mouakket and Bettayeb, 2015; Eraslan Yalcin and Kutlu, 2019; Lew et al., 2019). It can provide students with additional computer use opportunities to help them increase their future use and improve their self-efficacy.

This research demonstrates that SI has a significant role in determining CI. In light of this, it can be deduced that SI is still an important component of effective online learning, which is consistent with the findings of Eom and Ashill (2016); (Eom et al., 2010; Lasfeto, 2020; Mehall, 2020). People are unable to leave their homes or participate in any outside social activities while the blockade is in place. One of the benefits of online learning is the

TABLE 10 Summary of hypothesis results.

Hypotheses	Path coefficient	Standard error	T-Value	Value of <i>p</i>	Test result
H1	0.133	0.045	2.956	0.000***	Supported
H2	0.711	0.053	13.415	0.000***	Supported
H3	−0.454	0.063	7.206	0.000***	Not Supported
H4	0.071	0.035	2.029	0.006**	Supported
H5	0.664	0.047	14.128	0.000***	Supported
H6	0.332	0.046	7.217	0.000***	Supported
H7	0.141	0.053	2.660	0.005**	Supported
H8	0.372	0.056	6.642	0.000***	Supported
H9	0.432	0.051	8.470	0.000***	Supported

increased potential for students to interact with teachers, classmates, and people from other parts of the world. If potential users of online learning systems hear from others in their social environment that the online learning system is simple to operate, they may believe that switching to the online learning system will require little effort.

The findings also indicate that a student's CSE has a positive correlation with their CI to use online learning systems. As a consequence of this, the higher the CSE of the students, the higher their intention to continue using online learning systems. The finding is identical with the results of Nurhikmah et al. (2021), who discovered that higher CSE contributes to higher computer usage. The findings, however, show that CSE is the weakest predictor. When students grow more and more familiar with online learning systems, the significance of CSE may diminish.

Remarkably, MGA results indicate that there is a remarkable difference between males and females in the relationship of PU to CI. There is no significant difference in other path assumptions. However, this difference does not exist naturally. It overturns the conventional understanding that males have natural advantages in the use of technology (Fu et al., 2022). From the perspective of the path coefficient (PU → CI), females are higher than males. This shows that females pay more attention to the classroom teaching and teaching evaluation of online learning than boys and have a more significant impact on their intentions to continue using online learning. In addition, females pay more attention to the influence of PU than males, which also shows that females always maintain the gender impression of “hard work” in learning and that online learning has stronger endogenous motivation.

In conclusion, the findings of this study suggest that ECM can be applied to assess the students' intention to continue utilizing an online learning system. Nevertheless, it is essential to note that students place varying amounts of importance on the factors that determine CI but place less emphasis on CSE. In addition, we ought to pay attention to the moderating effect of gender on students' intentions to use online learning continuously.

6. Implications

6.1. Theoretical implications

This research takes students from eight vocational colleges in Jiangxi Province as the research object to explore the influencing factors of online learning's intention to use continuously. The research conclusion has certain theoretical contributions.

Firstly, innovation in research perspectives. This paper discusses the influencing factors and the interaction mechanism between the vocational college students' intention to use online learning continuously, filling the gap that most current relevant researches focus on general college education and ignore vocational college students (Niu et al., 2022).

The second is the innovation of research variables. In previous studies based on an expectation confirmation model to reveal learners' intention to use continuously, the independent variables were mostly external factors (Wang T. et al., 2021). This research creatively introduces emotional factors such as computer anxiety and self-efficacy as independent variables in the process of online learning expectation confirmation. It is helpful to promote the innovation of research conclusions by mining variables that promote students' continuous use of online learning from their own factors.

Third, innovation of research focus. In the past, most studies on the intention to continue using online learning treated samples as homogeneous groups (Wu and Wang, 2018; Wu and Tian, 2021), ignoring differences among users. This study is conducted from the perspective of gender, and the results show that gender moderates the relationship between perceived usefulness and intention to continually use, while having no significant impact on other paths, which is conducive to the promotion of research conclusions.

6.2. Practical implications

In the post-epidemic era, online learning will become a prevalent form of learning, and one important research direction is to clarify how to enhance students' continuous use intentions.

Accordingly, this study proposes the following practical implications based on the results:

From the perspective of system developers, there are numerous approaches to enhance the design of online learning systems, which include enriching the systems' course content, optimizing the functional layout, making the systems' navigation function clearer, increasing students' search efficiency, and streamlining the use of the platform's interactive functions and tools. In order to further enhance the quality of the material presented in the online course, the system developers need to change the course design based on the learning behavior data of the students and provide meaningful course material to boost students' perception of the usefulness of the system.

From the perspective of educators, teachers should cultivate students' online learning abilities, such as the capacity to conduct an efficient search for useful educational resources and to make appropriate use of a wide range of educational tools. Only when students become proficient in a variety of learning strategies who can their sense of self-efficacy be further improved. Additionally, effective online learning relies heavily on social interaction. Therefore, it is necessary to design realistic ways to improve student-teacher and student-student interaction. The instructional design of online classrooms may incorporate collaborative course activities such as group work and debate, as well as other forms of communication tools, such as chat rooms and discussion boards, to encourage student engagement and interaction. Meanwhile, teachers should also avoid stereotypes and recognize that, under the same

educational background, the difference in the intentions of males and females to continue to use online learning is gradually narrowing.

7. Limitations

The findings of this study have a great deal of important repercussions. Nevertheless, there are also certain limits, which will be discussed in more detail below. First of all, only students enrolled in vocational colleges are included in the sample for this research. In the future, researchers can investigate whether or not there are differences in what ways by comparing vocational college students with general higher education students, with the goal of better understanding the vocational college students' intention to continue using online learning. Secondly, the conclusions are drawn solely from statistical data, which might make it more difficult to have an in-depth discussion about the continued use of online learning in emergency management. Therefore, future research can include qualitative methods, which could help find more key elements of the continued intention, and the results might help to explain deficiencies in quantitative research. Finally, the focus of this study is on the intention to continue using online learning system, the ultimate objective of all study on intention is to forecast and account for behavior in essence. Previous studies have shown that there is a significant correlation between the intention to continue using online learning and behavior. Future studies can further explore whether intention and behavior are directly related, indirectly related, or affected by other factors.

8. Conclusion

This study aims to explore the influencing factors of vocational college students' intentions to continue using online learning systems in the post-epidemic era. This research outcomes reveal that the expansion model based on ECM by social interaction, computer anxiety, and computer self-efficacy can well predict the continuous use intention of students' online learning. In addition, there are differences between males and females in the influence of perceived usefulness on the intention to continue using the online learning systems, while gender does not have a substantial effect on the moderation of other paths. This research provides

TABLE 11 Measurement invariance test using MICOM.

	Original correlation	5.00%	Permutation <i>p</i> -value	Results
CA	1.000	1.000	0.838	Yes
PU	1.000	1.000	0.833	Yes
CON	1.000	1.000	0.175	Yes
SAT	0.998	0.998	0.359	Yes
CSE	1.000	1.000	0.412	Yes
SI	1.000	1.000	0.263	Yes
CI	1.000	0.999	0.161	Yes

TABLE 12 MICOM Step 3 results report—part 1.

	Mean-original difference (male–female)	Mean-permutation mean difference (male–female)	0.025	0.975	Permutation <i>p</i> -values	Equal mean values
CA	0.468	0.002	−0.253	0.262	0.001	NO
PU	0.385	0.002	−0.245	0.271	0.005	NO
CON	0.332	0.003	−0.260	0.263	0.014	NO
SAT	0.448	0.002	−0.255	0.245	0.000	NO
CSE	0.413	0.003	−0.256	0.272	0.006	NO
SI	0.369	0.002	−0.252	0.265	0.002	NO
CI	0.455	0.002	−0.246	0.267	0.000	NO

TABLE 13 MICOM Step 3 results report—part 2.

	Variance- original difference (male–female)	Variance- permutation mean difference (male– female)	0.025	0.975	Permutation <i>p</i> - values	Equal mean values
CA	0.468	0.002	−0.252	0.232	0.001	NO
PU	0.225	0.002	−0.225	0.261	0.227	Yes
CON	0.332	0.003	−0.260	0.251	0.014	NO
SAT	0.233	0.002	−0.254	0.245	0.322	Yes
CSE	0.413	0.003	−0.226	0.242	0.003	NO
SI	0.369	0.002	−0.255	0.275	0.001	NO
CI	0.455	0.002	−0.241	0.237	0.000	NO

TABLE 14 Assessment of group differences.

	Path coefficients original (males)	Path coefficients original (females)	Path coefficients original difference (males– females)	2.5%	97.5%	Permutation <i>p</i> -value	Supported
CSE → CI	0.765	0.626	0.139	−0.211	0.202	0.415	NO
SI → CI	0.063	0.186	−0.123	−0.299	0.284	0.241	NO
PU → CI	0.012	0.023	−0.116	−0.113	0.115	0.000	Yes
SA → CI	0.370	0.567	−0.206	−0.377	0.201	0.261	NO

TABLE 15 Comparison analysis.

	Path coefficient	Value of <i>p</i> (female)	Results	Path coefficient	Value of <i>p</i> (male)	Results
CSE → CI	0.358	0.000	Accepted	0.288	0.000	Accepted
SI → CI	0.552	0.007	Accepted	0.554	0.005	Accepted
PU → CI	0.466	0.001	Accepted	0.443	0.000	Accepted
SAT → CI	0.485	0.000	Accepted	0.376	0.000	Accepted

new insights for studies based on the intention to use online learning continuously in recent years. At the same time, we also put forward reasonable and feasible suggestions to the system developers of the online learning system and teachers so that they can optimize the platform functions and enhance students' online experience from the perspective of students in the process of platform development and teaching so as to ultimately promote students' intentions to continue to use online learning.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

CW: conceptualization. XL and XW: data curation. XL: writing original draft. XL, XW, and CW: writing–review and editing. All the authors have read and approved to the published version of the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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What I know, what I want to know, what I learned: Activating EFL college students' cognitive, behavioral, and emotional engagement through structured feedback in an online environment

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Given the spread of the COVID-19 pandemic, online classes have received special attention worldwide. Since teachers have a lasting effect on the students, the teacher–student relationship is a pivotal factor in language learning classes. Students will not be engaged in class activities if they are not sufficiently challenged by them or if they do not find them interesting, especially in online classes. From this point of view, motivating, engaging, and testing techniques in online classes are highly important. The present study attempts to demonstrate a correlation between structured feedback and three types of engagement in an online class: cognitive, behavioral, and emotional engagement. The structured feedback, which is used at the end of each lesson lets the students express what they know, what they want to know, and what they learned. The sample of the study consists of 114 EFL third-year college students. The study's findings reveal positive and significant correlations between the three types of engagement; cognitive, behavioral, and emotional, and the use of structured feedback in online classes. In a nutshell, some academic implications and recommendations are provided.

KEYWORDS

cognitive engagement, behavioral engagement, emotional engagement, structured feedback, online education

Introduction

Technology has brought inevitable effects on different aspects of human life, particularly education (Aghaei et al., 2020; Derakhshan and Malmir, 2021). Due to the advancement of technology, there has been a shift from traditional classes to online learning during the last decade. How dynamic the students are in online courses can be a simple definition of engagement. Generally, the exploitation of resources (time and effort) by students or instructors to improve the learning experience and the learning results is referred to as engagement (Trowler, 2010). Academic engagement among students is a prerequisite for L2 learning (Dotterer and Lowe, 2011; Nejati et al., 2014; Derakhshan, 2021, 2022c; Shakki, 2022). It is related to “the quality of how students connect or involve themselves in educational activities” (Skinner et al., 2009, p. 495). According to Amerstorfer and Frein von Münster-Kistner (2021), students’ academic engagement depends on many factors related to the learner, teacher, teaching methods, colleagues, and some features in the learning environment.

As stated by many studies such as Carini et al. (2006), Trowler (2010), Wang J. et al. (2022), and Wang et al. (2022a,b), students’ satisfaction, persistence, and academic achievement influence the students’ engagement, which is where individual’s attention is allocated in active reaction to the environment; it is then a growth-producing activity (Csikszentmihalyi, 1990). School engagement (student involvement) has emerged as a critical notion linked to a variety of educational outcomes, such as achievement, behavior, attendance, conduct, and dropout/completion (Jimerson et al., 2003, 2009). Fredricks et al. (2016) stated that there are three components of engagement, which are cognitive, behavioral, and emotional and they are all related to each other in the process of engagement (Wang et al., 2016).

Nowadays, engagement in online teaching and learning has become crucial, especially after the COVID-19 pandemic. This engagement should be characterized by the effort, concentration, active participation, and emotional responsiveness (Philp and Duchesne, 2016; Aghaei et al., 2022). Because of the widespread use of online learning, it is more vital than ever to figure out how engagement relates to students’ performance (i.e., the measurement of results) and specific characteristics of the online classroom (i.e., the types of educational practices). Every responsible English language teacher makes every effort to meet the needs of their students to improve their level of performance (Derakhshan and Shakki, 2020). To accomplish this, they employ a variety of approaches and strategies, and all of this can be accomplished effectively if some responses are received from students in the form of feedback. The use of feedback in EFL classes of all types can promote an effective interactive class environment.

This viewpoint was highlighted by Hyland (2006) who mentioned that one of the most crucial jobs of a teacher is to provide feedback to students, as it allows for the kind of individual attention that is otherwise difficult to achieve in a classroom setting. As a kind of feedback, reinforcement and interpersonal attraction theories may also be related to students’ engagement (Derakhshan et al., 2019). This theory proposes that once an individual finds anything satisfying in interacting with another person, they will want to communicate with that person again. In educational settings, teachers’ non-verbal acts in interacting with their pupils, if deemed gratifying, may contribute to improving student classroom engagement (Witt et al., 2004). As a result, the more regular and constructive the feedback is in online education, the greater the potential for performance improvement (Walther and Burgoon, 1992; Flaherty and Pearce, 1998; Eslami and Derakhshan, 2020). In relation to that, the use of structured feedback is highlighted in the present study.

Recently, and within the current wave of online teaching in colleges and schools, the challenge of motivating students to engage in online classes has become urgent. However, if the right pedagogy is not used, the haste to add online classes to the calendar might result in losing connectivity with the students. As mentioned by Shu-Fang and Aust (2008), online learning possesses two distinguished pedagogical features that were inefficient in the earlier generations of distance education. One is interaction and the other is collaboration.

The nature of human-computer interaction (HCI) has changed dramatically in recent decades, transitioning from simple user interfaces to interactive and engaging experiences (Shankar et al., 2016). This study tries to focus on using structured feedback from the students at the end of each online session. Structured feedback as mentioned by (Larsen-Freeman and Anderson, 2011, p. 67) happened when “the students are invited to make observations about the day’s lesson and what they have learned. The teacher accepts the students’ comments in a non-defensive manner, hearing things that will help give him direction for where he should work when the class meets again.” In the present study, the teacher asked the students to determine what they already know about the material of the lesson (their previous knowledge), what they want specifically to know, and what they actually learned in the class. This technique is used to represent structured feedback in online classes. Thus, this study shows which type of engagement in the students may be developed (cognitive, behavioral, and emotional) and which can be correlated with structured feedback in online classes. This desideratum can be filled out by answering the following research questions:

- Is there a correlation between EFL college students’ behavioral engagement and their attitudes toward structured feedback in online classes?

- Is there a correlation between EFL college students' emotional engagement and their attitudes toward structured feedback in online classes?

Literature review

Engagement

Engagement has become a popular psychological term that influences human behavior and decision-making in a variety of areas, including education, employment, leisure, and marketing. Kuh (2009) explained students' engagement as "...the more students study a subject, the more they know about it, and the more students practice and get feedback from faculty and staff members on their writing and collaborative problem solving, the deeper they come to understand what they are learning" (p. 5). According to the student involvement theory, the more involved a student is in college, the more learning and personal growth they will receive (Astin, 1984; Wang et al., 2021).

In the literature, most of the previous studies focused on traditional students' engagement in universities worldwide (Robinson and Hullinger, 2008). After the COVID-19 pandemic, all universities worldwide moved into online learning. This movement was unusual to most students, especially for those who have not joined this system yet though most studies proved its positive role in many aspects in relation to language teaching. Because of its virtues and the benefits for English students, researchers consider EFL online classes an innovative approach that can answer students' concerns in English lessons (Tawafak et al., 2019; Alahmadi and Alraddadi, 2020; Hamouda, 2020; Pikhart and Klimova, 2020).

Empirical studies

In the same concern, Rad et al. (2022) recommend using flipped learning as a way of online education, as it positively impacts instructors' support, team support, and positive subjective feelings about the course material. Moreover, Çakmak et al. (2021) reported the essential role of online education, specifically in vocabulary learning and retention. On the contrary, Pikhart et al. (2022) found some dissatisfaction among students with online education in the EFL context as they much prefer traditional face-to-face classes and written textbooks.

As far as students' engagement is concerned, it could be divided into three interrelated components, which are cognitive, behavioral, and emotional engagement (Fredricks et al., 2016; Al-Bahadli, 2020). Through cognitive engagement, students apply mental energy during the learning process. First, according to Nguyen et al. (2016), cognitive engagements deal with the student's enrolment in the learning process, which refers to the students' improvement in understanding, studying, and getting the knowledge shown in their academic work.

TABLE 1 Demographic information.

Age	Participants	Percentage
18–21	75	65.8%
22–26	31	27.2%
Above 26	8	7%
Total	114	100%

This means that cognitive engagement is very important in identifying the students' psychological motivations, which are connected directly with their engagement. Second, in behavioral engagement, the students perform special behaviors while they are learning. According to Nguyen et al. (2016), behavioral engagement is related to students' participation and activities in the classroom that motivates the students to be a part of the school learning environment. Third, while they are learning, students should experience positive emotions to get emotional engagement (Derakhshan, 2022a).

The student's engagement could be considered as the analysis of their positive behaviors, such as students' participation, attendance, and attention (Derakhshan, 2022b). This engagement analyzes the students' psychological experience and their feelings in the schools. Through the chain mediation of autonomous motivation and positive academic emotions (such as satisfaction and relief), teacher engagement had an impact on students' English achievement (Derakhshan et al., 2022; Wang et al., 2022a,b; Wang J. et al., 2022). Another dimension, which is social engagement was also added by Fredricks et al. (2016). This is to recognize that learning possibilities are embedded in a social environment (Wang and Hofkens, 2019), as evidenced by students' participation in social contact or collaboration during the learning process. In this concern, Latipah et al. (2020) demonstrated that students were positively engaged in terms of behavioral, emotional, and cognitive engagement, according to the findings of their study. In terms of behavioral engagement, students made a significant effort to study English before class by watching a video and performing admirably. They are more engaged in learning activities and most students respond positively to emotional engagement as they were enthusiastic about learning English.

Pilotti et al. (2017) reported that the richness of the discussion prompts in classes was found to have a favorable relationship with students' cognitive engagement and instructors' behavioral engagement. With increased class size, both cognitive and behavioral measures of student involvement decreased (Derakhshan and Shakki, 2019). So, the type of engagement varies from context to context depending on the type of techniques used by the teachers and the class environment. Based on that, this study tries to discover the type of correlations that can be existed between the three types of engagement and structured feedback, which is used by teachers in online English classes.

Methods

Participants

The total number of participants was 114. They were all EFL third-year college students at the English department of the University of Diyala, Iraq, who were exposed to the structured feedback in their daily lessons for 8 weeks. The ages of the participants varied between 18 and 26 years, but most of them were 18–21 years as shown in Table 1.

According to Table 1, the highest number of participants was from the age of 18–21 years (65.8%), and the less participants were with the age older than 26 years (7%). Regarding the specialization, all 114 students belong to English Department, and they were all third-year students.

Instruments

The instrument used to collect data, to verify/falsify the hypotheses, was an online questionnaire that the researchers constructed (see Appendix 1). SESQ Students' Engagement in Schools Questionnaire was used, which was constructed by many researchers (see Lam and Jimerson, 2008). The SESQ consisted of 109 items focused on the comprehensive assessment of the construct of students' engagement. The researchers summarized the number of items to suit the study's aim and context. Students' attitudes questionnaire was adopted from a questionnaire developed by Barmby et al. (2008) in the same process of writing the questionnaire (see Lam and Jimerson, 2008). The questionnaire, after a short introduction with the consent to take part in the survey, contained a few demographic questions related to age and specialization. The validity and reliability of the items were confirmed statistically, as shown in Table 4. The results show that the sample can be accepted, and the test is statistically valid. Face validity was also gained by exposing the instruments and the idea of the study to some specialists in the domain of the English language and taking their notes into consideration.

In each lesson, the students were invited to register what they noticed in the lecture in three domains; what they already knew about the material of the lecture (their previous knowledge), what they want specifically to know, and what they actually learned in the same lecture. The teacher then, at the end of each lecture, tries to listen to the students, kindly discussing some points, and attempting to respond to all their inquiries. The students were third-year college students and the material is a method of English language teaching, a book by Larsen-Freeman and Anderson (2011) "*Techniques and Principles in Language Teaching*." The questionnaire was submitted to the participants online via Google Forms. The data collection took place in January and February 2022, just at the beginning of the second semester. Once the questionnaire was finalized, the

TABLE 2 Reliability indices.

Latent factors	Items (N)	Cronbach's alpha
Attitude toward structure feedback	11	0.916
Behavioral engagement	11	0.729
Cognitive engagement	12	0.862
Emotional engagement	8	0.802

TABLE 3 Reliability statistics.

Cronbach's alpha	Items (N)
0.936	42

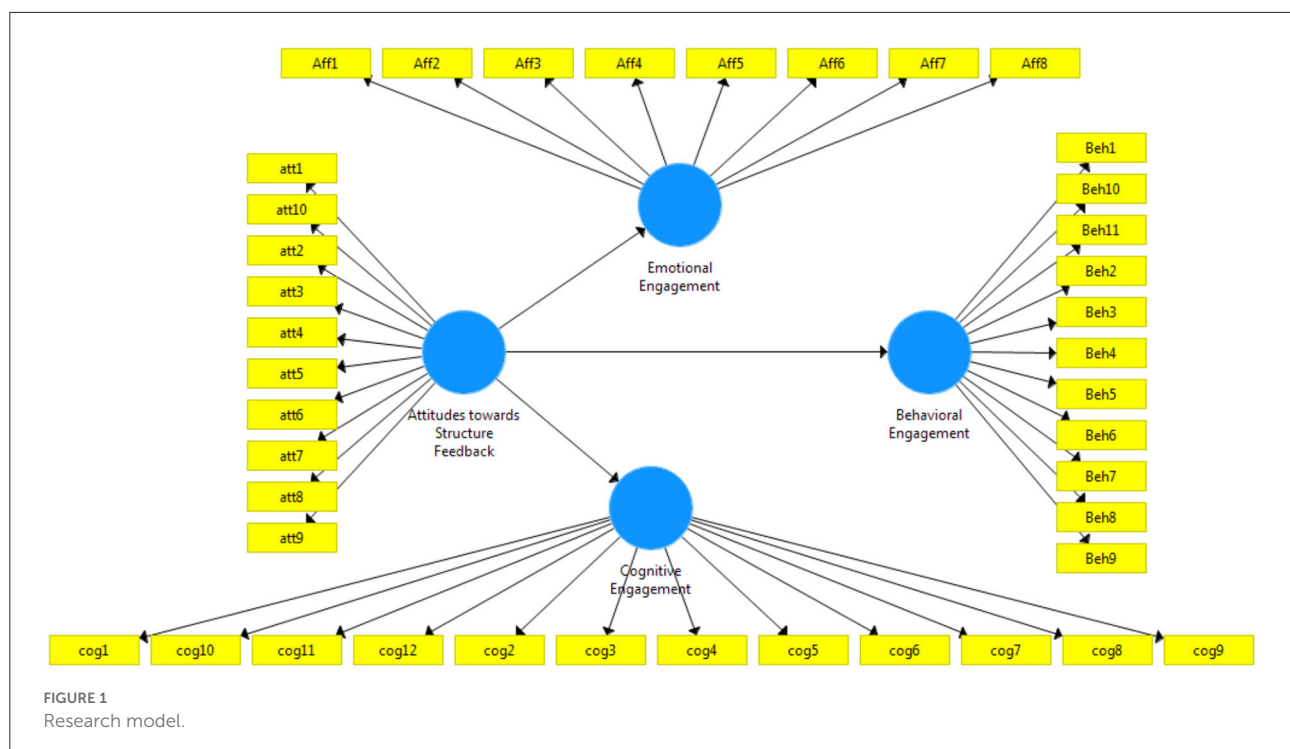
next step would be to test the reliability of the questionnaire using the Cronbach alpha test. If the reliability passed Cronbach's alpha of >0.7 , the questionnaire would be distributed to the sample of the study. However, it is always advantageous to pilot the questionnaire first. This is in line with Sekaran and Bougie (2016)'s recommendation. They suggested that before collecting data, useful statistics from the original study should be calculated to ascertain reliability. This section discusses how the acceptance model was piloted in this study.

The pilot test was conducted by one of the researchers on her section's students. They were 58 undergraduate students from two sections. A copy of the questionnaire was distributed during class time. The aim was to check if students could answer the questionnaire without any difficulty. The participants that were selected for the pilot study received a preliminary declaration stating that their participation was voluntary and that their anonymity would be guaranteed if they chose to complete the questionnaire survey.

As shown in Table 2, the internal consistency of the items was measured using Cronbach's alpha analysis on Statistical Package for the Social Sciences (SPSS). Since Cronbach's alpha fell within the acceptable range (0.729–0.916) >0.7 , the reliability of the scale was confirmed (Tawafak et al., 2018). This shows that the current model is applicable to the acceptance model and the measures reflect the research goal. The questionnaire was then distributed online using Google Forms and a free online survey service that can be used to collect responses. In the first step, the researchers tested the initial results after the 114 responses received to check whether the survey is working properly or not.

Reliability

Table 3 shows a high acceptance of reliability. The normal acceptance needs to be >0.7 , and the current test of this survey gave 0.936 as a significant accepted result.



Conceptual research model

The function of construct validity is to validate the assessment that ensures the factors measure what it intends to measure (Mohajan, 2017). This study includes subsections of construct validity, such as the evaluation of reliability and convergent validity, as well as data screening and measurement model. Moreover, the validation of the structural model and hypothesis testing are also described. The survey, which comprised 42 questions, distributed four factors, as shown in Figure 1.

The research paper developed a model consisting of four factors, as shown in Figure 1. Attitude toward structured feedback connected with 11 items of contrasts. Emotional engagement is linked with eight items of the survey questionnaire. Behavioral engagement connected with 11 items, and finally, cognitive engagement used 12-item questions. The main influences individually linked the attitude toward structured feedback with the other three factors.

Results

Once the acceptance model passed the reliability test, data could be collected. It is important to collect information from every single individual in the population. Hence, sampling means collecting sufficient information from particular participants in the population to popularize the findings of the

entire population (Hair et al., 2014). The data to validate the model were collected from four different HEIs from the sample of students. All these four HEIs apply to an online learning system. The next main criterion, therefore, was that the research sites must be using e-learning systems. According to Cone and Foster (1993), a few departments in universities were already using e-learning or had participated in earlier research as the teachers were allowed to use e-learning in combination with their subject knowledge at that point in time.

Others were still in the early stages of the innovation-decision process or were transferring from a period of investigation into a phase where e-learning was considered part of the institutional agenda (Tawafak et al., 2018). The data entered in an Excel file and saved as vs. extension were tested using PLS-SEM software based on a set of data collection used to evaluate all the questions with different factors. The total number of respondents was 114, making it a representative sample. For this research, the students were considered as the key participants to evaluate the factors and the acceptance of the conceptual research model as mentioned in Figure 2 shows the results of using PLS-SEM construction and the validity of its items and influence links.

As shown in Figure 2, some of the items in the model showed low loadings on their pertinent factors. These items endanger the internal validity of the model and have to be excluded. Table 4 shows the loading for each item used in the model and which questions are the most highly impacted and strongly connected.

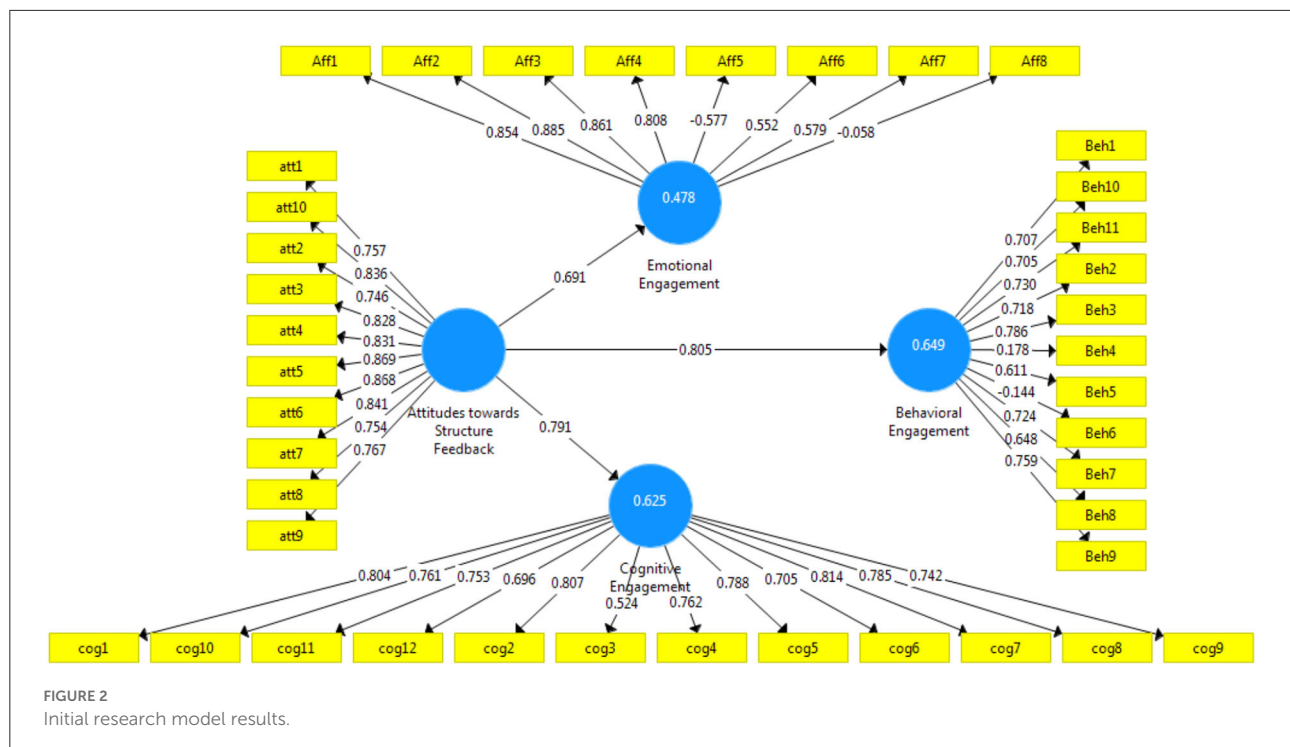


Table 4 shows the item loading and Cronbach's alpha values for all constructs/factors in the measurement model, which exceeded the recommended threshold values. In summary, the adequacy of the measurement model indicated that all items were reliable indicators of the hypothesized constructs. According to Table 4 and concerning the results of the factor "attitude toward structure feedback," the highest impact items used are item numbers 3 to 6 and 10, with 0.828, 0.831, 0.869, 0.868, 0.841, and 0.836, respectively. In the behavioral engagement factor, all 11 items are significant and remarks as supported except for items Beh4 (its loading 0.178) and Beh6 (its loading -0.144), and its remarked as not supported by the total questions designed in the survey. In the cognitive engagement factor, all 12 items are remarked as supported items except for Cog3, its item loading value of 0.524, which is <0.6, and remarks as not supported in the survey factors. Although it should be mentioned that Hair et al. (2006) explained that an item with loading above 0.5 can also be supported if the total AVE of the construct is not endangered.

Regarding the affective section of the survey (emotional engagement) factor in the model design, this factor is supported by all calculations. Moreover, the item loading values are divided into two categories, the first four items are highly supported remarks, while the second four items (items 5 to 8) are not supported because their negative loading values impact the model design. The two of these items (items 6 and 7) had loadings above 0.5 and could be included in the model if they do not endanger the total AVE of the factor. Also, the student

feedback was not supporting the results in these last four items. By the end of all PLS calculations, the emotional engagement is remarked as supported and significant results. Based on the results explained earlier, the final model was run after the exclusion of problematic items (Beh4, Beh6, Aff5, and Aff7). The final model is shown in Figure 3.

The path coefficient results for three dependent factors show an acceptable value where all results are above 0.5, the standard condition for being accepted (Table 5).

Table 6 shows the validity of R square results. According to Hair et al. (2006), the R square have three categories: 0 to 0.29 is a weak and mostly rejected model, 0.3–0.45 is acceptable, and from 0.46 to 0.99 is highly accepted and a significant model result. Regarding this analysis, this model is fully accepted with its three R square results constructed directly from the attitude toward structured feedback to the other three related factors with R square 0.649, 0.625, and 0.478 to behavioral engagement, cognitive engagement, and emotional engagement, respectively. Concerning the prediction values of Q square, the accepted results can be any value greater than 0.4. For Table 5, all Q square predicted values are 0.631, 0.613, and 0.434, respectively, which indicates a significant value with all factors.

The structural model's characteristics are measured by studying R square determination coefficients, regression estimates, and statistical significance. The R^2 value assesses the amount of predictive power and shows the extent of divergence, justified by its antecedent factors in the model. The model's R^2 values should be high enough to reach a minimum

TABLE 4 Item loading and reliability.

Construct	Item	Loading	Remarks	Alpha	Correlation
Attitude toward structure feedback	ATT1	0.757		0.878	Supported
	ATT2	0.746	Supported		
	ATT3	0.828	Supported		
	ATT4	0.831	Supported		
	ATT5	0.869	Supported		
	ATT6	0.868	Supported		
	ATT7	0.841	Supported		
	ATT8	0.754	Supported		
	ATT9	0.767	Supported		
	ATT10	0.836	Supported		
Behavioral engagement	Beh1	0.711	S	0.871	Supported
	Beh2	0.721	Supported		
	Beh3	0.785	Supported		
	Beh4	0.178	Not supported		
	Beh5	0.600	Supported		
	Beh6	−0.144	Not supported		
	Beh7	0.726	Supported		
	Beh8	0.652	Supported		
	Beh9	0.760	Supported		
	Beh10	0.712	Supported		
	Beh11	0.729	Supported		
Cognitive engagement	Cog1	0.804		0.927	Supported
	Cog2	0.807	Supported		
	Cog3	0.524	Not supported		
	Cog4	0.762	Supported		
	Cog5	0.788	Supported		
	Cog6	0.705	Supported		
	Cog7	0.814	Supported		
	Cog8	0.785	Supported		
	Cog9	0.742	Supported		
	Cog10	0.761	Supported		
	Cog11	0.753	Supported		
	Cog12	0.696	Supported		
Emotional engagement	Aff1	0.849	Su	0.827	Supported
	Aff2	0.880	Supported		
	Aff3	0.861	Supported		
	Aff4	0.808	Supported		
	Aff5	−0.577	Not supported		
	Aff6	0.552	Not supported		
	Aff7	0.579	Not supported		
	Aff8	−0.058	Not supported		

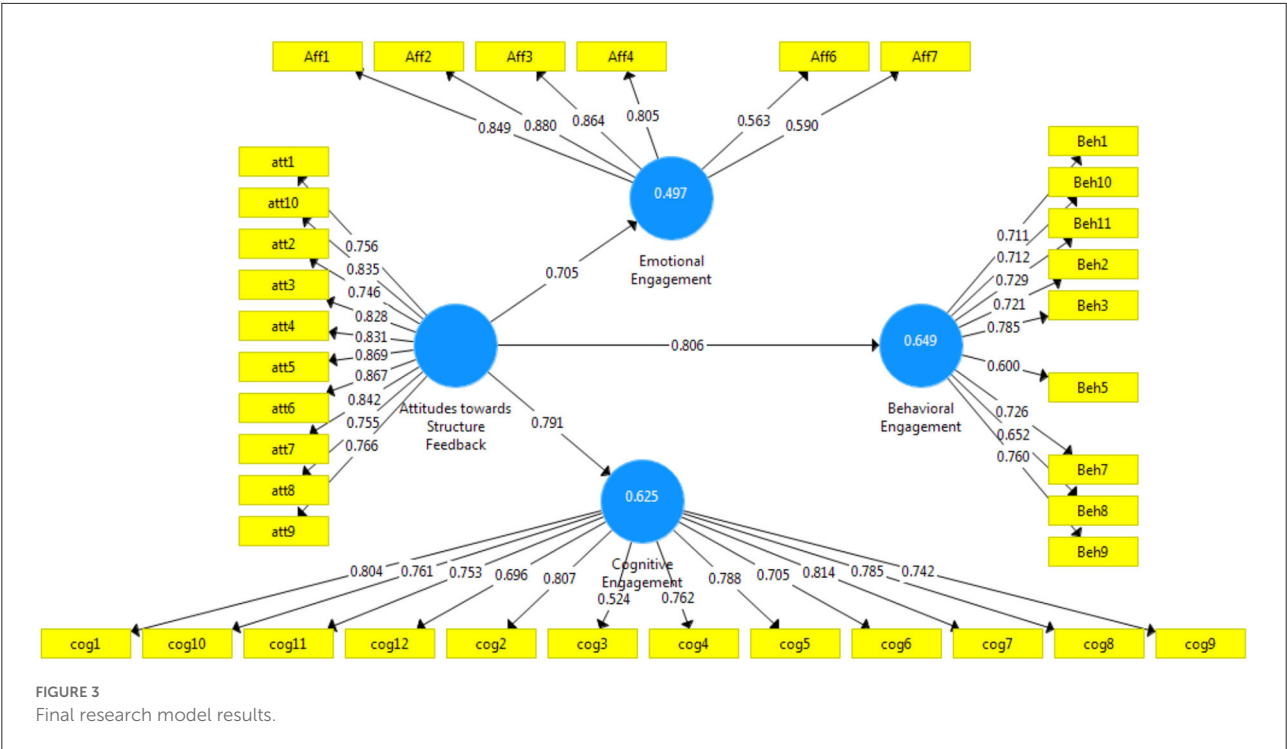


TABLE 5 Path coefficients.

	Behavioral engagement	Cognitive engagement	Emotional engagement
Attitude toward structure feedback	0.806	0.791	0.705

level of explanatory power (Urbach and Ahlemann, 2010). Accordingly, R^2 values of 0.67 are considered significant, 0.33 to be reasonable, and 0.19 to be poor. Another measure that is carried out in the assessment of the structural model is the path coefficient value, which measures how strong the link is between the independent factors and dependent factors. To assess if the path coefficient is significant, the value should be higher than 0.100 within the model and be substantive at the 0.05 level of significance at least. Figure 3 shows the real numbers of contrast among factors and their items.

In addition, it shows the active results of R square as it is shown in Table 6. In addition to the path coefficient with smooth relationships from the attitude toward structured feedback to the other three factors of the conceptual model as the same values mentioned in Table 5. The standard path coefficient to be accepted should be above 0.5 to prove the link between the factors in the model design.

The convergent validity assesses to what extent the construct measures are different from the other constructs in the model. The value of the convergent validity measure is based on a merge or percentage of variance. Several techniques are employed to measure the relative quantum of convergent validity among

measured items. Accordingly, Hair et al. (2006) suggested that the use of factor loadings, composite reliability, and average variance extracted (AVE) in measuring the convergent validity, where factor loadings ≥ 0.5 and preferably ≥ 0.70 , show a high convergent validity. Moreover, composite reliability with estimates ≥ 0.70 shows enough convergence or internal consistency. The AVE exhibits the indicator total variance accounted for by the latent construct and the value of the AVEs should be ≥ 0.5 . Thus, when the values are higher than the minimum recommended score for factor loading, composite reliability, and AVE, it signifies the instrument items are valid and reliable.

As can be seen in Table 7, a discriminant validity measure is another test carried out to measure the extent to which a construct is truly different from other constructs. A discriminant validity measure is another test carried out to measure the extent to which a construct is truly different from other constructs. A high discriminating validity shows that a concept is specific and highlights some effects overlooked by other measures. To assess discriminating validity, latent construct correlation matrices are applied where the square roots of the AVEs along with the diagonals are indicated. Correlational statistics between

TABLE 6 R square.

	R square	R square adjusted	Q ² -predict
Behavioral engagement	0.649	0.646	0.629
Cognitive engagement	0.625	0.621	0.626
Emotional engagement	0.497	0.492	0.556

TABLE 7 Construct reliability and validity.

Matrix	Cronbach's alpha	rho_A	Composite reliability	Average variance extracted (AVE)
Attitude toward structure feedback	0.878	0.886	0.902	0.657
Behavioral engagement	0.871	0.878	0.897	0.508
Cognitive engagement	0.927	0.931	0.938	0.561
Emotional engagement	0.827	0.862	0.760	0.587

constructs are shown in the lower left off-diagonal elements in the matrix. Thus, discriminant validity is realized when the diagonal elements (square roots of AVEs) exceed the off-diagonal elements (correlations between constructs) in the same row and column as suggested by [Fornell and Larcker \(1981\)](#). [Table 8](#) shows the discriminant validity results.

In testing the validity of the model constructs, two measures were considered, which are convergent validity and discriminant validity, where convergent validity was employed to assess whether items within the same construct were highly correlated with each other. Moreover, discriminant validity was used to assess if the items loaded more on their intended construct than on other constructs ([Lai and Chen, 2011](#)). Therefore, construct validity was tested using factor analysis with principal component analysis and varimax rotation. The diagonal line of loading between 0.45 and 0.54 is generally considered fair, loading between 0.55 and 0.62 is good, loading between 0.63 and 0.70 is very good, and loading is considered excellent if it is higher than 0.71 ([Comrey and Lee, 2013](#)). The modified factor loading analysis indicated that all the constructs in the model have both excellent convergent and discriminant validity with each AVE value greater than the threshold value, as shown in [Table 8](#).

According to [Table 9](#), the factors used in this study show significantly supported remarks regarding the PLS-SEM program. Therefore, this model shows a high correlation between these factors.

Discussion

Teaching may be extremely rewarding when students are engaged, profoundly interested in the subject matter, and intelligently participating. However, strong student engagement is difficult to create. This study promotes structured feedback *via*

online education as one of these ways since the ability to adapt and nurture improved student engagement frequently involves research and preparation. Student engagement is crucial in every class, but it is essential in the online learning environment where students must be disciplined enough to avoid distractions and other obligations competing for their time while being cut off from their instructor and other students. According to extensive studies in class engagement, student's engagement differs depending on the environment that is established by the school and instructor as well as the learning opportunities that are provided in the classrooms, which is in notable agreement with this study, as the environment turned to online one ([Watanabe, 2008](#); [Kelly and Turner, 2009](#); [Nasir et al., 2011](#)).

According to the results of this study, all three types of engagement (cognitive, behavioral, and emotional) are positively correlated with the structured feedback used in online classes, which is in line with the following studies that used different types of feedback in online classes ([Flahery and Pearce, 1998](#); [Dixson, 2010](#); [Chakraborty and Nafukho, 2014](#); [Martin and Bolliger, 2018](#)). So, the three types of engagement were achieved during class time, which is in agreement with [Latipah et al. \(2020\)](#). The type of structured feedback that is used in this study led the students to ask themselves what I know, what I want to know, and what I learned, in each lesson, which shows positive to very positive results in relation to students' engagement. [Wenger \(1998\)](#) and [Vonderwell and Zachariah \(2005\)](#) stated that participating in an online class involves more than just joining the class or commenting on a message board. These researchers concluded that participating in a discussion and being active are crucial components of being engaged.

Although students can post to the discussion board, real engagement occurs in the dialogue that develops after the first post. The environment of online classes that make learners passive receivers of knowledge, just listeners, specifically in human science lectures, requires a rethinking process of the

TABLE 8 Discriminant validity.

Matrix	Attitude toward structure feedback	Behavioral engagement	Cognitive engagement	Emotional engagement
Attitude toward structure feedback	0.811			
Behavioral engagement	0.806	0.713		
Cognitive engagement	0.791	0.651	0.749	
Emotional engagement	0.705	0.687	0.652	0.766

TABLE 9 Bootstrapping path coefficient.

	Original sample (O)	Sample mean (M)	Standard deviation (STDV)	T statistics (O/STDV)	P-value	Remarks
Attitude toward structure feedback→ behavioral engagement	0.806	0.808	0.050	16.088	0.000	Supported
Attitude toward structure feedback→ cognitive engagement	0.791	0.793	0.056	14.004	0.000	Supported
Attitude toward structure feedback→ emotional engagement	0.705	0.713	0.045	15.829	0.000	Supported

ways used in presenting the material, which is in agreement with [Garrison et al. \(2000\)](#) who stated that “potential for creating an educational community” referring to the exploitation of subject material. Hence, teachers need to activate the ideas of student-centered education with some types of class discussion ([Mandernach et al., 2006](#)) to ensure wide participation of the students in the class, which in turn develops their class engagement. The results of the study in relation to each question can be stated as follows:

First research question

Is there a correlation between EFL college students' cognitive engagement and their attitudes toward structured feedback in online education?

Depending on the results gained, cognitive engagement achieved very positive results in relation to structured feedback between the two others. This result demonstrates that leading students to think in an online class can play a role in increasing their engagement, specifically cognitive engagement ([Nguyen et al., 2016](#); [Pilotti et al., 2017](#)). Let us first clarify cognitive psychology and discuss how it affects student engagement and active learning. According to cognitive psychology, active learning entails the growth of cognition, which is accomplished through accumulating systematic knowledge structures and methods for understanding, remembering, and solving issues, and these processes are related to applying structured feedback. Active learning also involves an interpretation process, whereby new information is connected to previously learned information and retained in a way that emphasizes the extended significance of these links, and this can interpret the positive results in relation to cognitive engagement in the current study.

At the start of a new unit or lesson, online teachers routinely provide context and meaning to students, which promotes improved retention and mastery. Cognitively speaking, because memory is associative, the environment can influence the information and vice versa. When new memories are generated, neurons wire together. Students' curiosity and learning capacity might be piqued by a teaching technique that uses questions to guide lesson ideas, and this explanation can provide another justification for the positive results of cognitive engagement in relation to structured feedback in online education.

The results of the present study are in agreement with [Mandernach \(2009\)](#) who claims that an online course encourages the best level of student cognitive involvement if it:

- Incorporates authentic learning tasks and active learning environments.
- Encourages personal connections between students and teachers in the class.
- Helps to learn to take place in a virtual setting.

It is evident that all these three points mentioned by [Mandernach \(2009\)](#) exist in the current study, so for this reason, the results are notably positive in relation to the existence of cognitive engagement in the online environment.

Second research question

Is there a correlation between EFL college students' behavioral engagement and their attitudes toward structured feedback in online education?

In relation to the results achieved, behavioral engagement is positively correlated with structured feedback in online

education. Results prove that if the students interact behaviorally in class, this will affect positively their behavioral engagement and this result is in line with [Nguyen et al. \(2016\)](#). The behavioral engagement domain asks about how students behave in class, how they participate in extracurricular activities, and how interested they are in their academic assignments. All these three domains are under the light in the present study as they are all related to how EFL college students engage behaviorally *via* online education using structured feedback. The varied activities used in structured feedback lead the students to ask; what I know, what I want to know, and what I learned and try to provide answers for all of them, encouraging the students to engage indirectly with their class activities, and show interest in applying them.

Focusing on the student's support during the activities (such as attendance and pleasant interactions), research on school participation has shed light on the student's motivation to participate in school to gain positive class engagement ([Jones et al., 2008](#); [Wang and Holcombe, 2010](#)). So, it is clear that the right choice of class activity plays a crucial role in activating students' engagement as a result of raising their motivation. The students' interest in their academic assignment, which refers to the concrete behavioral acts displayed by the students to demonstrate their desire to participate in classroom activities and their will to tackle difficult material, is also a pivotal component of behavioral engagement. Research in this area sheds light on the classroom exercises that result in the student displaying concrete behavioral engagement, such as perseverance, concentration, asking questions, and participating in different class discussions ([Yazzie-Mintz and McCormick, 2012](#); [Cooper, 2014](#)).

Engaging students as autonomous learners in online contexts without the presence of a teacher is still complex. This has prompted more research to be done on the variables affecting students' engagement in this situation. Student time-on-task behavior is referred to engagement with the assigned activities. Throughout the class, students were required to participate in a variety of activities, specifically in online education to prove their active existence in class and to be engaged gradually.

Another point is where the students showed strong engagement in the feedback on various activities. As in the present study, it is discovered that this feature was excellent for learning, specifically online learning. For instance, after receiving feedback that revealed their presumptive understanding to be false, students revisited the simulation model and further investigated the concepts. It helped them to better comprehend what was going on at the molecular level. This research can generally be divided into three primary categories: interactions between students and the teacher, interactions between students and their peers, and interactions between students and the subject matter. All these categories are part of the structured feedback used in the current study.

which proves its effectiveness in activating students' engagement of all types.

Third research question

Is there a correlation between EFL college students' emotional engagement and their attitudes toward structured feedback in online education?

According to the results, emotional intelligence was correlated positively with using structured feedback in online education. Due to the nature of online learning as a distant learning experience, there are obstacles to student engagement and learning. It is observed that low student engagement and greater dropout rates in online courses are primarily a result of these impediments. Emotions are a potent weapon in the struggle for online student attention, engagement, and persistence ([Deng, 2021](#)). The difficulties of forming social and emotional connections with and between them are the biggest obstacle to the success of online students ([Gallien and Oomen-Early, 2008](#)).

However, combining technology and emotion in the classroom might have an even greater impact. Creating an emotional connection to the material inside the classroom can be a vital tool for student retention. Students will be better able to comprehend, relate, and recognize the significance of the course subject through powerful teaching techniques, such as structured feedback. They will not perceive the course material as meaningless facts; instead, it might elicit an emotional reaction that makes it easier for them to retain it for the duration of the course ([Wang et al., 2022a,b](#); [Wang J. et al., 2022](#)). Hence, the role of the teacher in nurturing emotional intelligence in an online class is crucial and essential ([Al-Obaydi et al., 2022](#)).

Online classes can also be used to address students' emotions. Discussing hot-button issues that concern students is one way to do this. Designing discussion platforms, like structured feedback, such that students can express their own emotions and that automatically encourage engagement ([Deng, 2021](#)). This viewpoint is also expressed by [Niedenthal et al. \(2006\)](#) who mentioned that learning is cognitive and emotional simultaneously. To ensure that students treat one another with respect despite any disputes, it is crucial to set ground rules before these dialogues. Overall, rather than having students study content inside a framework of monotony, it is critical to use technology to evoke emotion and keep content exciting.

Online social and emotional support for students will boost their engagement, perseverance, learning, and success. Helping students get through the obstacles that arise because of the distance involved with taking online classes is, in fact, one of the best things online instructors can do ([Xie and Derakhshan, 2021](#)). In this concern, ([Rodríguez-Ardura and Meseguer-Artola, 2016](#), p.100) stated that many learners "feel individually

placed within a true humanized education environment” in which they feel that they are taking part “in a true teaching-learning process, interacting with their lecturers and peer students.” Finally, the more alternatives we can give to online students in online classes, the more they engaged in all three types of engagement and the more control they will have over their education, and the ability to choose activities that are important to their personal, academic, and professional goals.

Conclusion

The focus on the students and how tactics in online education classes affect their participation and learning in the classroom from their point of view is what makes this study significant. The use of structured feedback in an online class for EFL college students, which gave the students a chance to think, speak, participate, express, and compete at the same time proves its successful utilization in a college context. For the following reasons, this study will be necessary for higher education institutions and professors instructing distance learning programs. The results of this study may help administrators and teachers in online education make judgments on engagement tactics for current online education courses. Numerous prior studies on online education of all types have been conducted from the perspective of the faculty; this study would enable the faculty to learn about successful engagement techniques by hearing from the students.

In addition, it is clear that improved learner engagement does not always result from the use of online platforms. When using online education, it is essential to carefully plan educational tactics to boost and maintain learner engagement. As a drawback, giving this type of feedback may have the unintended consequence of decreasing student learning autonomy. Making the student an independent learner is the major goal of the online education environment. Therefore, when proper teaching methods are offered in this sort of learning, a balance between individualized learning and reducing the teacher's involvement is always preferred. Thus, it has been suggested that more work can be done researching the negative and positive sides of using feedback in online education.

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Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Golestan University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1083673/full#supplementary-material>

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The effect of teaching style and academic motivation on student evaluation of teaching: Insights from social cognition

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Student evaluation of teaching (SET) is ubiquitous in higher education as a metric for assessing teachers, gaining student feedback, and informing faculty personnel decisions. It is thus imperative to examine the dimensions along which a teacher is judged. This study tested the application of the universal dimensions of social judgment (i.e., warmth and competence) in SET. A total of 108 psychology undergraduates ($M_{age}=23.63$, $SD_{age}=3.14$) in Singapore rated a fictitious teacher (i.e., either relationship-oriented or task-oriented) based on their interactions over a programmed online chat. Participants responded to the social judgment measures of warmth and competence and rated their academic motivation. Results indicated a higher SET rating for a relationship-oriented than a task-oriented teacher. Further, student academic motivation mediated the link between teaching style and judgment of competence. The findings extend the supremacy of warmth in the context of SET, thus supporting the application of social cognition literature to educational research. In addition, the findings suggest that fostering a match in task goals between a teacher and student improves ratings of teacher competence.

KEYWORDS

warmth, competence, task-oriented, relationship-oriented, student evaluation of teaching, student academic motivation, social cognition, mediation

1. Introduction

To improve quality teaching, regular and objective examination of teachers is imperative (Spooren et al., 2013). Since the 1920s, universities have relied on students to assess teachers. Students are considered relevant stakeholders in gathering insights into teaching quality. SET is primarily drawn on the perception of teaching style, and the experience one has with the teacher (Coldren and Hively, 2009). SET is a tool for measuring teaching performance either in whole or part (Spooren et al., 2013). However, the basis of these perceptions has yet to be thoroughly investigated (Zhao et al., 2022). There is thus merit in extending the decades of research in social cognition to the domain of SET. Research has established *warmth* and *competence* as the two universal dimensions of social perception (Fiske et al., 2007). In the present study, we address the possibility of applying the tenets of social judgment to the parameters of SET.

1.1. Teaching style

Teaching style refers to a pervasive quality of teaching behavior that persists even though the taught content changes (Ghanizadeh and Jahedizadeh, 2016). Teaching style has been documented to affect student learning experience and student impressions of the teacher

(Coldren and Hively, 2009), potentially factoring into SET. Like leaders, teachers influence students' attitudes and behavior (Yukl, 1989). Teachers monitor, motivate, manage, and engage students. Their expertise grants them respect and authority in the classroom to control rewards and punishment for students. These functions draw parallels between a teacher and a leader. A teacher's impact on the education system is synonymous with a leader's role in organizational success. Hence, a teacher's position mirrors a leader's hierarchical power structures in a high power distance organization (Ryan et al., 2017).

The task-relationship model in organizational psychology distinguishes leader behavior as either work oriented and achievement focused (task) or person oriented and relationship focused (relationship; Northouse, 2018). Therefore, task-oriented leaders prioritize goal attainment by efficiently allocating resources and delegating responsibilities to their followers. Relationship-oriented leaders help followers feel comfortable with the self, others, and the situation (Cohen et al., 2004). In education, teachers who embody a task-oriented style demand high academic performance by providing rigorous instructions and challenges to students (Sandilos et al., 2017). On the other hand, teachers who embody a relationship-oriented style render warmth to students through unconditional positive regard, attentiveness, care, and respect. Adopting an appropriate teaching style is integral to good teaching practices and evaluation. Thus, the present study investigated the applicability of two leadership styles in teaching and how they may affect SET.

1.2. Student evaluation of teaching

Adhering to Spooren et al. (2013) recommendations for designing SET, there is merit in applying the well-established concept of social judgment to SET. Research in social cognition suggests that warmth and competence are universal dimensions based on how we perceive and relate to others. According to the stereotype content model (SCM), the universality of the dimensions results from one's need to survive and thrive in the social world (Fiske et al., 2007). The judgment of warmth anticipates others' intentions toward us and is accompanied by questions of their trustworthiness, sincerity, kindness, and friendliness (Aaker et al., 2010). Next, in temporal sequence, the judgment of competence anticipates others' capability to enact those intentions through their demonstrations of respect, self-efficacy, skills, confidence, and intelligence. The SCM's generality across place, levels, and time (Fiske, 2018) further supports the application of the social judgment dimensions to SET.

Purportedly, warmth corresponds with traits related to relationship-orientation, while competence coincides with task-orientation (Brambilla et al., 2010). However, this begs the question of whether a task-oriented teaching style is perceived as higher on competence than a relationship-oriented teaching style; and whether a relationship-oriented teaching style is perceived as higher on warmth than a task-oriented teaching style. Thus, the main research question we investigate is whether the evaluation of task and relationship-oriented teaching styles differs on the dimensions of warmth and competence.

Hypothesis 1: There would be a significant main effect of teaching style on the SET dimensions of warmth and competence.

Hypothesis 1a: A task-oriented teacher would be rated higher on competence than a relationship-oriented teacher.

Hypothesis 1b: A relationship-oriented teacher would be rated higher on warmth than a task-oriented teacher.

1.3. Student academic motivation

Student academic motivation is the vigor to engage, learn, and work effectively to achieve potential (Martin, 2010). Komarraju (2013) revealed that students who lacked academic motivation valued the 'caring' trait in a teacher, while motivated students strongly endorsed the importance of a teacher being more professional than caring. Hence, the finding implies that students with high academic motivation prefer a task-oriented teacher, while those with low academic motivation prefer a relationship-oriented teacher. This speculation calls into question the role of student academic motivation when evaluating the two teaching styles in the present study. According to Dignath-van Ewijk (2016), a match in task goals between two individuals forms the basis for assessing competence. Given that student academic motivation and teacher competence are grounded in the same need for task achievement (Guay et al., 2010), this study hypothesizes that academic motivation would control how students perceive the respective teaching styles on the SET dimension of competence.

Hypothesis 2: Student academic motivation will mediate the effect of teaching style on the SET dimension of competence.

2. Present study

In applying the social judgment dimensions to SET, participants of the present study will evaluate the task-oriented and relationship-oriented teaching styles based on the dimensions of warmth and competence. Additionally, the present study will test for the mediating effect of student academic motivation on the relationship between teaching style and the SET dimension of competence.

3. Methodology

3.1. Participants and design

One hundred and eight psychology undergraduates in Singapore ($M_{\text{age}} = 23.63$, $SD_{\text{age}} = 3.14$) participated in the exchange of course credits. The participants were randomly assigned to one of two between-subjects experimental conditions (teaching style: task vs. relationship).

3.2. Measures

3.2.1. Teacher judgment (DV)

Participants rated the teacher using the 12-item teacher judgment scale (Poorani and Singh, 2015; $\alpha = 0.94$). The scale was patterned after the established social judgment dimensions (Fiske et al., 2007) of *warmth* (e.g., 'I think this lecturer would be approachable'; 'this lecturer would be friendly toward individual students') and *competence* (e.g., 'this

lecturer is probably an intelligent individual' 'this lecturer would probably achieve all of their goals'). Participants responded on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

3.2.2. Student academic motivation (MV)

The 12-item academic motivation sub-scale (Martin, 2010; $\alpha=0.83$) of the Motivation and Engagement Scale–University/College was used to assess participants' academic motivation (e.g., If an assignment is difficult, I keep working at it trying to figure it out). Participants responded on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

3.2.3. Manipulation check

To check the success of the experimental manipulation of teaching style, participants rated the teacher on the Least Preferred Co-worker (LPC) scale (Fiedler, 1964). Participants described the teacher on a series of 18, 8-point bipolar semantic differential scales (e.g., rejecting—accepting). The favorable pole of each scale is scored as “8,” and the unfavorable pole as “1.” Scores for all scales are summed, with low-LPC scores (i.e., 18–64) indicating task-orientation; high-LPC scores (i.e., 73–144) indicating relationship-orientation; and mid-ranged LPC scores (i.e., 65–72) indicating a hybrid. The LPC scores were matched against the participant's assigned experimental condition.

3.3. Teaching style manipulation (IV) and procedure

The study was approved by the Human Research Ethics Committee at James Cook University (Ref.H7563). Upon arrival at the lab, participants were assigned to one of two experimental conditions (i.e., task-oriented vs. relationship-oriented teacher) *via* permuted block randomization.

Participants read a circular introducing a fictitious teacher who would mentor their research project. The circular contained information about the teacher's research interest, field of expertise, and years of experience. The teaching style was manipulated using an online chat programmed to facilitate interaction between the teacher and participants. The chat was presented on Microsoft PowerPoint's kiosk mode with images of the user session and loading and typing animations (see Figure 1).

The teacher's questions and instructions to participants were patterned after Northouse's (2018) Style Questionnaire ($\alpha=0.93$). Two versions were developed to correspond to each teaching style. The relationship-oriented teacher was programmed to show flexibility in making decisions by allowing participants to choose the role they would like to be assigned for the research project. In contrast, the task-oriented teacher was programmed to pre-assign roles to the participants. Participants engaged in the online chat according to their assigned experimental condition. There was a total of six blocks of interaction. Participants took ~6 min to interact with their teacher. Participants chose one of two response choices for each block. The response options were kept the same throughout both conditions. A sample block of interaction from both versions are shown in Figure 1. At the end of the chat, participants were invited to complete all the study's questionnaires. The study took ~20 min to complete. Participants were debriefed after they finished responding. Data analyses were performed using IBM's SPSS version 27.

4. Results

4.1. Manipulation check

To test if the teaching style manipulation produced intended effect, an independent *t*-test was performed on the LPC scores. It revealed a significant

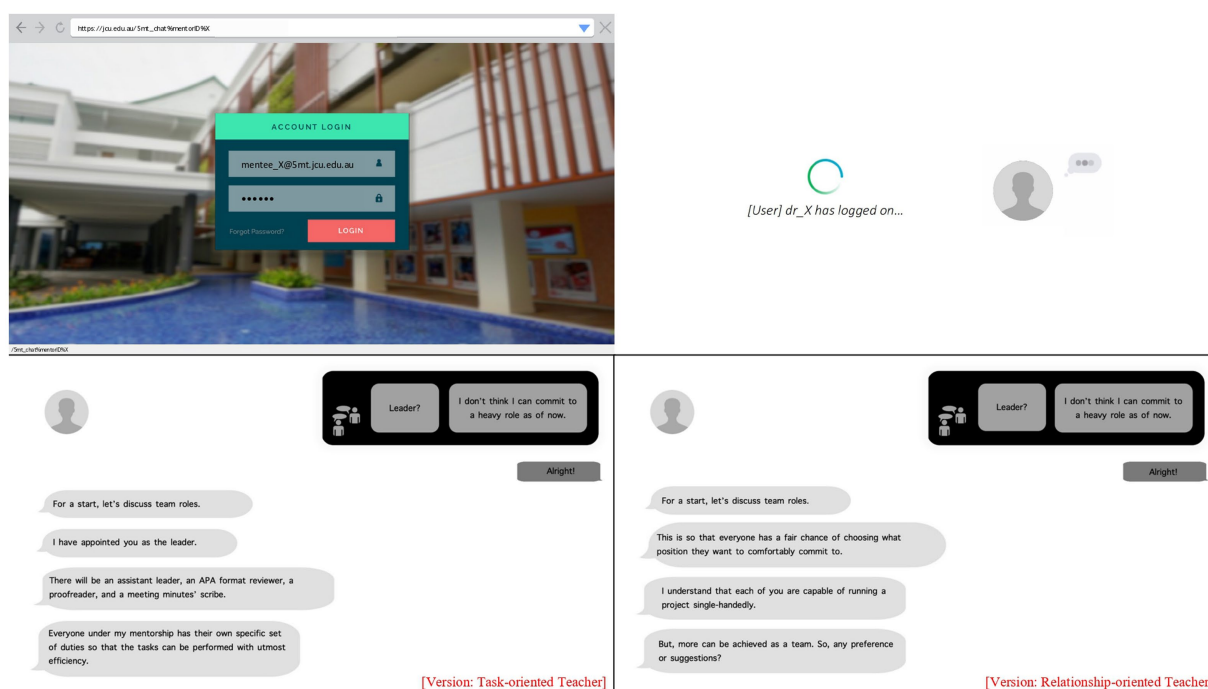


FIGURE 1

Images of the user session (i.e., the login screen of the online chat, loading, typing animations) and sample block of interaction between the (task-oriented vs. relationship-oriented) teacher and participant in the online chat.

TABLE 1 Factor patterns in the responses to the competence, warmth, and student academic motivation measures.

Responses to the items	Factor 1	Factor 2	Factor 3
Factor 1: Competence (C)			
C1: This lecturer is probably a gifted individual.	−0.86		
C2: This lecturer is probably a talented individual.	−0.89		
C3: This lecturer is probably an intelligent individual.	−0.86		
C4: This lecturer would probably be successful in life.	−0.87		
C5: This lecturer would probably achieve all of her goals.	−0.81		
C6: This lecturer is probably a competent individual.	−0.76		
Factor 2: Warmth (W)			
W1: I think this lecturer would be approachable.		0.91	
W2: This lecturer seems to make students feel welcome in seeking help in or outside of class.		0.85	
W3: This lecturer seems to have a genuine interest in individual student.		0.89	
W4: This lecturer would be friendly toward individual students.		0.9	
W5: This lecturer would probably respect students as individuals.		0.82	
W6: I would enjoy discussing controversial topics with this lecturer.		0.8	
Factor 3: Student Academic Motivation (SAM)			
SAM1			0.88
SAM2			0.9
SAM3			0.9
SAM4			0.92
SAM5			0.94
SAM6			0.97
SAM7			0.95
SAM8			0.93
SAM9			0.9
SAM10			0.9
SAM11			0.96
SAM12			0.94
Variance explained (%)	47.67	21.25	11.14

difference between the scores in two identifiable levels of the teaching style condition (i.e., relationship- and task-orientation), $t(106) = 20.86$, $p < 0.001$, Cohen's $d = 4.01$. Participants rated the relationship-oriented teacher ($M = 108.31$, $SD = 22.04$) higher than the task-oriented teacher ($M = 33.74$, $SD = 14.31$) on the LPC scale. The result was consistent with the LPC score interpretation wherein higher scores on the LPC scale indicate relationship orientation while lower scores indicate task orientation. This verified the effectiveness of the teaching style manipulation.

4.2. Construct distinction and reliability

To test for construct distinction among the measures of competence, warmth, and student academic motivation, a principal components analysis was conducted on all 24 items using direct oblimin rotation. Factor patterns demonstrated clear loadings on the three factors and explained 80.06% of the total variance. Table 1 lists the factor patterns in the responses.

In addition, the three distinct constructs showed excellent levels of internal consistency. The intercorrelations, reliability coefficients, and descriptives are presented in Table 2.

4.3. Hypotheses testing

4.3.1. Hypotheses 1, 1a, 1b

A multivariate analysis of variance (MANOVA) was used to examine the effect of teaching style on warmth and competence ($N = 108$). All underlying assumptions were supported. Findings revealed a significant main effect of teaching style on the combined DVs of warmth and competence, $F(2, 105) = 13.64$, $p < 0.001$; Wilk's $\Lambda = 0.79$, partial $\eta^2 = 0.21$, indicating that Hypothesis 1 was supported. The individual DVs were analyzed at the Bonferroni-adjusted alpha level of 0.025. There was no significant effect of teaching style on competence ($p = 0.248$), indicating that Hypothesis 1a was not supported. However, the effect of teaching style on warmth was statistically significant, $F(1, 106) = 20.52$, $p < 0.001$, $\eta^2 = 0.16$, indicating that Hypothesis 1b was supported. Participants rated the relationship-oriented teacher significantly higher on warmth ($M = 5.82$, $SD = 1.11$) than the task-oriented teacher ($M = 4.73$, $SD = 1.37$).

4.3.2. Hypothesis 2

Mediation analysis was performed using SPSS Process Model 4 (Hayes, 2018). Model 4 estimated (1) the indirect effect (IE) of

teaching style on competence *via* academic motivation, (2) the bias-corrected 95% confidence interval (CI) around that IE from 5,000 bootstrap resamples, and (3) the mediation effect size (ES). We accept the IE as greater than zero if its bias-corrected 95% CI excluded zero.

The IE of teaching style on competence *via* academic motivation was significant, $IE = 0.21$, bias-corrected 95% CI [0.068, 0.371]. However, the direct effect of teaching style on competence was nonsignificant, $b = -0.056$, $t = -0.437$, $p = 0.66$. While a mediation in the absence of a total effect ($b = 0.151$, $t = 1.162$, $p = 0.25$) may seem contradictory, evidence has suggested that the lack of a total effect does not preclude the possibility of observing an IE (Rucker et al., 2011; Kenny and Judd, 2014). This anomaly may be attributed to the inadequate sample size of the present study. Post-hoc power analysis revealed an obtained power of 0.73 ($\alpha = 0.05$; Faul et al., 2009). Thus, it can be argued that student academic motivation mediated the relationship between teaching style and competence, indicating that Hypothesis 2 was supported. Results are presented in Figure 2.

TABLE 2 Inter correlations, reliability coefficients, and descriptive of the competence, warmth, and student academic motivation measures.

	1	2	3
1. Competence	–	–	–
2. Warmth	0.23**	–	–
3. Student Academic Motivation	0.42**	–0.05	–
Number of items	6	6	12
Cronbach's Alpha (α)	0.93	0.93	0.98
<i>M</i>	4.8	5.27	5.57
<i>SD</i>	1.35	1.36	1.63
Actual range	1–7	1.33–7	1–7
Potential range	1–7	1–7	1–7

** $p < 0.01$.

5. Discussion

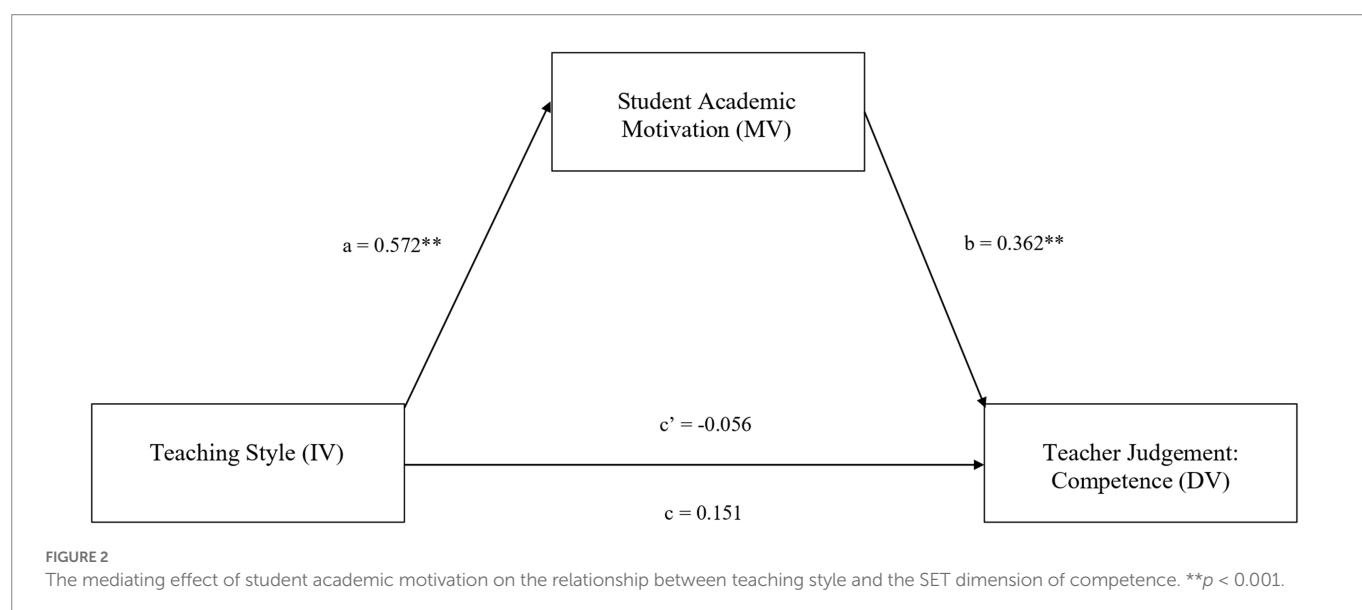
The present study aimed to investigate the effect of teaching style on SET. Results indicated a higher SET rating for a relationship-oriented than a task-oriented teacher. Further, student academic motivation mediated the link between teaching style and judgment of competence.

5.1. Findings and implications

Hypothesis 1, which predicted a significant main effect of teaching style on the dimensions of SET, was supported. A significant multivariate effect meant that the two teaching styles were discriminated against on the linear combination of warmth and competence. This finding supported the two fundamental and distinct categories of leadership style (Northouse, 2018). The task-relationship model continued to differentiate beyond leadership literature. We can say that the online chat patterned after Northouse (2018) effectively discriminates between the two teaching styles, and teachers are perceived as leaders based on their behavior or style.

Hypothesis 1a, which predicted that a task-oriented teacher would be rated higher on competence than a relationship-oriented teacher, was rejected, implying that students perceived both teaching styles as relatively equal on the dimension of competence. Cuddy et al. (2008) argue that task-orientation is not fully representative of competence. Task-orientation focuses more on taking action, whereas competence entails possessing skills, talents, and capabilities. In the online chat, the task-oriented version of the teacher was programmed to mainly emphasize goal setting and delegation of workload (i.e., taking actions). According to Dignath-van Ewijk (2016), an individual's competence only matters when they have personal relevance to the perceiver. In our study, a lack of information about the teacher's distinguishable competence traits and the low importance of the task may have diminished the sense of personal relevance for the participants.

Hypothesis 1b, which predicted a relationship-oriented teacher would be rated higher on warmth than a task-oriented teacher, was supported. This was consistent with Cohen et al. (2004)'s description of relationship orientation comprising warmth traits. Overall, findings



show that the judgment of competence is constant while warmth varies across both teaching styles. This supports the supremacy of warmth over competence in that people are cognitively more sensitive to information regarding others' warmth than competence cues (Cuddy et al., 2008). An important implication is that enacting warmth cues play a pivotal role in managing student impressions of the teacher and that warmth is specific to a relationship-oriented teaching style.

Hypothesis 2, which predicted student academic motivation would mediate the effect of teaching style on the SET dimension of competence, was supported. The mediation analysis revealed that relative to a relationship-oriented teacher, a task-oriented teacher was rated on average 0.21 (*ab*) units higher on competence due to student academic motivation. This was in line with Dignath-van Ewijk (2016) research, where a match in task goals forms the basis for student appraisal of teacher competence. This proposes that practicing a teaching style appropriate for the student's academic motivation is pivotal for high SET scores on competence.

5.2. Contributions

The present study has extended the application of organizational and social cognition principles to research in education. It has not only tested but established the universality of social judgment dimensions in setting the parameters of SET. Further, findings supported the universality of the stereotype content model and have established high reliabilities for the two-factor model of warmth and competence. In addition, our study champions the adoption of the two-factor leadership models in the teaching domain. This encourages further theoretical and empirical explorations in generalizing ideas and theories developed within organizational psychology to the context of teaching.

5.3. Limitations and future directions

The present study was constrained to a smaller sample size with post-hoc power analysis (0.73; $\alpha=0.5$) falling below the recommended power of 0.8 (Faul et al., 2009), thus warranting a bigger sample size. Further, future studies could expand on the present findings by including the gender of the teacher and student as variables of interest. Understanding potential gender biases may contribute to the existing literature as extraneous factors biasing SET.

6. Conclusion

The present study extends the application of organizational and social psychology principles to research in the educational setting. By adopting universal dimensions of social judgment to the parameters of SET, the study has reinstated the supremacy of warmth in the SET context. Furthermore, fostering a match in task goals between a teacher and student improves ratings of teacher competence.

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Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Human Research Ethics Committee, James Cook University, Australia (Ref. H7563). The patients/participants provided their written informed consent to participate in this study.

Author contributions

CK contributed to the conception and design of the study, data collection, data analysis, and wrote the first draft of the manuscript. SS contributed to the manuscript preparation, provided advice on the design of the study and statistical methods. All authors contributed to the manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The effect of teacher support on Chinese university students' sustainable online learning engagement and online academic persistence in the post-epidemic era

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Since entering the post-epidemic era of COVID-19 at the end of 2021, schools have mostly adopted a combined online and offline teaching mode to effectively respond to the normalized epidemic, which has changed the traditional learning mode of students. Based on the study demand-resources (SD-R) model theory, this study developed a research model and proposed six research hypotheses to explore the relationship between Chinese university students' perceived teacher support (PTS), online academic self-efficacy (OAS-E), online academic emotions (OAE), sustainable online learning engagement (SOLE), and online academic persistence (OAP) in the post-epidemic era. In this study, 593 Chinese university students were invited to respond to a questionnaire survey using the convenience sampling method. The results of the study showed that: PTS had a positive effect on OAS-E and OAE; OAS-E had a positive effect on OAE; OAS-E and OAE had a positive effect on the students' SOLE; and SOLE had a positive effect on their OAP. Based on the analysis, it is recommended that teachers provide more support and resources to further enhance students' academic self-efficacy and academic emotions, and thus ensure students' SOLE and OAP.

KEYWORDS

post-epidemic era, Chinese university students, perceived teacher support, sustainable online learning engagement, online academic persistence

1. Introduction

To eradicate poverty, implement quality education, and achieve human well-being and development, in 2015, the 17 Sustainable Development Goals (SDGs) were established by the United Nations (UN), which also provided a new vision and goals for action for sustainable development (United Nations, 2015). Among them, Sustainable Development Goal 4 (UN's SDGs4) purposes at how to achieve quality education and promote lifelong learning opportunities for all to better achieve sustainable development in education (UN, 2020). However, the persistence of the COVID-19 epidemic has affected the implementation of the SDG process. Moreover, since the end of 2021 in the post-COVID-19 era, the associated risk and regular epidemic prevention has had a significant influence on individual's social and economic livelihoods (Cheng et al., 2021), including in the field of education. As the COVID-19 epidemic

continues to recur, many schools are rapidly adopting online delivery models so that students can continue their education online (Wang et al., 2021), which not only changes the traditional learning patterns of students, but also makes the continued implementation of online learning an important issue for the sustainability of education in the post-epidemic era.

In order to effectively respond to the complex situation of the epidemic, in February 2020, the Chinese Ministry of Education issued the Guidance on the Organization and Management of Online Teaching and Learning in General Universities during Epidemic Prevention and Control. Many Chinese universities have adopted online or non-face-to-face learning approaches to transform traditional educational activities into digital teaching and learning modes (Putra et al., 2019; Ye et al., 2022). Online learning plays a crucial role in the current educational environment because it can solve many of the problems of traditional offline teaching and learning. The present online teaching cases have more flexibility (Fagö-Olsen et al., 2020), and more importantly, online learning helps students to learn online anytime across geographical space (Maatuk et al., 2022). However, the sustainable online learning engagement (SOLE) of university students in China during the epidemic blockade is not optimistic, as evidenced by the low motivation of students to engage in online learning (Yang et al., 2021) and their tendency to be distracted from completing online learning tasks in a focused and sustained manner, which may even lead to university students in China dropping out or losing their enthusiasm for learning (Lee et al., 2019). Whereas previous studies have found that students' academic persistence as an important variable in online learning environments, their academic persistence not only affects their willingness and behavior to engage in online learning, but may also influence the effectiveness of their online learning (Yu et al., 2022). More importantly, higher academic persistence of students will lead to higher online learning engagement status (Jung and Lee, 2018). Therefore, in the context of the post-epidemic era, how to promote SOLE and online academic persistence (OAP) among university students has become an essential matter for the sustainable development of education in the post-epidemic era.

According to SDG4, the educational environment and student behavioral outcomes are interconnected and act in a sustainable system that continuously and dynamically influences student behavior and outcomes (Tran et al., 2020). That is, the recurrence of COVID-19 has brought about changes not only in the learning environment but also in the learning patterns of students (Hong et al., 2021a,b). In addition, considering that teacher support is an important social resource, during the COVID-19 pandemic, teacher behavior not only affects students' motivation to learn online but also affects their level of engagement in online learning (Adeshola and Agoyi, 2022). Related studies have found that when conducting online courses such as Small Private Online Courses (SPOCs) and Massive Open Online Courses (MOOCs), the lack of effective communication and interaction between teachers and students and the failure to understand students' learning dynamics and participation status in a timely manner have led to a low level of student participation in such courses (Liu et al., 2019; Shen and An, 2022). In addition, prior to the outbreak, due to the lack of face-to-face instruction and the large spatial distance between learners and instructors, many students tend to be less engaged in online learning than in traditional learning environments, which has a more significant impact on their sustainable and effective engagement in online learning (Kim et al., 2019). While the implementation of online learning has become an essential and regular mode of instruction in the post-epidemic era, it is

not yet known how faculty support will influence student engagement and OAP in online learning.

Furthermore, the study demand-resources (SD-R) model is based on the JD-R model theory and focuses on the relationship between student learning requirements, learning resources and health. According to the SD-R model recommended by Lesener et al. (2020), study resources can facilitate student engagement and produce positive learning outcomes in the larger educational context. In other words, when taking online courses, students interact with study resources in a two-way manner and are connected to the educational environment and system in a continuous and dynamic way (Koob et al., 2021). Study resources can therefore influence not only students' motivation but also their learning behaviors and outcomes (Robins et al., 2015). Researchers have also explored the relationship between learning engagement and psychological well-being among university students based on the SD-R model and found that more study resources can influence students' individual resources, which in turn affects aspects of their psychological well-being (Wei et al., 2022). Related research has found that students may be more actively engaged in course learning with teacher support and engage in learning activities with a higher sense of academic self-efficacy (Lauermann and ten Hagen, 2021). At the same time, if students can feel happy and relaxed in online courses, it will not only facilitate their active participation in online learning activities, but also influence their performance in a sustainable and positive way (Jdaitawi, 2020). As the SD-R model theory suggests, more environmental and individual resources are closely related to student behavior and outcomes (Lesener et al., 2020). That is, environmental resources such as teacher support may influence students' academic performance and persistence through their academic self-efficacy and academic emotions.

However, most studies on online learning during COVID-19 explored the relationship between students' academic performance and mental health or focused on students' learning satisfaction in different online courses (Yekefallah et al., 2021). Fewer studies have discussed the aspects of supporting university students' engagement and intention to learn through environmental resources such as teachers (Jin et al., 2021), or of further promoting university students' engagement and persistence by stimulating their OAS-E and sustaining their positive academic emotions. However, in the current post-epidemic context, it has become important to explore how faculty can support university students' online learning engagement. Thus, this study explored the association among perceived teacher support (PTS), online academic self-efficacy (OAS-E), online academic emotions (OAE), SOLE, and OAP in online course learning in a post-epidemic context based on the SD-R model theoretical framework and SDG4.

2. Research model and hypothesis

In this chapter, this study constructed the framework diagram of this study model based on the existing literature and theoretical models, and proposes the hypothetical relationships among the research variables in conjunction with the theoretical models and relevant literature exploration.

2.1. Research model

According to the SD-R model, study resources support student engagement and positive study outcomes (Lesener et al., 2020). Study

resources include environmental resources (e.g., perceived teacher support, classroom climate, etc.), personal resources (e.g., academic self-efficacy and psychological resilience), and learning behaviors including learning engagement (Wei et al., 2022). Thus, PTS can be considered as an environmental resource, OAS-E and academic emotions can be considered as personal resources, and SOLE and OAP can be considered as learning outcomes and behaviors. That is, based on the post-epidemic context, the higher the PTS among university students in the current online learning environment, the more likely it is to be conducive to motivating their OAS-E and academic emotions, which will continue to influence their online learning engagement and OAP. Therefore, this study investigated the relationship between university students' PTS, OAS-E, OAE, SOLE, and OAP by combining the SD-R model theory and mapped the research model structure as follows (Figure 1).

2.2. Research hypothesis

2.2.1. The effect of perceived teacher support on online academic self-efficacy and online academic emotions

In SDG4, teachers are an important factor influencing educational sustainability, because teachers are not only the primary guides of their students, but they also continue to influence student behavior and development (Bengtsson et al., 2020), and in related research it has been found that more teacher support not only motivates students to engage in course learning, but also motivates student self-efficacy, which in turn impacts their academic achievement and performance (Lauermann and ten Hagen, 2021). Moreover, self-efficacy is seen as a key factor in motivating learners in online courses. It is the confidence and beliefs that learners have about their own task completion (Bandura, 1977; Berga et al., 2021), and it influences learners' behavioral outcomes in specific contexts. With the COVID-19 pandemic, instructors have become increasingly important for student

learning in online courses such as MOOCs and SPOCs. Those with more support tend to have higher academic self-efficacy and the support continues to influence student engagement in online learning (Alamri, 2022). In addition, due to the impact of the epidemic, many schools have adopted online teaching models or non-face-to-face approaches, which are prone to a lack of effective and sustainable positive teacher-student interactions which then affect the students' OAS-E (Gao et al., 2021; Adeshola and Agoyi, 2022). That is, in the post-epidemic context, more PTS would be beneficial for stimulating students' OAS-E. Grounded on the above literature, this study proposed the following research hypothesis:

H1: PTS has a positive effect on OAS-E.

According to the SD-R model theory, environmental resources such as social, teacher, and family support can better support students' development (Wei et al., 2022), while teacher support, as an important social resource, plays a crucial role in promoting student behavior and development and can be more involved in course learning by stimulating students' positive emotions (Lei et al., 2018). Furthermore, research has found that teacher support is significantly related with positive academic emotions and that students who perceive greater teacher support have greater positive emotions such as liking, enjoyment, and hope, which continue to influence their effectiveness in course learning (Sadoughi and Hejazi, 2021). During the current COVID-19 pandemic, the lack of effective teacher support and continuous guidance in online courses conducted due to the impact of the pandemic has resulted in many students having more negative academic emotions such as anxiety, depression, and despair (Nandi et al., 2021). In the current post-epidemic era, more instructor support in online learning may affect students' learning status under the risk and normative management of the epidemic (Song et al., 2022). Therefore, in the post-epidemic context, students will feel more positive academic emotions when they have a higher level of teacher support while participating in online learning. Therefore, this study proposed the following research hypothesis:

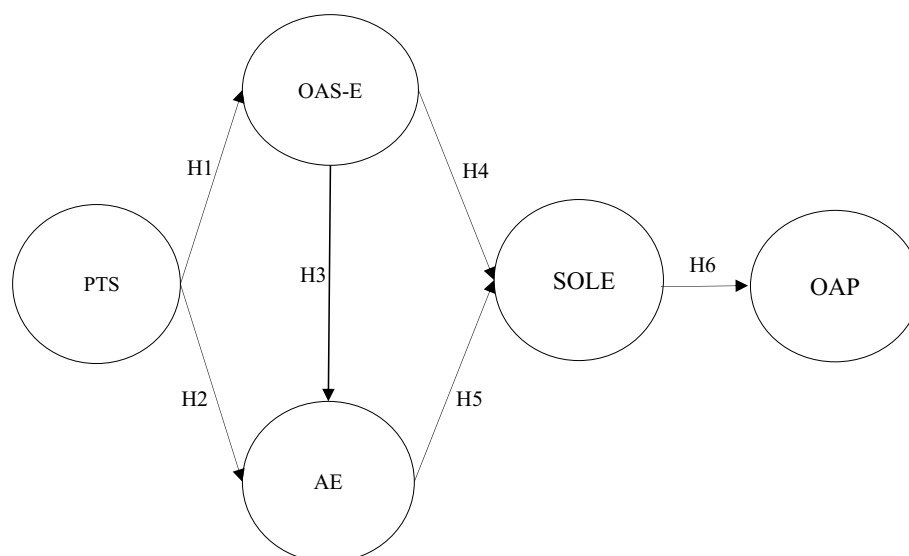


FIGURE 1

Research model. Perceived teacher support (PTS), online academic self-efficacy (OAS-E), online academic emotions (OAE), sustainable online learning engagement (SOLE), and online academic persistence (OAP).

H2: PTS has a positive effect on OAE.

2.2.2. The effect of online academic self-efficacy on online academic emotions

During the learning process, learners' emotions, cognition, and learning states are intertwined and contribute to their behavioral outcomes (De Carolis et al., 2021). In particular, positive emotions can influence learners' learning performance through individual factors such as enhanced self-efficacy and self-regulation (Yu et al., 2022). Especially since the COVID-19 pandemic, some students have been prone to negative emotions such as anxiety, depression, isolation, and even the inability to consistently complete online learning tasks due to the impact of the epidemic prevention and control quarantine (García-Álvarez et al., 2021). Moreover, studies have also found that pandemic-induced disruptions and uncertainty affect students' academic self-efficacy to some extent, which may lead to negative emotions such as anxiety, worry, and fear (Berman et al., 2022). In contrast, in online learning, more academic self-efficacy was found to be positively associated with more positive emotions (Soncini et al., 2021). That is, students who have a higher sense of academic self-efficacy in an online learning environment will feel more positive emotions such as pleasure. Therefore, in the post-epidemic era, this study proposed the following research hypotheses:

H3: OAS-E has a positive effect on OAE.

2.2.3. Effects of online academic self-efficacy and online academic emotions on sustainable online learning engagement

Learning engagement refers to a state of focus, energy, and dedication of learners in a learning environment to consistently complete learning tasks (Schaufeli et al., 2002). Moreover, it is often used to assess student online learning outcomes and performance (Alamri, 2022). In the case of online course learning, academic self-efficacy is seen as the confidence and beliefs that learners have about taking online courses such as MOOCs and SPOCs, and is closely linked to learners' motivation and behavior, which continues to influence their persistence in continuing to complete online learning (Adeshola and Agoyi, 2022). In addition, students' academic self-efficacy can generate more motivation in online learning environments due to the ongoing influence of the epidemic (Kuo et al., 2021). Due to the duration of online courses and the need for more independent engagement, students' OAS-E plays a critical role in their continued participation in online learning (Gao et al., 2021). That is, in the post-epidemic context, those students with higher OAS-E will have higher SOLE. Therefore, in the post-epidemic era, this study proposed the following research hypotheses:

H4: OAS-E has a positive effect on SOLE.

During the COVID-19 pandemic, the state of sustainable student engagement in learning was often considered a key indicator of learning in online courses (Adeshola and Agoyi, 2022), as the level of sustainable student engagement in online learning affects not only the behavioral performance of students but also the educational quality of online courses (Poon et al., in press). In contrast, in online learning environments, students' academic emotions serve as an important individual factor, and their emotional state continues to influence

learning interactions and engagement (Wang et al., 2021). Related research found that during the COVID-19 pandemic, students experiencing more positive and fewer negative academic emotions would have more positive interactions with teachers, peer interactions, and a greater willingness to stay engaged in online course learning (Yu et al., 2022). On the contrary, the epidemic lockdown brings great negative emotions to students, which tend to produce depression, loneliness, and anxiety. If these negative academic emotions are not eliminated in time, they will continue to affect students' engagement and may even lead to problems such as boredom and academic suspension (Hassan et al., 2021). More importantly, due to the impact of the epidemic, unlike other global online learners, Chinese university students are prone to negative emotions such as anxiety and depression in online learning, which may be detrimental to their participation in online learning due to the stricter and more persistent embargo measures in China (Yang et al., 2021). Therefore, this study proposed the following research hypothesis:

H5: OAE has a positive effect on SOLE.

2.2.4. Effect of sustainable online learning engagement on the academic persistence of online learning

The concept of lifelong learning has become an important issue in SDG4 (Ossiannilsson, 2022), and in the current post-epidemic era, students, as key individuals in educational sustainability, are influencing the achievement of the SDGs by their learning status and their ability to complete their education sustainably (Hanemann, 2019). Related research has also found that the behavioral, cognitive, and affective levels of student engagement in online learning in MOOC learning environments consistently influence their learning behavior outcomes and are strongly associated with the persistence of the MOOC learning environment (Jung and Lee, 2018; Kuo et al., 2021). Moreover, studies have found that students' online learning engagement during the COVID-19 pandemic was strongly related with learning persistence, with higher online learning engagement having higher learning persistence (Adeshola and Agoyi, 2022). In other words, students will have higher OAP when they have a higher level of SOLE. Therefore, in the post-epidemic era, this study proposed the following research hypothesis:

H6: SOLE has a positive effect on OAP.

3. Materials and methods

3.1. Research procedure

The sample of this study was drawn from a comprehensive university in Guizhou province, China, where online courses had been offered before the beginning of the epidemic and students had experience in online learning. And the impact of COVID-19 required online teaching during the period of this study, so this study used convenience sampling to distribute online questionnaires to 593 university students in Guizhou province, China, through the Wenjuanxing platform.

Chinese university students were invited to fill out online questionnaires on social media platforms such as WeChat and QQ. The online questionnaire for this study was collected from May 16 to June 20, 2022.

3.2. Participants

To better investigate the relationship between teacher support and university students' SOLE and OAP, 593 questionnaires were collected, and after deleting those questionnaires with incomplete or short response times (less than 1 min), 550 were considered valid, with an effective rate of 92.7%. Additional respondent background information is shown in Table 1.

3.3. Measurement

This study used a quantitative research method to conduct this study. The questionnaire method is a social science research method that collects data through a cross-sectional approach and infers the characteristics of the aggregate by sampling to represent the aggregate data while controlling for errors (Kotrlík and Higgins, 2001). At the same time, the questionnaire method has the advantage of inferring the total with a small sample of data, and has the characteristics of rapidity, convenience, and reliability (Nayak and Narayan, 2019). Therefore, the measurement instrument of this study was revised and developed from previous studies and theories, and the fluency and comprehension of the questionnaire were further confirmed by inviting three experts in the field of digital learning for expert validity review and revision. We also invited 10 Chinese university students to complete the online questionnaire as part of the development process. In addition, in order to better measure the research scale, improve the validity of the completed responses and facilitate statistical analysis, this study used closed-ended questions to measure the research participants.

TABLE 1 Demographic details of participants.

Variables	Content
Gender	145 males (26.4%)
	405 females (73.6%)
University	195 freshmen (35.5%)
	158 sophomores (28.7%)
	197 juniors (35.8%)
Areas of expertise	423 students (76.9%) in humanities and social sciences online courses
	127 students (23.1%) in natural science online courses
Online course platforms	126 students (22.9%) used DingTalk
	189 students (34.3%) used VooV Meeting
	46 students (8.4%) used ZOOM
	103 students (18.7%) used WeChat
	51 students (9.3%) used QQ
	35 students (6.4%) used other platforms
Online learning experience before COVID-19	117 students (21.3%) had online learning experience prior to the COVID-19 pandemic
	433 students (78.7%) had no previous online learning experience

3.3.1. Perceived teacher support

Perceived teacher support (PTS) is defined as a behavior that provides students with targeted instruction and promotes active learning in the course learning environment. It is a process that gives students more autonomy, competence, and emotional support (Liu et al., 2021). Thus, according to the above definitions, this study adapted Teachers Support Scale (TSS) of Stornes et al. (2008) with 13 questions to assess university students' perceptions of receiving teacher support during the post-epidemic period. Example questions include "The teachers are patient in listening to our ideas and ways of doing things in the online course" and "Whenever I have problems in the online course, the teachers will provide me with timely help."

3.3.2. Online academic self-efficacy

According to definition of Bandura (1986) of self-efficacy (S-E), S-E refers more to an individual's cognitive and psychological state of confidence and beliefs about completing specific learning tasks in the learning process (Hong et al., 2021a,b). Consequently, according to the above definition, this study adapted S-E Questionnaire (Grit-S) of Bandura (1986) to measure OAS-E with a total of 10 questions to assess the OAS-E of university students during the post-epidemic period. Examples of questions are: "When I have problems with online learning, I can usually think of some solutions" and "When I study online, no matter what problems I encounter, I believe I can figure out how to solve them."

3.3.3. Online academic emotions

Academic emotion is a learning experience that encompasses both positive and negative emotions, with positive emotions including enjoyment of learning, hope, and pride. On the other hand, negative emotions including anger, boredom, and anxiety can promote or decrease student behavior and subsequent academic achievement (Kohoulat et al., 2017). Consequently, according to the above definition, this study adapted the Achievement Emotions Questionnaire (AEQ) developed by Pekrun et al. (2011) with eight questions to assess the academic emotions of university students during the post-epidemic period. Examples of questions are: "I like studying online" and "I feel irritated when studying online."

3.3.4. Sustainable online learning engagement

Engagement in learning is widely defined as the level of energy, focus, and dedication an individual exhibits when engaged in learning activities (Wei et al., 2022). Based on these definitions, this study adapted Schaufeli et al.'s (2002) Work Engagement Questionnaire (WE), with nine questions, to assess the engagement of university students in online sustainable learning during the post-epidemic period. Example questions include: "I feel sustainably energized in online courses" and "I feel sustainably happy in online courses."

3.3.5. Online academic persistence

Online academic persistence (OAP) is a measure used to assess students' willingness to continue their education (Adeshola and Agoyi, 2022). Based on these definitions, this study adapted Student Persistence Questionnaire (SP) of Shin (2003) with six questions to assess the OAP of university students during the post-epidemic period. Example questions are: "No matter how difficult it is, I will continue to complete the online course" and "I will continue to take online courses in the future."

3.4. Data analysis

Structural equation modeling is a way to measure the structural relationships between individual study variables, to explain the hypothesized associations between individual indicators by reducing measurement error (Lee Helm et al., in press), and to assess the validity of measurement models by examining model constructs (Deng et al., 2018). Thus, in this study, after item analysis and reliability analysis using SPSS statistical software, the reliability of the study scale was confirmed through validation factor analysis. This study investigated the association between PTS, OAS-E, OAE, SOLE, and OAP by analyzing structural equation modeling tests using the AMOS 24.0 software.

4. Results and discussion

4.1. Item analysis

In order to test the fit indices of the items by identifying the original items that did not meet the criteria, this study conducted item analysis through first-order validated factor analysis (Kline, 2015). When the χ^2/df is less than 5, the RMSEA is lower than 0.1, and the GFI is greater than 0.80, then the item has a good fit (Hair et al., 2019). Those items with factor loadings (FL) lower than 0.5 should be deleted. As a result, PTS decreased from 13 to 10 questions; OAS-E decreased from 10 to seven questions; OAE decreased from eight to seven questions; SOLE decreased from nine to eight questions; and OAP decreased from six to five questions, as seen in Table 2.

4.2. Reliability and validity analysis

In structural equation modeling, the reliability and validity of statistical data can be assessed by testing the reliability of the study constructs (Henseler et al., 2016). To measure the intrinsic consistency of a construct, a Cronbach's alpha value with a Composite Reliability (CR) value higher than 0.7 (Hair et al., 2011) indicates a good intrinsic consistency of the construct. In the current study, Cronbach's α values were from 0.79 to 0.96 and CR values ranged from 0.82 to 0.94, both of which were greater than 0.7, demonstrating good reliability of the data in this study (see Table 3).

In addition, values of FL and Average Variance Extracted (AVE) higher than 0.5 indicate good convergent validity of the construct (Hair et al., 2011). In this study, FL values ranged from 0.72 to 0.82 for PTS, 0.60 to 0.78 for OAS-E, 0.64 to 0.76 for OAE, 0.66 to 0.76 for SOLE, and 0.63 to 0.81 for OAP. In contrast, the AVE values of the constructs in this

study ranged from 0.51 to 0.61, which were above 0.5 and so had good validity.

In addition, when the value of the square root of AVE is greater than the relevant value of each construct, it is considered as having good discriminant validity (Awang, 2015). In this study, the square root of AVE for each construct was larger than the relevant value of the construct (see Table 4).

4.3. Model fit analysis

SEM analysis can examine the overall fit and differential acceptance of the study model (Stanley and Edwards, 2016). When the value of χ^2/df is smaller than 5 (Hair et al., 2010); RMSEA is smaller than 0.1; GFI, AGFI, NFI, NNFI, CFI, IFI, and RFI are all higher than 0.800 (Abedi et al., 2015), and PNFI and PGFI are both larger than 0.500 (Hair et al., 2010), it indicates that the study model has good fitness. In this study, the fit values of the study model were as follows: $\chi^2/df=2.04$, RMSEA=0.04, GFI=0.89, AGFI=0.87, NFI=0.89, NNFI=0.94, CFI=0.94, IFI=0.94, RFI=0.88, PNFI=0.83, and PGFI=0.78, indicating good model fitness.

4.4. Path analysis

This study proposed six research hypotheses and conducted research model validation based on learning needs resources. Results indicated that PTS had a positive influence on OAS-E ($\beta=0.51^{***}$; $t=10.78$) and OAE ($\beta=0.21^{***}$; $t=3.88$); OAS-E had a positive influence on OAE ($\beta=0.30^{***}$; $t=5.34$); OAS-E ($\beta=0.37^{***}$; $t=6.98$) and OAE ($\beta=0.15^{**}$; $t=3.07$) had a positive influence on SOLE; and SOLE had a positive influence on OAP ($\beta=0.45^{***}$; $t=8.30$), seen in Figure 2.

In addition, Hair et al. (2010) suggested that explanatory power values in between 0.25, 0.50, and 0.75 indicate weak, moderate, and strong levels of explanatory power. In contrast, in this study, the explanatory power of OAS-E was 26%, OAE was 19%, SOLE was 21%, and OAP was 21%; this indicates that this study had low and above moderate explanatory power, as can be seen in Figure 2.

4.5. Indirect effect analysis

Indirect effects analysis showed that PTS was indirectly positively related to SOLE and OAP ($\beta=0.41^{***}$, $\beta=0.39^{***}$); OAS-E was indirectly positively correlated with OAP ($\beta=0.43^{***}$), and OAE and SOLE were indirectly positively correlated with OAP ($\beta=0.13^{**}$) with

TABLE 2 First-order CFA.

Construct	χ^2	df	χ^2/df	RMSEA	GFI	AGFI	FL
Threshold	–	–	<5	<0.10	>0.80	>0.80	>0.5
PTS	73.14	17.05	4.29	0.77	0.94	0.91	0.72–0.82
OAS-E	53.43	14	3.82	0.71	0.97	0.94	0.60–0.78
OAE	56.65	14	4.05	0.74	0.97	0.94	0.64–0.76
SOLE	69.02	20	3.45	0.67	0.97	0.94	0.66–0.76
OAP	6.12	2	3.06	0.61	0.99	0.97	0.63–0.81

TABLE 3 Reliability and validity analysis.

Construct	<i>M</i>	<i>SD</i>	α	FL	CR	AVE	<i>t</i>
PTS	3.83	0.66	0.96	0.78	0.94	0.61	18.61–21.84
OAS-E	3.72	0.54	0.91	0.72	0.89	0.53	13.01–14.05
OAE	3.34	0.71	0.91	0.71	0.88	0.51	15.57–19.33
SOLE	3.55	0.61	0.92	0.70	0.89	0.53	14.75–17.53
OAP	3.99	0.58	0.79	0.72	0.82	0.53	12.74–15.15

TABLE 4 Discrimination validity analysis.

Construct	1	2	3	4	5
(1) PTS	0.78				
(2) OAS-E	0.48	0.73			
(3) OAE	0.32	0.36	0.71		
(4) SOLE	0.25	0.35	0.46	0.73	
(5) OAP	0.25	0.21	0.28	0.40	0.73

95% confidence intervals excluding 0 (** $p < 0.01$, *** $p < 0.001$), as can be seen in Table 5.

4.6. Discussion

4.6.1. Perceived teacher support has a positive effect on online academic self-efficacy and academic emotion

The results of this study indicated that PTS had a positive effect on students' OAS-E and academic emotion; that is, when students perceived higher teacher support it would be conducive to higher OAS-E and positive academic emotion, consistent with previous research. For example, Research indicates that teachers play an important role in educational sustainability (Bengtsson et al., 2020), not only by teaching the curriculum and providing more support to promote student behavior and outcomes (Lauermann and ten Hagen, 2021). Furthermore, Alamri (2022) stated that due to the COVID-19 pandemic, greater faculty support plays a crucial role in online courses such as MOOCs and SPOCs offered by schools because faculty support promotes students' academic self-efficacy and further motivates students to stay engaged in online courses. In addition, Adeshola and Agoyi (2022) indicated that students generally had low academic self-efficacy during the COVID-19 epidemic because teachers were less likely to have positive and sustainable interactions with them. In other words, more teacher support was strongly related with higher academic self-efficacy among students and was also positively related with positive academic emotion (Lei et al., 2018). In addition, Nandi et al. (2021) indicated that students' negative emotions were more prominent during the COVID-19 epidemic and that more teacher support was beneficial for reducing their negative emotions. As Sadoughi and Hejazi (2021) argued, teacher support is closely related to positive academic emotions such as student liking and pleasure. However, there are fewer studies on online learning in the post-epidemic era, so this study will further deepen the research

on perceived teacher support, online academic self-efficacy, and academic emotions based on the post-epidemic era context.

4.6.2. Online academic self-efficacy has a positive effect on academic emotion

The results of this study showed that OAS-E had a positive effect on students' online academic mood, that is, when students perceived higher OAS-E it would be conducive to a more positive academic mood, consistent with previous research. In contrast, Yu et al. (2022) stated that when learners have good positive emotions, their academic self-efficacy is enhanced and affects both their academic behavior and performance. Meanwhile, Soncini et al. (2021) argued that students' academic self-efficacy in online learning courses can motivate them to have positive emotions such as pleasure and liking in online courses. In addition, García-Álvarez et al. (2021) indicated that during the epidemic prevention and control period, students are prone to some negative emotions such as loneliness and anxiety in online courses if their academic self-efficacy is low. In summary, in the post-epidemic context, when students gain higher OAS-E, they are more likely to have positive emotions in online course learning. Therefore, in the process of achieving the SDGS4 goals, it is more important to stimulate students' online academic self-efficacy and acquire positive academic emotions in order to sustain a positive learning state. However, there are fewer studies on academic self-efficacy and academic emotions of online learning among university students in the post-epidemic era. Therefore, this study will further deepen the research on online academic self-efficacy and academic emotions based on the post-epidemic era context.

4.6.3. Online academic self-efficacy and online academic emotions have a positive effect on sustainable online learning engagement

The results of this study indicated that students' OAS-E and OAE had a positive effect on SOLE; that is, when students perceived higher OAS-E, more positive academic emotions would be conducive to promoting their SOLE, which is consistent with previous studies. Adeshola and Agoyi (2022) stated that with the widespread use of online courses such as MOOCs and SPOCs during the epidemic, students' academic self-efficacy is critical because it not only affects their behavior but also continues to affect their OAP in online learning. In addition, Gao et al. (2021) indicated that in online learning, students need to engage more autonomously, so higher perceived academic self-efficacy facilitates their sustainable engagement in online courses. That is, during the COVID-19 pandemic, students' online self-efficacy was strongly associated with SOLE (Poon et al., in press). In contrast, Wang et al. (2021) concluded that students' academic emotions are critical in online learning, and that higher positive emotions consistently affect students' online engagement. Therefore, Hassan et al. (2021) stated that in the COVID-19 pandemic environment, negative academic emotions of students in online courses will affect their engagement in online or live classes and may even have negative effects such as disruptions and aversion to learning.

4.6.4. Sustainable online learning engagement has a positive effect on online academic persistence

The results of this study indicated that students' SOLE had a positive effect on OAP, consistent with previous studies. In contrast, Hanemann (2019) argued that student learning status and OAP are critical to the SDG4 agenda of the Education Sustainable Development Goals. Furthermore, Jung and Lee (2018) suggested that higher student

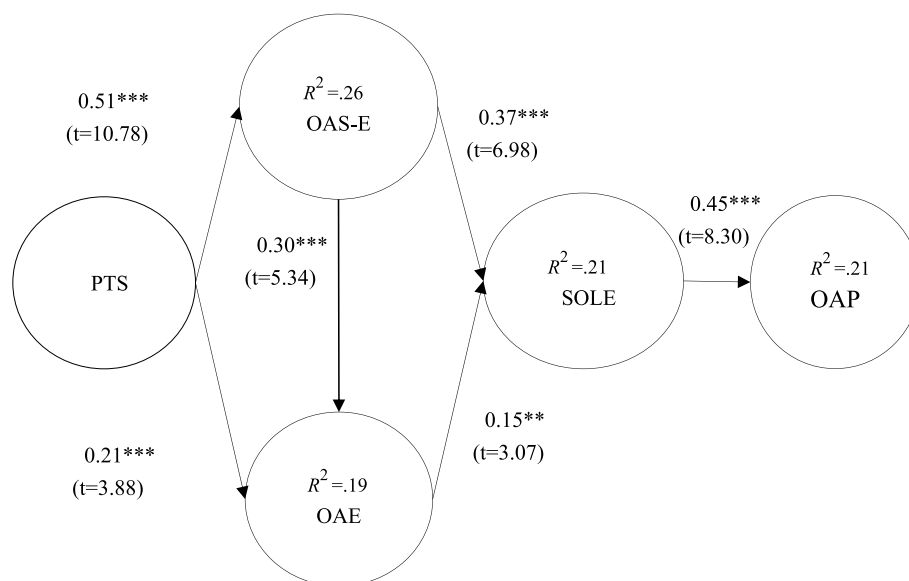


FIGURE 2

Validation of the research model. ** $p < 0.01$, *** $p < 0.001$, perceived teacher support (PTS), online academic self-efficacy (OAS-E), online academic emotions (OAE), sustainable online learning engagement (SOLE), and online academic persistence (OAP).

TABLE 5 Indirect effect analysis.

Construct	PTS		OAS-E		OAE	
	β	95% CI	β	95% CI	β	95% CI
SOLE	0.41***	[0.18, 0.32]				
OAP	0.39***	[0.08, 0.16]	0.43***	[0.13, 0.26]	0.13**	[0.02, 0.12]

** $p < 0.01$.

*** $p < 0.001$.

engagement in learning is associated with higher OAP in online learning environments. Moreover, Adeshola and Agoyi (2022) more explicitly stated that during the COVID-19 pandemic, students' behavioral, cognitive and emotional engagement in online courses would influence their sustainable and active participation in those courses. Students who have a higher commitment to online learning have more sustainable OAP (Alamri, 2022). That is, SDG 4 goals are more focused on sustainable and lifelong learning for students, and in the current post-epidemic era when students perceived higher OAS-E, more positive academic emotions would be conducive to promoting their SOLE.

5. Conclusion and recommendations

5.1. Conclusion

In the development agenda of Education SDG4, there is a greater focus on lifelong learning and development of learners (Campbell et al., 2022). However, after more than 2 years of the ongoing impact of the COVID-19 epidemic, the current post-epidemic era not only affects the achievement of educational sustainability goals, but also makes student engagement in online learning an important issue in the post-epidemic era (Alamri, 2022). However, for Chinese university students, students' OAS-E is low

and their engagement in online learning is not promising (Yang et al., 2021). Also, as teachers are forced to choose online courses and adopt a non-face-to-face teaching style (Ye et al., 2022), how to provide more teacher support to promote students' OAS-E and positive academic emotions has become an important issue for the higher education sector, as it continues to affect student engagement and OAP in online learning.

Starting from SDG4, this study used structural equation modeling to explore the relationship between university students' PTS, SOLE, and OAP, based on the SD-R. The results of the study found that the higher the students' PTS, the higher the OAS-E and OAE would be in the post-epidemic context. That is, in the current post-epidemic context, more PTS has a facilitating effect on students' personal resources in the online learning environment and is more conducive to stimulating students' self-efficacy and having positive OAE and hope in the online learning environment. Therefore, in the post-epidemic context, more instructor support in students' online learning environment can enhance their OAS-E, which would further enhance their sustainable learning engagement and OAP in online courses.

In addition, higher OAS-E and positive OAE of college students will facilitate their online learning engagement status, because in the online learning environment, students' personal resources can be further stimulated and have higher motivation to engage in online learning, which continues to influence the effect of students' SOLE. More importantly, college students who have higher SOLE have higher OAP. In other words, when teachers conduct online courses or live classes, they should provide more resources to support students' engagement with more vivid and imaginative cases, and guide students to participate actively and positively in online learning, thus consistently influencing their online learning engagement and OAP.

5.2. Recommendations

Previous studies have more often investigated the associations between online learning environments and learner behavior

(Adeshola and Agoyi, 2022). However, with the advent of the post-epidemic era, concern for online learning engagement and OAP among university students has become more frequently discussed. It is more convenient and timelier for teachers to conduct online courses or live classes in the post-epidemic era, so providing more teacher support when taking online courses is not only conducive to promoting students' OAS-E, but also inspires students to actively and continuously participate in online learning by achieving two-way interaction between teachers and students in online courses, and further maintaining OAP to achieve the goal of education sustainability.

At the same time, this study found that students' positive academic sentiment regarding learning in online courses was low, making it particularly important to provide more instructor support resources and to reform online teaching methods. Particularly in the current post-epidemic era, the lack of face-to-face teaching opportunities and effective two-way interactions makes teacher support approaches which enhance positive student emotions particularly important when teachers are unable to effectively identify students' emotions while participating in online learning courses. Therefore, it is suggested that university faculty should improve their teaching strategies for online courses, enhance their skills and abilities to conduct online courses, create a relaxed and enjoyable online learning atmosphere, and diversify their online course delivery methods to stimulate students' online positive academic emotions and further promote their SOLE and OAP.

5.3. Limitations and future study

This is a cross-sectional study, with data collected from May 16 to June 20, 2022. In the current post-epidemic era, the provision of additional support resources to promote student performance and persistence in online courses has become an important part of the education sustainability agenda. Therefore, the association among teacher support and students' online learning performance and OAP after the end of COVID-19 may be explored through a longitudinal study in a follow-up study.

In addition, more consideration was given to the behavioral and attitudinal aspects of the study participants. However, it was not possible to fully interpret the phenomena and the underlying deeper reasons behind the findings of this study. Thus, in-depth interviews could be used in follow-up studies to further explore university students' views of PTs versus their SOLE and academic emotions.

In addition, research has found that learning resources in the learning environment can enhance student engagement and motivate students to be consistently and actively engaged in their learning activities. Therefore, in follow-up studies, other types of learning

resources such as social support, family support, or peer support may be explored to further extend this study's findings on the impact of students' online learning performance and OAP.

In addition, the participants of this study are from a university in Guizhou Province, China, and since there are more female students than male students in this university, and the participants of this study are predominantly female, the scope of the participants will be expanded in future studies to further expand the gender ratio of the subjects in the context of China.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on Human Participants in accordance with the Local Legislation and Institutional Requirements. Written informed consent from the participants was not required to participate in this study in accordance with the National Legislation and the Institutional Requirements.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The role of emotion and reflection in the development of student teachers' self-efficacy when analyzing video lessons

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Introduction: Teachers' self-efficacy is an important indicator of student teachers' preparedness for teaching. Interventions using video lessons are effective in increasing student teachers' self-efficacy. However, there is a lack of research on emotional and reflective processes in the context of video-based interventions.

Methods: The present study examined emotions and reflection as well as their effects on changes in self-efficacy in a video-based intervention. A total of 159 student teachers participated in the study. The participants were randomly assigned to three groups: Two groups analyzed video lessons in which group one received open-ended observation tasks (ig1) and group two received structured observation tasks (ig2). Participants in the control group (cg) analyzed text-based case studies with open-ended observation tasks.

Results: The results show that self-efficacy increased with medium effect size ($d=0.68$) in video group two (ig2), whose members analyzed videos using structured observation tasks but not in video group one (ig1), whose members analyzed open-ended observation tasks, and in the control group. In addition, there were significant relations between positive arousal and reflection. Finally, regression analyses showed that reflection was a significant predictor for changes in self-efficacy, whereas no significant effect of emotional arousal was detected.

Discussion: In conclusion, the findings of this study indicate that video-based interventions with structured observation tasks increased self-efficacy among student teachers. Furthermore, the findings provide novel evidence on the association between reflection, self-efficacy and emotion in video-based interventions in teacher education.

KEYWORDS

self-efficacy, emotion, emotional arousal, reflection, teacher education, video lessons

1. Introduction

In previous empirical studies, self-efficacy turned out to be a relevant factor influencing pre-service and in-service teachers' acquisition of competencies, professional teacher behavior (e.g., Klassen et al., 2011), and teacher health (e.g., Evers et al., 2002; Friedman, 2003; Hoy and Spero, 2005). Thus, it can be inferred that supporting the development of self-efficacy is an appropriate goal in university teacher training (e.g., Enochs et al., 2000; Gaudin and Chaliès, 2015). Moreover, it is already known that student teachers' self-efficacy can be increased in different learning environments. For example, there is evidence that collaborative learning environments with theoretical input can increase self-efficacy (e.g., Valtonen et al., 2015), and interventions with practical content (e.g., microteaching, counseling training; e.g., Hertel, 2009; Mergler and Tangen, 2010) or teaching practicums (e.g., Pfitzner-Eden, 2015) are also effective.

Video-based interventions seem to be effective in promoting self-efficacy (e.g., Thiel et al., 2020). Learning with video lessons can be characterized as a vicarious learning experience and has become a frequently used method for linking theory and practice in teacher education (Bandura, 1986; Gaudin and Chaliès, 2015). Video lessons allow students to observe complex teaching situations without a requirement to act immediately. Moreover, the flexible pausing and playing of the video allow for situation-specific incorporation of different theoretical perspectives (e.g., Sherin, 2004). Thus, video lessons enable students to approach professional teacher action known as “approximations of practice” (Grossmann et al., 2009) and offer learners time and space for an analysis and critical reflection without pressure to act. In addition to the development of self-efficacy, empirical studies show that through video lesson interventions, action-oriented knowledge can be acquired and professional vision can be trained (e.g., Sherin and van Es, 2009).

Whereas some studies show that video-based interventions trigger reflective processes (e.g., Seidel et al., 2011; Zhang et al., 2011), few studies focus on examining the emotional-motivational aspects in video-based interventions. Empirical studies found that student teachers experience more positive emotions (e.g., Syring et al., 2015; Egloff and Souvignier, 2020) and higher emotional arousal (e.g., Egloff and Souvignier, 2020) while working with video lessons compared to student teachers working with text-based lessons, in control groups. However, the role of reflection and emotions in professional development in video-based learning environments remains unclear.

To address this research gap, the present study focused on beginning student teachers' self-efficacy concerning adaptive teaching in heterogeneous classrooms and their changes during a video-based intervention. The video lessons showed typical teaching situations for dealing with heterogeneity in elementary schools, with a focus on the different performance levels and requirements for students. Our study explored the emotional and reflective processes among student teachers analyzing video lessons or equivalent written case studies and investigated the effects of emotion and reflection on changes in their self-efficacy.

2. Theoretical framework

2.1. Development of self-efficacy in video-based interventions

According to Bandura (1986), individuals shape self-efficacy by interpreting information regarding their abilities. This information stems from four sources: personal experience, vicarious experience, verbal persuasion, and affective and physiological states.

Personal experience is the most effective source because it provides information about one's successes or failures. Self-efficacy is positively influenced in the case of success and negatively in the case of failure. In vicarious experiences, learning occurs from models. Individual self-efficacy is affected by observing model competency behaviors and comparing them to one's competencies. Vicarious experiences are particularly effective when different successful models can be compared. Verbal persuasion of meaningful others can have an impact on one's self-efficacy. Finally, physiological and affective states provide information about arousal during situations in which capabilities are practiced. In particular, negatively evaluated somatic information decreases self-efficacy, and positively read somatic information increases self-efficacy (cf., Bandura, 1986).

A few empirical studies revealed associations between emotions and teacher self-efficacy (e.g., Stephanou et al., 2013; Burić et al., 2020). However, research on the sources of self-efficacy in teacher education is scarce (e.g., Klassen et al., 2011; Pfitzner-Eden, 2015; Keppens et al., 2021). The present study addresses this research gap by examining the effects of emotions and reflection in a vicarious learning experience (analyzing video lessons), for changes in self-efficacy.

Video lessons have become a popular tool to foster teacher self-efficacy (e.g., Thiel et al., 2020). Various types of videos can be used, such as videos of one's teaching, videos of peers, typical video lessons, and scripted videos (these are videos made with actors; e.g., Blomberg et al., 2013). For example, results of an intervention study show that self-efficacy increases more in students who analyzed videos of others or in students who analyzed videos of others and their own videos than in a group in which students analyzed text-based case studies and their own teaching protocols. In sum, the superiority of video-based interventions compared to text-based interventions is evident though it does not seem relevant if one's own or another's video is analyzed (Gold et al., 2017). However, in addition to analyzing authentic videos, it is also possible to use scripted videos, such as the best and worst examples of teaching practices (Blomberg et al., 2013). In their intervention study, Thiel et al. (2020) investigated whether functional or dysfunctional scripted video scenarios had different effects on student teachers' professional development. The results showed significant increases in self-efficacy according to student engagement, classroom management, and instruction in both experimental groups.

2.2. Emotions in video-based interventions

Emotional experience is described as a complex phenomenon that arises, is maintained, and diminishes in reciprocal dependence on cognitions. Furthermore, emotions are integrated into current action and interact with goals, expectations, and subjective evaluations (Lazarus and Lazarus, 1994). Emotions can be categorized into valence (pleasant-unpleasant) and arousal (low-high; e.g., Feldman Barrett and Russell, 1998). Thus, arousal arises after the attribution of meaning, which is affected by the assessment of one's control and subjective values (e.g., Lazarus and Lazarus, 1994; Pekrun, 2006). In addition, emotional experience depends on individual (e.g., gender) and contextual factors (e.g., social, geographical, political; e.g., Boler, 1997; Nussbaum, 2001; Feldman Barrett et al., 2007). The experience of emotions is, relevant to shaping learning processes as well as one's teacher's actions (Boler, 1997).

In addition to activating cognitive and motivational processes, video lessons are likely to engage student teachers emotionally as well (Gaudin and Chaliès, 2015). Since videos provide a more authentic learning experience about a teaching situation compared to text-based case studies, it can be assumed that they provide more emotional involvement than text-based case studies. Few studies refer to the emotional aspects in the context of analyzing video lessons (e.g., Syring et al., 2015; Egloff and Souvignier, 2020). Egloff and Souvignier (2020) examined the emotional experience (arousal and valence) of students who analyzed video lessons and students who analyzed videos of expert talks (control group). Both videos addressed student-oriented teaching beliefs, attitudes, and intentions positively. The results showed a significantly higher emotional arousal in students who analyzed video lessons than for participants of the control group. In addition, higher emotional arousal was associated with a more positive change in student teachers' beliefs, whereas emotional valence did not affect changes in

teaching-related beliefs, attitudes, and intentions. The authors attribute the results to the fact that video lessons are authentic situations that elicit greater emotional responses (cf., Egloff and Souvignier, 2020). Overall, it has been shown that learning with video lessons is emotionally involved and can generate emotional arousal.

2.3. Reflection in video-based interventions

Another strand of theory addresses the role of reflection in authentic learning situations in (student) teachers' professional development (cf., Gaudin and Chaliès, 2015). Although there is widespread agreement that reflection is crucial to improving teacher practice, there is, at the same time, a lack of clarity about different definitions of reflection (for an overview see Clara, 2015). Based on Schön's (1987) and Dewey's (1910) writings, reflection is a complex construct that can be described as a specific and purposeful thought process. Reflection seems particularly relevant for the professionalization of pre-service teachers as it can stimulate theory-practice connections and critical thinking (cf., Bain et al., 1999; Mulryan-Kyne, 2020). Therefore, reflection has an important role in teacher education and is crucial for linking theory and practice as well as for the development of competencies (e.g., Clara, 2015). Reflection in classroom situations is difficult to implement as it is dynamic and complex. Therefore it seems more appropriate and more in line with the goal of teacher education to reflect on events after some time has passed (e.g., Anderson, 2019; Neuweg, 2021). In conclusion, reflective processes should lead to an understanding of actions, deeper observations, and future drive for action (e.g., Dewey, 1910; Zeichner, 1981).

Reflection in the context of video lesson analysis describes comprehensive reflection on teaching practice while viewing a video and on one's own beliefs. Elsner et al. (2020) developed a model of the reflection processes for video lessons that include the following components: (1) observation of the teaching situation, (2) recognition of relevant scenes, (3) representation (description) of the recognition scene, (4) theory-based reflection of the scene, and (5) development of alternative scenarios (Elsner et al., 2020). Reflection on teaching situations can be done in an open or highly structured way. In general, it is known that novices have a more shallow reflective competence and need more guidance compared to experts (e.g., Blomberg et al., 2013; Gaudin and Chaliès, 2015). Structured observation tasks are especially advantageous for students with little previous knowledge because they guide students' focus on critical events in video lessons, which can be helpful for deeper reflection. In addition, structured observation tasks can also help to appropriately reduce excessive cognitive load in complex learning situations (e.g., Blomberg et al., 2013; Elsner et al., 2020). Thus, it may be important to guide students in a structured way in their analysis to gain a greater depth of reflection (e.g., Kumschick et al., 2017; Imhof and Schlag, 2018; Elsner et al., 2020).

According to Bandura (1986), there is an association between reflection and self-efficacy since mastery or vicarious experiences must be interpreted by the individual to impact one's self-efficacy. Moreover, Tschannen-Moran et al. (1998), who describe in their model the theoretical underpinnings of teacher self-efficacy, propose that reflective processes, such as the self-assessment of one's own competencies, affect changes in teacher self-efficacy. Associations between reflection and self-efficacy have been shown in empirical studies (e.g., Han and Wang, 2021; Naidoo and Naidoo, 2021), but not in the context of video lessons.

In the context of learning with video lessons, it is particularly interesting how reflection and emotions interact. Several theories

describe the relationship between emotion and cognitive processes (e.g., Frederickson, 2001; Um et al., 2012). For example, the emotions-as-facilitators-of-learning hypothesis describes a favoring of the learning process through the positive influence of emotions on cognitive processing (cf. Um et al., 2012). This is shown in different empirical studies (e.g., Isen and Baron, 1991; Erez and Isen, 2002; Konradt et al., 2003). A qualitatively designed case comparison with in-service teachers points to the association of depth of reflection and emotional experience while analyzing videos (Kleinknecht and Poschinski, 2014), but quantitative research findings in this context are still lacking.

3. Research question and hypotheses

The relevance of using video lessons to promote professional competencies in teacher education was emphasized (e.g., Borko et al., 2011). Video lessons are vicarious experiences and a source of self-efficacy, according to Bandura's (1986) self-efficacy theory. It has been shown, empirically, that analyzing video lessons can increase self-efficacy (e.g., Gold et al., 2017; Thiel et al., 2020). Emotional states are another source of self-efficacy (Bandura, 1986) and the results of empirical studies show that emotion and self-efficacy are associated with each other (e.g., Pitkäniemi, 2017). In addition, empirical studies show that the analysis of video lessons stimulate emotional experience (e.g., Kleinknecht and Poschinski, 2014; Egloff and Souvignier, 2020).

Furthermore, analyzing video lessons encourages students' reflection skills (e.g., Blomberg et al., 2013). Emotion and reflection have been investigated independently in the context of analyzing video lessons (e.g., Zhang et al., 2011; Egloff and Souvignier, 2020). Concerning reflection, there are few studies that have examined its relationship to self-efficacy, and research on reflection processes and emotional-motivational processes is still pending (e.g., Han and Wang, 2021). In video lesson research, one qualitative study of in-service teachers has highlighted that emotional experience is associated with depth of reflection (Kleinknecht and Poschinski, 2014). A few studies show that reflection and self-efficacy are associated with each other (e.g., Han and Wang, 2021; Naidoo and Naidoo, 2021), but not in the context of video lesson research. The question of the exact relationship between reflection, emotion, and self-efficacy in the context of video lessons remains open.

In our study, a 90-min intervention was administered to student teachers in a pre-post-experimental design. Students analyzed two video lessons (ig), or two equivalent written case studies (cg). Participants were asked to observe the case studies using either open-ended (ig1, cg) or structured observation tasks (ig2).

Against the theoretical and empirical background of the subject area, the present study examined the following questions:

RQ 1: Does student teachers' self-efficacy increase during a video-based intervention?

RQ 2: What role do emotion and reflection play in changes in self-efficacy during a video-based intervention?

To answer the research questions, we developed four hypotheses. First, we assumed that self-efficacy increases while analyzing video lessons (e.g., Thiel et al., 2020). Therefore, we hypothesized that self-efficacy will increase more in ig2 (analyzing video lessons, structured observation tasks) than in ig1 (analyzing video lessons, open-ended observation tasks), and cg (analyzing text-based cases, open-ended observation tasks)–ig2 > ig1 > cg (*hypothesis 1*).

Second, Banduras' self-efficacy theory (1986) allows for the assumption that analyzing video lessons is more stimulating for students' emotional arousal than reading case studies. Empirical findings verify this assumption (e.g., Miesera and Will, 2017; Egloff and Souvignier, 2020). We hypothesized that participants of both intervention groups (ig1 and ig2) will experience more emotional arousal than participants in cg (*hypothesis 2a*). In addition, due to the variation of the observation tasks, different depths of reflection can be expected with the highest values on reflection in structured observation tasks. Therefore, participants in ig2 will report a deeper reflection than participants in ig1 and cg (*hypothesis 2b*).

Third, theoretically and empirically, there is evidence for a correlation between reflection and emotion (e.g., Kleinknecht and Poschinski, 2014; Stark, 2016). Consequently, we assume that emotion and reflection are associated with each other (*hypothesis 3*).

Finally, there is evidence for bilateral correlations between reflection and self-efficacy (e.g., Naidoo and Naidoo, 2021) as well as for emotion and self-efficacy (e.g., Pitkäniemi, 2017). Therefore, a theory-based (Bandura, 1986) hypothesis can be made that (a) emotion and (b) reflection will predict changes in self-efficacy in both intervention groups while controlling for previous experience in analyzing video lessons, interest and relevance, and reflection skills (*hypothesis 4*).

4. Methods

4.1. Intervention and procedures

The intervention was implemented on elementary student teachers in an online learning environment. Data were collected during a 90-min intervention in November 2021. After a short welcome in the plenum, in which the students received information about the learning unit and the link to a virtual campus, they were assigned randomly into three groups. Each group received a digital schedule *via* the virtual campus and filled in the first questionnaire (pretest). Then they received theoretical input on teaching in heterogeneous classes (e.g., definition, empirical results, and best practice) in an online learning environment. After completing the first case study,¹ they filled in another questionnaire (posttest 1); Following the second case study,² they completed the last questionnaire (posttest 2), which ended the seminar session for the students. Depending on intervention groups (ig) or control group (cg), the case studies were either video lessons that the students watched *via* the Metavideoportal³ or text-based case studies, which were the transcripts of the video lessons in edited form. Both videos showed examples of similar situations—task introductions in elementary school showing typical practice. Both positive and negative aspects on the topic of heterogeneity were observable in each case. Furthermore, the observation tasks varied within the groups: ig1 and the cg received two open-ended tasks (e.g., What did you notice positively in the

video sequence?), ig2 received nine structured observation tasks (e.g., Describe the procedure for grouping! What do you think about this approach concerning teaching in heterogeneous classes? Give brief reasons for your answer!). The structured observation tasks were developed using Elsner's et al. (2020) model, including description of relevant scenes, theory-based reflection, and the development of alternatives. Observation tasks were given to the students before they watched the video or read the text, the editing should be done after watching the video.

4.2. Sample

Participants were drawn from students enrolled at an elementary teacher education lecture and seminars at a German University. The University of Bamberg is a public university in Bavaria with a high percentage of teaching students (about 20%). Participants of our study were intended to work in elementary schools and their studies focused on primary education. The initial sample was $N = 156$, but with a relatively high dropout of 39% ($N = 62$) during the study. However, this was not considered a systematic dropout. There were no significant differences between participants who participated fully and those who dropped out early during the study ($p = 0.094$) or with regard to prior experience with the topic heterogeneity ($p = 0.413$), prior experience with video lesson analysis ($p = 0.478$), self-efficacy ($p = 0.591$), and positive ($p = 0.267$) and negative emotional arousal ($p = 0.477$). The participants were randomly assigned to three groups (according to their birth month), resulting in an initial $N = 58$ in ig1, $N = 47$ in ig2 and $N = 51$ in cg. A total of 87.7% of the participants were female, 10.3% are male, and 10 participants did not answer the question on gender. In all three groups, students were, on average, in their 2nd semester ($M = 1.45$, $SD = 1.83$). Participants in both intervention groups were, on average, 20 years old (ig1: $M = 20.80$, $SD = 2.74$; ig2: $M = 20.62$; $SD = 2.98$). Participants in the cg were, on average, 21 years old ($M = 21.20$, $SD = 3.48$).

4.3. Instruments

To investigate the hypotheses we used three measurement tools to evaluate self-efficacy, emotion, and reflection. Furthermore, previous experience, reflection skills, and interest and relevance were used as control variables.

4.3.1. Self-efficacy

The *Self-efficacy of Adaptive Teaching in Heterogeneous Classrooms* by Meschede and Hardy (2020) was used to assess self-efficacy in pretest and posttest 2. The focus on teaching achievement in heterogeneous classes was in line with theoretical input, case studies, and the observation tasks of this intervention. The scale consisted of eight items. Participants had to rate themselves on a 4-point Likert scale (e.g., *I feel able to make reasoned decisions about differentiation in the classroom.*). The reliability of this scale was good to very good (see Table 1).

4.3.2. Emotion

Emotional arousal was assessed with the PANAS (Positive and negative affect schedule; Breyer and Bluemke, 2016). Participants had to rate 20 adjectives on a 5-point Likert scale (e.g., *active, strong, irritated*). However, 10 adjectives belonged to positive arousal on the

1 University of Münster (2022) ProVision https://vsso.uni-muenster.de/ProVision/video/#MAT_K1_LK5_1ES_SEL [9:42 to 16:42, Accessed October 18, 2022].

2 University of Münster (2022) ProVision https://vsso.uni-muenster.de/ProVision/video/#MAT_K1_LK4_3ES_LER [1:43 to 14:35; 20:10 to 21:57, Accessed October 18, 2022].

3 University of Münster (2022) ProVision <https://unterrichtsvideos.net/metaportal/> [Accessed October 18, 2022].

TABLE 1 Reliability coefficients.

	Pretest		Posttest 1		Posttest 2	
	α	n	α	n	α	n
Positive arousal	0.86	136	0.89	91	0.91	82
Negative arousal	0.83	137	0.85	92	0.89	82
Self-efficacy	0.81	129	-	-	0.84	76
Reflection (theoretical contextualization)	-	-	0.66	93	0.72	79
Reflection (theoretical evaluation)	-	-	0.86	92	0.91	80
Reflection skills	0.76	136	-	-	-	-
Interest and relevance	-	-	-	-	0.69	81

scale, and 10 items to negative arousal. The higher the mean values, the higher the arousal. The internal consistencies were good to very good (see Table 1).

4.3.3. Reflection

To evaluate the depths of reflection, two subscales of the reflection circle by Reinders (2016) were used. The scales were about *theoretical evaluation* (including seven items; e.g., *Theories help me to better understand educational situations that I have experienced.*) and *theoretical contextualization* (including eight items; e.g., *I understand well how a theoretical concept can describe the situation.*). Participants had to rate their answers on a 4-point-Likert scale. The reliability of these scales was good to very good (see Table 1).

4.3.4. Control variables

Participants had to rate their general reflection skills (self-developed scale including four items; e.g., *I think a lot about my role as a teacher in heterogeneous classes.*) on a 7-point Likert scale. A categorical variable was used to investigate previous experience (e.g., *Do you have previous experience with analyzing video lessons?*). Additionally, interest and relevance were also rated on a 4-point Likert scale (5 items, e.g., *The seminar session today fostered my interest in the topic area of Teaching in Performance Heterogeneous Classes*; adapted Reinders, 2016) and measured last (posttest 2). The reliability of the scales measuring reflection skills and interest and relevance was good (see Table 1).

4.4. Statistical analysis

The statistical software package Social Science (SPSS), Version 23, was used for the statistical analysis of the data. To identify changes in self-efficacy, a two-factor repeated measures ANOVA and single ANOVAs with repeated measurement for each group to examine group differences were conducted (*hypothesis 1*). We checked the differences for emotional arousal as well as for reflection using two-factor ANOVAs with repeated measures and planned contrast comparisons (*hypothesis 2*). The planned contrasts were adjusted to the hypotheses: In hypothesis 2a, the video groups (ig1 and ig2) were compared with the control group. In hypothesis 2b, the group with structured observation tasks (ig2) was compared with the two groups with open-ended observation tasks. Correlation analyzes were conducted to evaluate the association between emotional arousal and reflection (*hypothesis 3*). Finally, the prediction of self-efficacy was checked with a regression analysis. Self-efficacy (posttest 2) was the

dependent variable, and emotion and reflection were the independent variables. Self-efficacy (pretest), previous experience in analyzing video lessons, general reflection skills, interest, and relevance were the control variables in the regression models. To control for multicollinearity, stepwise sequential regression models were calculated (*hypothesis 4*). For all parametric tests, Cohen's d was calculated and interpreted according to Cohen's (1988) benchmarks, as follows: ≥ 0.02 *small effect*, ≥ 0.05 *medium effect*, and ≥ 0.08 *large effect*.

5. Results

5.1. Descriptive results

All means for *positive emotional arousal* were in the middle range, with the highest values observed in ig2 ($M_{\text{pretest}} = 3.00$, $SD = 0.77$; $M_{\text{posttest1}} = 3.12$, $SD = 0.82$; $M_{\text{posttest2}} = 2.85$, $SD = 0.96$). Descriptively, cg showed a higher mean in posttest 1 ($M_{\text{posttest1}} = 3.02$, $SD = 0.71$) compared to the means of the other two measurement points ($M_{\text{pretest}} = 2.82$, $SD = 0.60$; $M_{\text{posttest2}} = 2.71$, $SD = 0.80$). The means for *positive emotional arousal* in ig1 were constant (see Table 2). The standard deviation increases slightly in all groups (see Table 2). However, the means for *negative emotional arousal* were in the lower range of the scale across all groups with only a few differences. In ig1, ($M_{\text{pretest}} = 1.48$, $SD = 0.49$; $M_{\text{posttest1}} = 1.40$, $SD = 0.52$; $M_{\text{posttest2}} = 1.38$, $SD = 0.58$) and ig2 ($M_{\text{pretest}} = 1.45$, $SD = 0.52$; $M_{\text{posttest1}} = 1.32$, $SD = 0.44$; $M_{\text{posttest2}} = 1.21$, $SD = 0.25$), *negative emotional arousal* decreased slightly during the intervention, and the mean value in cg increased again at posttest 2 ($M_{\text{posttest2}} = 1.38$, $SD = 0.53$).

There were no differences in *self-efficacy* between pretest and posttest 2 in ig1 ($M_{\text{pretest}} = 2.95$, $SD = 0.40$; $M_{\text{posttest2}} = 2.95$, $SD = 0.48$) and cg ($M_{\text{pretest}} = 2.85$, $SD = 0.52$; $M_{\text{posttest2}} = 2.85$, $SD = 0.42$). In ig2 ($M_{\text{pretest}} = 2.96$, $SD = 0.40$; $M_{\text{posttest2}} = 3.08$, $SD = 0.34$) there was a slight, observable increase. All mean values were in the upper range of the 4-point Likert scale.

Concerning *reflection*, means for *theoretical contextualization* were in the middle range. The lowest means were observed in ig1 ($M_{\text{posttest1}} = 2.36$, $SD = 0.47$; $M_{\text{posttest2}} = 2.37$, $SD = 0.55$), followed by the mean values of cg ($M_{\text{posttest1}} = 2.50$, $SD = 0.55$; $M_{\text{posttest2}} = 2.49$, $SD = 0.55$), and finally, the highest mean values were in ig2 ($M_{\text{posttest1}} = 2.60$, $SD = 0.46$; $M_{\text{posttest2}} = 2.67$, $SD = 0.48$). The means of *theoretical evaluation* were, in general, higher than those of *theoretical contextualization*. Moreover, a similar picture emerges in all groups as in the scale *theoretical evaluation*. The lowest mean values were observable in ig1 ($M_{\text{posttest1}} = 2.77$, $SD = 0.65$; $M_{\text{posttest2}} = 2.82$, $SD = 0.68$). This was followed by the mean values of cg ($M_{\text{posttest1}} = 2.82$, $SD = 0.46$; $M_{\text{posttest2}} = 2.80$, $SD = 0.410$), and finally, the highest mean values were in ig2 ($M_{\text{posttest1}} = 3.05$, $SD = 0.47$; $M_{\text{posttest2}} = 2.85$, $SD = 0.80$).

The *control variables* were collected at one measurement point. First, reflection skills (pretest) showed high means, with the highest values in ig1 ($M = 5.08$, $SD = 1.07$) and cg ($M = 5.03$, $SD = 1.15$), compared to ig2 ($M = 4.83$, $SD = 0.97$). There were high standard deviations in all groups. Second, 42.1% in ig1, 54.4% in ig2, and 56.5% in cg indicated students' previous experience in analyzing video lessons (pretest). Third, interest and relevance (posttest) showed the highest mean values in ig2 ($M = 4.13$, $SD = 0.61$), compared to cg ($M = 3.82$, $SD = 0.68$) and ig1 ($M = 3.98$, $SD = 0.89$). All mean values were in the higher range of the 5-point Likert scale.

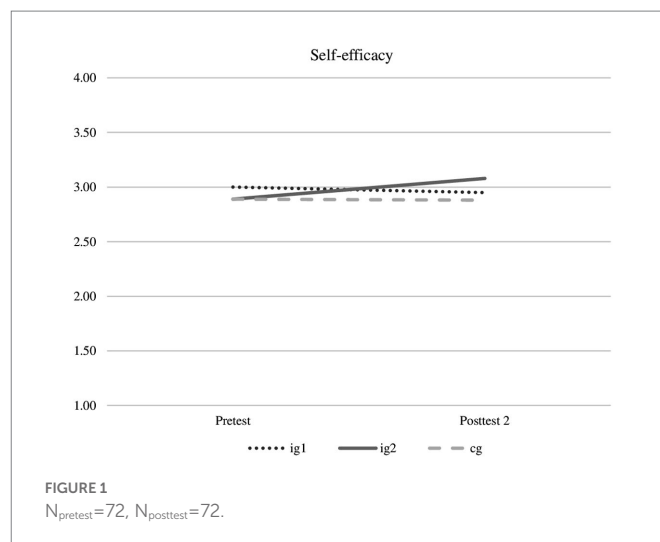
TABLE 2 Descriptive statistics.

	Pretest				Posttest 1				Posttest 2			
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>N_{mis}</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>N_{mis}</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>N_{mis}</i>
Intervention group 1												
Positive emotional arousal ^a	2.94	0.69	53	4	2.98	0.71	39	18	2.92	0.84	39	18
Negative emotional arousal ^a	1.48	0.49	52	5	1.40	0.52	39	18	1.38	0.58	39	18
Self-efficacy ^b	2.95	0.40	52	5	-	-	-	-	2.95	0.48	34	23
Reflection (theoretical contextualization) ^b	-	-	-	-	2.36	0.47	40	17	2.37	0.55	35	22
Reflection (theoretical evaluation) ^b	-	-	-	-	2.77	0.65	40	17	2.82	0.68	36	21
General reflection skills ^c	5.08	1.07	52	5	-	-	-	-	-	-	-	-
Interest and relevance ^b	-	-	-	-	-	-	-	-	3.98	0.89	35	22
Intervention group 2												
Positive emotional arousal	3.00	0.77	39	5	3.12	0.82	21	23	2.85	0.96	18	26
Negative emotional arousal	1.45	0.52	41	3	1.32	0.44	22	22	1.21	0.25	18	26
Self-efficacy	2.96	0.40	37	7	-	-	-	-	3.08	0.34	18	26
Reflection (theoretical contextualization)	-	-	-	-	2.60	0.46	22	22	2.67	0.48	18	26
Reflection (theoretical evaluation)	-	-	-	-	3.05	0.47	22	22	2.85	0.80	18	26
General reflection skills	4.83	0.97	37	7	-	-	-	-	-	-	-	-
Interest and relevance	-	-	-	-	-	-	-	-	4.13	0.61	18	26
Control group												
Positive emotional arousal	2.82	0.60	44	2	3.02	0.71	31	15	2.71	0.80	25	21
Negative emotional arousal	1.35	0.38	44	2	1.28	0.38	31	15	1.38	0.53	25	21
Self-efficacy	2.85	0.52	40	6	-	-	-	-	2.85	0.42	24	22
Reflection (theoretical contextualization)	-	-	-	-	2.50	0.55	31	15	2.49	0.55	26	20
Reflection (theoretical evaluation)	-	-	-	-	2.82	0.46	30	16	2.80	0.41	26	20
General reflection skills	5.03	1.15	42	4	-	-	-	-	-	-	-	-
Interest and relevance	-	-	-	-	-	-	-	-	3.82	0.68	24	22

^aRatings on a 5-point likert scale. ^bRatings on a 4-point Likert scale. ^cRatings on a 7-point Likert scale.

5.2. Changes in self-efficacy

In hypothesis 1 it was assumed that self-efficacy increases most in ig2, compared to ig1 and also to cg ($ig2 > ig1 > cg$). The calculation of a two-factor repeated measures ANOVA ($N=72$) shows no significant overall improvement in self-efficacy ($p=0.228$), but a significant interaction effect between measurement repetition factor and grouping factor [$F(2, 69)=4.40$, $p=0.016$, $\eta^2=0.113$] with a medium effect size ($d=0.71$). The calculation of single ANOVAs with repeated measures for the different groups showed that differences between Pretest and Posttest 2 were significant only in ig2 [$F(1,17)=7.84$, $p=0.012$, partial $\eta^2=0.316$] and showed a medium effect ($d=0.680$). Even after the Bonferroni correction, the effect was significant. In ig1 ($p=0.253$) and cg ($p=0.871$) there are no significant changes (see Figure 1). In sum, changes in self-efficacy were only apparent in ig2, whereas no significant changes were found in the other two groups. Therefore, hypothesis 1 may be partially accepted.



5.3. Emotion and reflection

It was assumed that participants in both intervention groups (ig1 and ig2) experienced more positive and negative emotional arousal than participants in cg. The two-factor ANOVAs with repeated measures show a significant overall improvement in positive emotional arousal [$F(1.60,118)=4.68$, $p=0.017$, $d=0.51$], but no significant interaction of emotion and the group factor [$F(3.19, 118)=0.61$, $p=0.621$, $d=0.29$]. There was no significant main effect [$F(1.75, 132.9)=1.06$, $p=0.342$, $d=0.24$] and no interaction effect [$F(3.50, 132.9)=1.13$, $p=0.342$, $d=0.35$] for negative emotional arousal (see Table 3). Nevertheless, hypothesis 2a must be rejected.

Concerning theoretical contextualization, there was no significant main effect [$F(1,74)=0.42$, $p=0.521$, $d=0.16$] and no significant interaction of reflection and the group factor [$F(2,74)=0.03$, $p=0.966$, $d=0.06$]. A similar model emerges concerning theoretical evaluation. There are no significant main [$F(1,74)=1.08$, $p=0.302$, $d=0.52$] or interaction effects [$F(2,74)=1.77$, $p=0.178$, $d=0.44$], but medium to high effect sizes. This is why the contrast comparison was calculated. There is a significant contrast comparison ($p<0.001$) with a high effect size ($d=4.50$) between ig2 and the other groups (ig1, and cg; see Table 3). In addition, mean values are higher in ig2 than in the other two groups (ig1, and cg; see Table 1). Therefore, hypothesis 2b can be partially accepted.

The correlation analysis (see Table 4) showed significant correlations of positive emotional arousal with both reflection scales (theoretical contextualization and evaluation) at both pre-and posttest. No significant correlations were found between negative emotional arousal and reflection. In addition, there were significant correlations between theoretical contextualization and theoretical evaluation, but not between positive and negative emotional arousal. In sum, hypothesis 3 may be partially accepted.

5.4. Prediction of self-efficacy

Finally, it was assumed that emotional arousal as well as reflection predicts changes in self-efficacy. Five regression models were calculated to gradually include all independent variables in the model to learn the extent of the proportion of variance explained changes (see Table 5).

TABLE 3 Differences in emotional arousal and reflection (two-factor ANOVA with repeated measures).

		<i>F</i>	<i>df</i>	<i>p</i>	<i>d</i>
Positive arousal ^a	Main effect	4.68	1.60	0.017	0.51
	Interaction effect	0.61	3.19	0.621	0.29
Negative arousal ^a	Main effect	1.06	1.75	0.342	0.24
	Interaction effect	1.13	3.50	0.342	0.35
Reflection (theoretical contextualization)	Main effect	0.42	1	0.521	0.16
	Interaction effect	0.03	2	0.966	0.06
Reflection (theoretical evaluation)	Main effect	1.08	1	0.302	5.02
	Interaction effect	1.77	2	0.178	0.44

For emotional arousal there are three measuring times, but just two measuring times for reflection (posttest 1 and posttest 2). ^aCorrection according to Greenhouse–Geisser.

Model 1 shows that neither positive nor negative emotional arousal are significant predictors for changes in self-efficacy. However, reflection (theoretical contextualization) is a significant predictor ($p=0.016$) for changes in self-efficacy (model 2). The added control variables of prior experience in analyzing video lessons (model 3), reflection skills (model 4), and interest and relevance (model 5) had no significant effect. Since the model quality does not change due to the addition of the control variables, it can be assumed that model 2 is the most informative as it explains most of the variance with only a few variables. While there are no effects of emotional arousal on self-efficacy, reflection is a significant predictor of self-efficacy. Therefore, hypothesis 4a must be rejected and hypothesis 4b may be accepted.

6. Discussion

The present study focused on the effects of emotion and reflection on student teachers' changes in self-efficacy following video-based learning. The experimental study design includes two intervention groups in which student teachers analyzed video lessons and a control group in which participants analyzed text-based case studies. The observation tasks also varied: One intervention group and the control group received open-ended observation tasks, whereas the other intervention group received structured observation tasks for the video

TABLE 4 Correlation analysis for emotional arousal and reflection.

	Posttest 1				Posttest 2			
	1	2	3	4	1	2	3	4
1. Positive arousal	1				1			
2. Negative arousal	−0.06	1			0.02	1		
3. Reflection (theoretical contextualization)	0.23*	−0.20	1		0.48**	−0.03	1	
4. Reflection (theoretical evaluation)	0.40**	−0.12	0.36**	1	0.35**	−0.02	0.42**	1
Means	3.03	1.34	2.46	2.85	2.84	1.34	2.48	2.82
Min	1.10	1.00	1.20	1.00	1.00	1.00	1.00	1.00
Max	4.70	3.00	3.60	4.00	4.50	3.40	3.80	4.00
SD	0.73	0.46	0.50	0.56	0.85	0.51	0.54	0.63
N	91	92	93	92	82	82	79	80

**Correlation is significant at the 0.01 level (2-tailed), *Correlation is significant at the 0.05 level (2-tailed).

TABLE 5 Regression analysis: Predictors of self-efficacy (posttest 2).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β	p	β	p	β	p	β	p	β	p
Self-efficacy (pretest)	0.84	<0.001	0.79	<0.001	0.75	<0.001	0.76	<0.001	0.77	<0.001
Positive emotional arousal	0.04	0.345	−0.02	0.730	−0.03	0.555	−0.02	0.641	−0.02	0.680
Negative emotional arousal	−0.13	0.226	−0.14	0.187	−0.15	0.150	−0.15	0.167	−0.14	0.181
Reflection (theoretical contextualization)			0.22	0.016	0.23	0.012	0.24	0.010	0.24	0.011
Reflection (theoretical evaluation)			0.04	0.535	0.06	0.355	0.07	0.281	0.07	0.285
Prior experience in analyzing videos					0.13	0.124	0.13	0.112	0.13	0.123
Reflection skills							−0.04	0.303	−0.04	0.345
Interest and relevance									−0.01	0.864
Model fit	$R = 0.77$ $R^2 = 0.59$ corrected $R^2 = 0.56$		$R = 0.81$ $R^2 = 0.66$ corrected $R^2 = 0.62$		$R = 0.82$ $R^2 = 0.68$ corrected $R^2 = 0.63$		$R = 0.83$ $R^2 = 0.68$ corrected $R^2 = 0.63$		$R = 0.83$ $R^2 = 0.68$ corrected $R^2 = 0.62$	

Self-efficacy (posttest 2) as the dependent variable.

analysis. This variation aimed to evoke variance in students' depth of reflection.

Our descriptive findings indicate that there are fairly high means for self-efficacy at all measurement points. Hence, even at the beginning of their teaching program, students assess their self-efficacy favorably concerning adaptive teaching in heterogeneous classrooms across all measurement points (upper range of the 4-point Likert scale). The results can also be partially attributed to the scale being limited to four rating options. Similar mean values are shown concerning the reflection scales. In all groups, the students rated their reflection concerning theoretical contextualization and theoretical evaluation as medium to high. In general, participants in all groups experience a higher positive emotional arousal compared to negative emotional arousal. This finding is in line with previous research studies, which also found more positive emotions than negative emotions in the context of video lesson analysis compared to a text-based control group (*cf.*, Syring et al., 2015). However, the means of positive emotional arousal remain relatively constant from Pretest to Posttest 2. This result is in contradiction with previous research. For example, Egloff and Souvignier (2020) showed increased positive emotions after video analysis. In the present study, only low negative emotional arousal was observed. This result goes against the findings of Kleinknecht and Poschinski (2014), who reported that analyzing the videos of others evoked negative emotions. One

possible explanation is the conceptual differences between the studies. Specifically, Kleinknecht and Poschinski's (2014) study of teachers, who are fully trained and already teach, was conducted within the framework of qualitative design, whereas our study collected quantitative data from beginning student teachers. Thus, beginning students may not yet be able to perceive critical teaching situations sufficiently well because they lack the required knowledge and competencies. In addition, student teachers who are at the beginning of their studies may not have developed a sensitivity to the practical relevance of the situations described, and therefore may have a limited emotional reaction to the teaching sequences.

This study investigated changes in self-efficacy as a result of the video-based intervention. We found students' self-efficacy increased, with a medium effect size, while analyzing video lessons with structured observation tasks. This result is in line with other studies, which reported that domain-specific self-efficacy increased through video-based interventions (Gold et al., 2017; Thiel et al., 2020). However, the findings of the present study did not show an increase for students who analyzed video lessons or text-based case studies with open-ended observation tasks. One possible explanation for these findings is that learners need to process information deeply on the situation presented and that simply presenting video lessons does not necessarily support deep learning processes. This assumption aligns with the findings that beginning

students need to be well-guided to attain deeper levels of reflection (e.g., [Blomberg et al., 2013](#); [Gaudin and Chaliès, 2015](#)). Therefore, it can be assumed that not only learning material (e.g., video lessons) by itself influences changes in self-efficacy, but also the instructional embedding of the videos (e.g., [Kumschick et al., 2017](#)). Thus, instructions should be designed in such a way that students are focused on the salient events in video lessons.

The second area of investigation focused on the role of emotions and reflection during the intervention. Contrary to our expectations, there were no significant differences in positive emotional arousal or negative emotional arousal between the intervention groups (analyzing video lessons) and the control group (analyzing text-based case studies). However, there were descriptive differences that did not achieve the level of significance. This descriptive result is in line with the findings of [Syring et al. \(2015\)](#), who reported higher emotional arousal for analyzing videos compared to analyzing texts. Furthermore, there was a significant and observable overall improvement in positive emotional arousal (without group differences), which is in line with the assumption, that positive emotions increase while analyzing case studies (*cf.*, [Egloff and Souvignier, 2020](#)). What could not be shown was the superiority of video-based case studies in this context. One possible explanation for the findings of the current study is that since students were at the beginning of their studies they were not able to make sufficient personal references to the presented classroom situations and thus attributed less meaning to them. Consequently, emotional arousal was lower ([Lazarus and Lazarus, 1994](#)). In addition, the medium effect sizes for results that are statistically non-significant indicate that the study should be replicated with a sample size based on a power analysis. For further research, it may be advantageous to use more stimulating videos (e.g., best vs. worst cases) to create more salient vicarious experiences and attribute more meaning to them ([Blomberg et al., 2013](#)). In summary, the role of emotional arousal in the analysis of video lessons needs further investigation. Which features of videos evoke emotional arousal and whether there are differences between novice and trained teachers remain unanswered.

In this study, we investigated the differences in depth of reflection between the intervention group with structured observation tasks, and two other groups with open-ended observation tasks (text-based and video). We assumed that students who analyzed the video lessons with structured observation tasks would show a higher depth of reflection. As expected, our results demonstrate partly that there are significant differences in reflection between the groups concerning open-ended observation tasks and the group concerning structured observation tasks. One possible explanation for this finding is that structured observation tasks lead to a deeper reflection compared to open-ended observation tasks. This assumption is supported by empirical work showing a greater depth of reflection among in-service teachers viewing their teaching (video) and completing structured observation tasks. Overall, these findings confirm the assumption that both the use of video lessons, particularly instructional embedding, are helpful for student learning (e.g., [Blomberg et al., 2013](#); [Syring et al., 2015](#)). Our results indicate that analyzing video lessons with structured observation tasks leads to a deeper reflection of the instructional situation in the context of already learned theories.

Another area of investigation focused on the relationship between emotion and reflection. In this study, a significant relationship between reflection and positive arousal was found. There was no relationship between negative emotional arousal and reflection. This result goes against the findings of [Kleinknecht and Poschinski \(2014\)](#), who reported

an association between negative emotions and depth of reflection in in-service teachers. However, in this study qualitative data from already trained teachers were used, whereas our study was based on quantitative data from beginning student teachers. One possible explanation for the findings of the current study is that beginning students have less previous experience. Consequently, they lack interpretation skills regarding negative situations, which are not negative enough in the context of typical classroom situations.

The final area of investigation focused on the role of emotions and reflection for changes in self-efficacy during video-based interventions. As expected, our results show that reflection has a significant effect on changes in self-efficacy. However, emotional arousal was not predictive of changes in self-efficacy. This means that students with deeper reflection showed a greater increase in self-efficacy. One possible explanation for the low emotional arousal in our study is that students have too little experience with teaching. Students at the beginning of their teacher education program see less personal connection in typical classroom situations. It can be assumed that these findings might change with different video material (e.g., [Blomberg et al., 2013](#)) or with more experienced students with higher interpretation skills (e.g., [Lazarus and Lazarus, 1994](#); [Santagata and Guarino, 2011](#)).

6.1. Limitations of the study and future directions

This study has several limitations. First, the appropriate sample size ($N = 107$), which was calculated in advance using G*Power analyzes, could not be reached because 39% of students dropped out. We believe that with a larger sample, results with medium effects that did not show significant p -values in the current study would have been significant. Second, dropout analyzes showed no differences in study duration, prior experience, and self-efficacy, but there may be differences in students' motivation. Many participants in the video group with structured observation tasks ended the intervention early. One possible explanation is that students probably worked more intensively and longer with the videos may be due to the more detailed observation tasks than students in the other groups (open-ended observation tasks), which is why they dropped out early. Future research studies could attempt more balance between groups and use incentives. Third, the data from self-report instruments may have been biased due to socially desirable responses as well as students' lack of practical experience, which could have led to results that differ from those obtained using other methods such as behavioral observation. Fourth, the validity of the self-developed reflection scale was not verified. Fifth, only the area of theoretical reflection was observed. It seems worthwhile to evaluate different levels of reflection more objectively (e.g., analysis of the responses to the reflection tasks) and in more detail (e.g., [Aeppli and Lötscher, 2016](#)).

Finally, the selected video lessons did not polarize students strongly enough, which resulted in relatively low emotional arousal and little variance. To investigate the association of self-efficacy with emotional arousal more meaningfully, it might be more fruitful to use alternative video lessons such as worst and best practice examples (e.g., [Blomberg et al., 2013](#)). Future research could include more facets of reflection, motivation, and professional knowledge to generate deeper insights. Nonetheless, the results of our study provide valuable information about the relationship between emotion, reflection, and self-efficacy in video-based interventions and offer ideas for improving teacher education practices. Finally, future studies could include individual and contextual

factors of the participants as control variables in the analyzes (e.g., Boler, 1997; Nussbaum, 2001; Feldman Barrett et al., 2007).

6.2. Conclusion

Although we were not able to confirm all of our hypotheses, this study contributes to a better understanding of video-based learning in teacher education. Only a few studies to date have explored the role of emotions and reflection in the development of self-efficacy in video-based learning environments. In conclusion, the findings of the present study indicate that beginning teaching students benefit from video lessons if the analysis is guided in a structured way. Nevertheless, the results could not show the superiority of the video format *per se*, as self-efficacy did not increase in the video group with open observation tasks. The results might be clearer if another control group had been examined with structured observation tasks. However, the results provide valuable support for the use of video lessons with structured observation tasks in initial teacher education.

In addition, the purpose of the study was to investigate the sources of self-efficacy. The results show that reflection is a significant predictor of self-efficacy, while the exact relationship with emotions is not yet entirely clear. These findings have the following implications: First, self-efficacy, emotional arousal, and reflection are associated with each other. Second, intervention with video lessons and structured observation tasks increased the self-efficacy of beginning students. Thus, future research needs to explore the emotional experience of student teachers in the context of video lesson analysis and the role of emotion and reflection in changes in self-efficacy.

Data availability statement

The datasets presented in this article are not readily available because informed consent signed by participants stated that data were only accessible to the authors of this study. Requests to access the datasets should be directed to AS, anne.schlosser@uni-bamberg.de.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and

institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

AS and JP planned and conducted the study and drafted the manuscript. AS performed the statistical analyses. All authors discussed the results, contributed to the final manuscript, read and approved the submitted manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Students' basic psychological needs in blended teacher learning groups

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Introduction: Student teachers (henceforth: students) in higher education often experience feelings of emotional loneliness that negatively impact upon their well-being and motivation to learn. Consequently, the importance of social learning for students has gained increased prominence, with Teacher Learning Groups (TLGs), that is, social configurations in which students, in-service teachers, and teacher educators, sometimes supplemented by researchers and/or experts, collaboratively learn through social interactions, being introduced in teacher training institutes. Ordinarily, TLGs organized their meetings face-to-face; however, due to COVID-19 measures, they had to rapidly transition to blended meetings, which in turn impacted upon students' basic psychological needs.

Methods: In the present study, a convergent parallel mixed-methods design was utilized. The variables Social Configurations (Practice integration, Long-term orientation and goals; Shared identity and equal relationships) and Basic Psychological Needs (Competence, Autonomy, Relatedness) were assessed through the use of qualitative interviews and by administering two online quantitative surveys: the "Dimensions of Social Learning Questionnaire" and the "Basic Psychological Need Satisfaction and Frustration Scale". Seventy students completed the questionnaires, while 14 students were interviewed. The students were recruited from four teacher training institutes.

Results: The analyses reveal that the more students perceive Shared identity and equal relationships in blended TLGs, the greater the fulfillment of Basic Psychological Needs they experience. Moreover, the more students experience the fulfillment of the need for Competence, the more students perceive TLGs' Social Configurations.

Discussion: Based on the findings, we conclude that, although in-depth learning is more challenging during distance learning, blended TLGs are valuable for students' Basic Psychological Needs during unpredictable times.

KEYWORDS

teacher learning groups, social configurations, basic psychological needs, blended learning, social learning

1. Introduction

Social learning is increasingly advocated within teacher training institutes as a means through which to enhance students' motivation to learn (de Laat, 2012). Social learning is especially important in light of the voluminous individual work that undergraduate students are required to carry out as part of their studies, which can lead to them experiencing a lack of

connection with both their educational institution and peers (Vrieling-Teunter et al., 2022a), exacerbate feelings of emotional loneliness that negatively impact upon their well-being, motivation for learning, and study performance, and ultimately result in dropout (Dopmeijer, 2021). Consequently, the topic of student well-being is currently high on the agenda of higher education institutes (Litjens and Ruijbroek, 2019; Social and Economic Council, 2019).

Grounded in the ambition to improve social learning and student well-being in teacher training institutes, Teacher Learning Groups (TLGs) are posited as providing a means through which to foster social learning environments that support students' motivation to learn. TLGs can be defined as social configurations in which in-service teachers, teacher educators and students, sometimes supplemented by researchers and/or experts, collaboratively learn through social interactions, which in turn affords students opportunities to exchange knowledge and practical advice with other professionals (Doppenberg et al., 2012; Vrieling-Teunter et al., 2022a). According to Vrieling-Teunter et al. (2022b), social configurations in TLGs comprise three social learning dimensions: (1) Practice integration (i.e., the relationship between the knowledge shared and created in the TLGs and members' daily teaching activities), (2) Long-term orientation and goals (i.e., TLGs' activities that focus on short- and long-term goals and reflect the TLG members' social learning attitude), and (3) Shared identity and equal relationships (i.e., the way TLG members work interdependently in equal relationships with a shared purpose and responsibility for collective success). Through social interactions and dialog, problems and insights are shared constructively in TLGs, and new knowledge is jointly created (Wenger et al., 2011).

In addition to enhancing students' motivation to learn, working and learning together in TLGs is also an important competence for teachers to possess in contemporary society. In a context characterized by ongoing professional development in a constantly evolving professional practice, TLGs provide a crucial opportunity for teachers to engage in lifelong learning (van Schaik et al., 2019). It is thus important to involve students and encourage their active participation in TLGs (Vrieling-Teunter et al., 2022a). The rationale for engaging in TLGs is considered to be in line with the principles of self-determination theory, in that the collaborative activities undertaken and the knowledge acquired may help to encourage intrinsic motivation by meeting people's basic psychological needs for autonomy, competence, and relatedness (cf. Deci and Ryan, 2000; Vansteenkiste et al., 2020). That is to say, TLGs can support students' basic psychological needs insofar as participants create new knowledge from theoretical and practical perspectives within a group that is characterized by diverse professional backgrounds (i.e., competence), that makes autonomous choices in their collaboration (i.e., autonomy), and provides peer support in a safe atmosphere (i.e., relatedness).

However, developing students' basic psychological needs in TLGs does not occur naturally, but rather must be facilitated (Vrieling-Teunter et al., 2022a). From this perspective, Vrieling-Teunter et al. (2022a) searched for relationships between TLGs' social configurations and the motivation of participating students from four Dutch primary teacher training institutes. Analyses of these relations revealed seven variables for realizing student support in TLGs: (1) Autonomous choices regarding content, (2) New knowledge, (3) Sharing, support, and social skills, (4) Personal goals, (5) Autonomous choices regarding collaborating partners, (6) Scaffolding, and (7) Equality in an informal atmosphere. Besides these variables, both homogeneous (students only) and heterogeneous (students, teachers, teacher educators,

researchers, and experts) TLGs turned out to be valuable for students' basic psychological needs, and, hence, both forms were advised to be integrated within the teacher training curricula. Homogeneous TLGs were found to be valuable for process sharing, peer support (feedback and emotional support) and the development of social skills with peers, whereas heterogeneous TLGs were found to be valuable for knowledge creation and developing social skills within a group of participants from diverse professional backgrounds.

Over the past years, TLGs would ordinarily convene face-to-face on a regular basis (Vrieling-Teunter et al., 2022a). However, this changed abruptly as a result of the COVID-19 pandemic. In light of the governmental measures (e.g., strict isolation measures), educational institutes had to switch constantly, flexibly and sometimes abruptly between face-to-face learning and distance learning (Meeter et al., 2020; Pokhrel and Chhetri, 2021). The alternation between face-to-face and distance learning is referred to as blended learning (Müller and Mildenberger, 2021). As a consequence, TLGs also had to switch to blended learning for their meetings (De Vocht et al., 2022). The expected result of this educational reform in the constitution of social configurations of TLGs is that it may have put considerable strain upon the fulfillment of students' basic psychological needs (De Vocht et al., 2022). This expectation is in line with research showing that students within educational institutes in the Netherlands and other Western countries experienced a decline in their well-being and increased psychological problems during COVID-19 (e.g., Morbée et al., 2020).

The present study examines the relationship between social configurations and the basic psychological needs of students in TLGs during the pandemic. Due to the COVID-19 measures, the alternation between face-to-face and distance TLG meetings was flexible and often difficult to plan. Therefore, the flexible, unplanned blended TLG (henceforth: blended TLG) was not a pure form of blended learning. The students ($n=70$) participated in blended TLGs for one academic year (2020–2021) within four different primary teacher training institutes in the Netherlands. Given that the four teacher training institutes differed with respect to key elements of their TLGs (e.g., goals and composition; see Table 1), we had the opportunity to investigate: (a) in which ways students experienced a variety of social configurations and fulfillment of basic psychological needs within blended TLGs and (b) the extent to which the social configurations of blended TLGs were related to students' basic psychological needs.

This results in the following research questions:

- RQ1: In which ways do students experience a variety in social configurations of blended TLGs?
- RQ2: In which ways do students experience a variety in the fulfillment of basic psychological needs in blended TLGs?
- RQ3: To what extent are blended TLGs' social configurations related to students' basic psychological needs?

2. Materials and methods

2.1. Design

In this study we utilized a convergent parallel mixed-methods design (Creswell, 2014). Data was gathered at the end of the academic year (April/June 2021). The quantitative data consisted

TABLE 1 TLGs' organization of participating institutes.

	Institute 1 (n=48)	Institute 2 (n=9)	Institute 3 (n=10)	Institute 4 (n=3)
Frequency meetings	8 times per year	12 times per year	6 to 8 times per year	20 times per year
Duration meetings	210 min	80 min	90 to 240 min	240 min
Goals	Collective + Individual goals	Mutually exchanging feedback and ideas pertaining to subject of the minor; Individual goals	In a Research and Development line to enhance research skills, collaborating on one research project centered around a question from educational practice; Collective goals	Developing answers to students' individual research questions related to innovative education; Individual goals
Contact and/or distance learning	Contact learning with 1.50 m distance (<i>September–November</i>) Occasionally partly contact learning, partly distance learning (half class); Regularly distance learning (<i>December–April</i>) Contact learning with 1.50 m distance (<i>May</i>)	Contact learning with 1.50 m distance (<i>September–November</i>) Occasionally partly contact learning, partly distance learning (half class); Regularly distance learning (<i>December–May</i>)	One-time partly contact learning (student), partly distance learning (externals); Regularly distance learning (<i>January–June</i>)	Contact learning with 1.50 m distance (<i>September–November</i>) Occasionally partly contact learning, partly distance learning (student's choice); Regularly distance learning (<i>December–May</i>) Contact learning with 1.50 m distance (student's choice) (<i>June</i>)
Guidance	Supervised by teacher educators	Students take initiative inviting teachers, teacher educators, researchers and experts themselves	Leadership by teachers; a senior researcher in the lead of research activities	Side-line support by teacher educators
Composition	Heterogeneous	Homogeneous	Heterogeneous	Homogeneous
Assessment	Formally assessment of final product; students' social skills were formally assessed by teacher educators with an educational tool	Practical or research assignment that was formally assessed by teacher educators employing a rubric that fitted the personal learning question and the way in which this learning question had been answered	Based on a logbook, the students were formally assessed by teacher educators on how they spent their TLG hours as part of their portfolio	Formally assessment by portfolio conversation with teacher educators in which students reflected on their learning in the TLG
Gender	Male (n = 13) Female (n = 35)	Male (n = 1) Female (n = 8)	Male (n = 3) Female (n = 7)	Male (n = 1) Female (n = 2)
Age Range	16–20 years (n = 24) 21–25 years (n = 21) 26–30 years (n = 1) > 30 years (n = 2)	16–20 years (n = 1) 21–25 years (n = 8)	16–20 years (n = 8) 21–25 years (n = 2)	16–20 years (n = 1) 21–25 years (n = 2)
Training program	Regular (n = 42) Academic (n = 4) Part-time (n = 2)	Regular (n = 9)	Academic (n = 8) Missing (n = 2)	Regular (n = 3)
Academic year student	Year 3 (n = 47) Year 4 (n = 1)	Year 4 (n = 6) Year 5 (n = 2) Missing (n = 1)	Year 1 (n = 10)	Year 4 (n = 3)

of questionnaires about students' Social Configurations and Basic Psychological Needs in blended TLGs. The qualitative data consisted of retrospective semi-structured interviews that prompted for students' experiences with respect to Social Configurations and Basic Psychological Needs within blended TLGs.

2.2. Participants

2.2.1. Students In TLGs

The TLGs in the four teacher training institutes varied with respect to the frequency of the meetings, duration of the meetings, goals, contact and/or distance learning, guidance, composition, assessment, gender, age range, training program and academic year of the students (see Table 1).

2.2.1.1. Institute 1

In the heterogeneous TLGs at this institute, 48 third- and fourth-year students collaborated with teachers, teacher educators and researchers on one research project centered around.

a question from educational practice that students could choose from their minor. These questions included topics such as pedagogical sensitivity, giftedness, and film education. The TLGs collaborated on the same theme across two academic years, but students participated only for one academic year. A maximum of 12 students were allowed to participate for each TLG. The TLGs had eight meetings lasting 210 min. In preparation for the TLG meetings, eight lessons were organized for students in the presence of the teacher educator. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020; May 2021) and distance learning (December 2020/April 2021). In some instances, meetings took place partly in the form of contact learning and partly in the form

of distance learning (half class; December 2020/April 2021). Students pursued both collective and individual goals in collaboration with the other TLG members. In addition to the final product, students' social skills were formally assessed by teacher educators *via* the use of an educational tool.

2.2.1.2. Institute 2

Within this institute, nine fourth-year students participated in homogeneous TLGs who chose the same minor. TLG topics were inquiry-based learning, learning by playing, and diversity. TLG members collaborated during one academic year and students could invite teachers, teacher educators, researchers, and experts if necessary. The 80-min TLG meetings were held 12 times a year. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020) and distance learning (December 2020/May 2021). In some instances, meetings took place partly in the form of contact learning and partly in the form of distance learning (half class; December 2020/May 2021). The students formed a TLG to develop answers to their own individual research questions by mutually exchanging feedback and ideas. The assessment involved a practical or research assignment that was formally assessed by teacher educators employing a rubric that fitted both the personal learning question and the way in which this learning question had been answered.

2.2.1.3. Institute 3

Because of the research and development focus at this institute, ten first- to third-year students participated together with teachers, teacher educators, and researchers in heterogeneous TLGs. While students enhanced their research skills, all the participants collaborated on one research project centered around a question from educational practice. These questions pertained to a variety of topics such as personalized learning with ICT, reading motivation, and ICT in self-direction and coaching. TLGs collaborated during two academic years, however all the students in this study participated for the first year. A maximum of three students were allowed to participate for each TLG. The TLGs had six to eight meetings of 90–240 min. The TLG leadership lay with the teachers, while a senior researcher from the teacher education institute primarily took the lead in the research activities. The TLG meetings were organized in the form of distance learning (January/June 2021). On one occasion, the TLG meeting took place partly in the form of contact learning (students) and partly in the form of distance learning (externals; January/June 2021). Students worked toward a collective TLG goal. Based on a logbook, students were formally assessed by teacher educators on the basis of how they spent their TLG hours as part of the portfolio.

2.2.1.4. Institute 4

The homogeneous TLGs at this institute consisted of three fourth-year students collaborating on educational innovation topics, such as, for example, Jenaplan education, Dalton education and personalized learning during one academic year. TLG members met weekly for 240 min. Although the teacher educators were not officially part of the TLG, they were often present in the classroom to answer students' questions. The TLG meetings took place in the form of both contact learning with 1.5 meters distance (September/November 2020; June 2021) and distance learning (December 2020/May 2021). In some instances,

meetings were held partly in the form of contact learning and partly in the form of distance learning (students' choice; December 2020/May 2021). Students formed a TLG to develop answers to their personal goals and individual research questions. They were formally assessed by teacher educators as part of a portfolio conversation, which meant that students had to reflect on their learning in the TLG.

2.2.2. Data collection

For the quantitative data, students were selected based on convenience sampling (Creswell, 2014). Overall, 135 TLG students were approached to participate in the present study, with 70 students ultimately completing the quantitative questionnaires (response rate of 52%). The students were recruited from four institutes, namely Institute 1 ($n=48$), Institute 2 ($n=9$), Institute 3 ($n=10$), and Institute 4 ($n=3$). Because of the low number of participants, we could not obtain reliable quantitative correlations for Institute 4. Therefore, we also had to exclude the students from Institute 4 in our quantitative analyses. With respect to the gender composition of the final sample, 26% were males and 74% were females. The age of the participating students ranged from 16 to 20 years (49%), 21–25 years (47%), 26–30 years (1%), and older than 30 years (3%). The majority of the students attended the full-time regular training program (77%), 17% attended the full-time academic program, 3% participated in the part-time regular program, while in 3% of cases the data on program variants were missing.

To collect the qualitative data, students were selected based on typical sampling (Creswell, 2014). Typical sampling allows students to represent the *typical* perspectives and detailed context of the TLGs within the four different institutes. Fourteen students participated in semi-structured interviews. The students were spread out across the four institutes, namely Institute 1 ($n=5$), Institute 2 ($n=3$), Institute 3 ($n=3$), and Institute 4 ($n=3$). Given that we were interested in the Social Configuration and Basic Psychological Needs within each institute, two different interviews were designed and conducted separately with various interviewees. This was legitimated on the grounds that the relationships say something about Social Configuration and Basic Psychological Needs within each of the institutes.

2.2.3. Materials

2.2.3.1. Dimensions of the social learning questionnaire

Social Configurations were measured quantitatively using the Dimensions of Social Learning Questionnaire (DSLQ; Vrieling-Teunter et al., 2022b; see [Supplementary files](#)). This validated questionnaire is a self-reported instrument for capturing Social Configurations of TLGs. The questions are based on the three dimensions of social learning, namely (1) Practice integration, (2) Long-term orientation and goals, and (3) Shared identity and equal relationships. [Table 2](#) contains the number of items for each scale, a sample question from each dimension of Social Configurations, and the reliability of the scales. The students scored the questions on a four-point Likert scale ranging from 'Totally disagree' to 'Totally agree.' The questionnaire took around 5 min to complete and was administered *via* an online application. Taking into account the number of items within each scale (3–5), homogeneity was considered to be high ($\alpha \geq 0.70$; see [Table 2](#); Field, 2018).

2.2.3.2. Dimensions of the social learning interview

Qualitatively, Social Configurations were measured *via* a biographical interview based on the DSLQ by [Vrieling-Teunter et al. \(2022b\)](#); see [Supplementary files](#). A biographical interview is a form of narrative inquiry ([Nurse and O'Neill, 2018](#)) in which students were asked to reflect on Social Configurations, dynamics, developments, and their future perspectives within the TLGs. [Table 2](#) reports a sample question from the Dimensions of Social Learning Interview (DSLQ) for each dimension of Social Configuration. The biographical interview was extended to include questions about the influence of COVID-19 ([Morbée et al., 2020](#)) on Social Configurations of TLGs (e.g., In what way has COVID-19 affected your personal and collective goals?). The DSLQ lasted approximately 45 min and was conducted *via* Microsoft Teams.

2.2.3.3. Basic psychological needs questionnaire

Basic Psychological Needs were measured quantitatively using the Basic Psychological Need Satisfaction and Frustration Scales (BPNSFS; [Chen et al., 2015](#)). The BPNSFS is a validated self-report instrument that measures three Basic Psychological Needs: (1) Autonomy, (2) Relatedness, and (3) Competence. For the present study, the BPNSFS was adapted to the Basic Psychological Needs Questionnaire (BPNQ; see [Supplementary files](#)) to connect more closely to the situation of learning within TLGs. For example, the original statement “I feel warmly about people I spend time with” was adapted to “I feel warmly about people in my TLG.” Items were rated on a four-point Likert scale ranging from ‘Totally disagree’ to ‘Totally agree.’ The questionnaire took approximately 5 min to complete and was administered *via* an online application. [Table 3](#) shows the number of items for each scale, a sample question for each aspect of Basic Psychological Needs, and the reliability of the scales. Taking into account the number of items within the scale (4–7), the internal consistency of the Autonomy scale was considered to be low ($\alpha < 0.70$; see [Table 3](#); [Field, 2018](#)). The reliability could not be increased by removing items. Yet, all items correlated well with the scale (item-total correlation ≥ 0.3 ; [Field, 2018](#)). We retained the scale since it was validated in earlier research ([Vrieling-Teunter et al., 2022a](#); $\alpha = 0.71$) and allowed us to compare the present study with other research. The internal consistency of the other BPNQ scales (i.e., Relatedness and Competence) was high ($\alpha \geq 0.70$; see [Table 3](#)).

2.2.3.4. Basic psychological needs interview

Qualitatively, Basic Psychological Needs were measured *via* the semi-structured Motivation Interview ([Jansen in de Wal, 2016](#)). The

interview included open-ended key questions for each scale of Basic Psychological Needs in order to capture students’ perspectives from each institute. For the purposes of this study, the original semi-structured interview was adapted to the Basic Psychological Needs Interview (BPNI; see [Supplementary files](#)). Questions that focused on Autonomy, Relatedness, and Competence were retained. [Table 3](#) presents a sample question of the interview for each aspect of Basic Psychological Needs. The interview was supplemented with questions about the influence of COVID-19 on learning ([Morbée et al., 2020](#)) in TLGs (e.g., In what way has COVID-19 affected your Relatedness in the TLG?), the (non)perception of fulfilled Basic Psychological Needs ([Chen et al., 2015](#); e.g., What is your main reason for choosing this TLG?) and motivation of students in TLGs ([Vrieling-Teunter et al., 2022a](#); e.g., How is it ensured that everyone gets equal input in the TLG?). The BPNI lasted approximately 45 min and was conducted *via* Microsoft Teams.

2.2.4. Procedure

This study was ethically approved by the Research Ethics Committee (cETO) of the Open Universiteit. Students received an information letter from the project leaders at their own institute during the first TLG meeting. By actively giving their informed consent, the students agreed to participate in the study. To collect the quantitative data, all students were invited to complete the questionnaires (i.e., DSLQ and BPNQ). To encourage a high response rate, the students were given the opportunity to complete the questionnaires during the TLG meetings. Students who did not complete the questionnaires due to absence subsequently received a reminder *via* an online application after 2 and 4 weeks. To collect the qualitative data, students were invited to participate in a semi-structured interview (i.e., DSLQ or BPNI) by the project leaders at their own institute (see [Table 4](#)). These interviews were recorded with a voice recorder and then transcribed verbatim. All quantitative and qualitative data were anonymized, analyzed, and stored in Full Disclosure on RESEARCH drive, a storage service for education and research that complies with European privacy laws.

2.2.5. Data analysis

2.2.5.1. Quantitative analysis

Quantitative analyses were conducted through IBM SPSS 29. Nonparametric testing was performed because of the non-normal distribution of the data ([Field, 2018](#)) for DSLQ and BPNQ, which

TABLE 2 Reliability and number of items of the quantitative measurement of social configurations *via* the scales practice integration, long-term orientation and goals, and shared identity and equal relationships.

Scale	Number of items	Example items questionnaire	Cronbach's alpha	Example item interview
Practice integration	5	“To what extent are practical experiences with materials developed in the TLG discussed?”	0.85	“In what ways practical experiences are discussed within the TLG?”
Long-term orientation and goals	3	“To what extent conversations about short- and long-term goals occur?”	0.92	“As a student, what goals do you hope to achieve when you participate in the TLG?”
Shared identity and equal relationships	5	“To what extent reciprocal relationships among group members occur?”	0.90	“Describe the relationships between you and other TLG members?”

TABLE 3 Reliability and number of items of the quantitative measurement of experienced basic psychological needs *via* the scales autonomy, relatedness, and competence.

Scale	Number of items	Example items questionnaire	Cronbach's alpha	Example items interview
Autonomy	4	"In my TLG, I have a sense of choice and freedom in the things I do."	0.55	"How does the TLG selection process work?"
Relatedness	7	"I care about the people in my TLG."	0.84	"Why are TLG members (not) valuable to you?"
Competence	6	"In my TLG, I feel able to achieve my goals."	0.87	"Why do you feel you can (not) achieve individual and/or collective goals?"

TABLE 4 Number of participants in the dimensions of social learning interview and the basic psychological needs interview per institute.

	Institute 1	Institute 2	Institute 3	Institute 4
DSLQ	<i>n</i> = 2	<i>n</i> = 2	<i>n</i> = 2	<i>n</i> = 1
BPNI	<i>n</i> = 3	<i>n</i> = 1	<i>n</i> = 1	<i>n</i> = 2

DSLQ, Dimensions Social Learning Interview; BPNI, Basic Psychological Needs Interview.

could be a consequence of the small number of respondents (see "Students in TLGs").

To gain insight into both the direction and strength of the relationship between the three dimensions for Social Configurations and the three aspects of Basic Psychological Needs, correlation analyses were conducted for each institute. Kendall's Tau-b tests were chosen because of the small data set with a large number of equal ranks (four-point Likert scale). The methodological assumptions for Kendall's Tau-b were met (Allen et al., 2014). Two-sided testing was conducted since theory does not predict direction in correlation (see "Introduction").

2.2.5.2. Qualitative analysis

The qualitative analysis was conducted using ATLAS.ti 22. The coding schemes were generated deductively from the literature (Geisler and Swarts, 2019) for both variables (i.e., Social Configurations: Practice integration, Long-term orientation and goals, and Shared identity and equal relationships; and Basic Psychological Needs: Autonomy, Relatedness, and Competence). In addition, to capture the blended TLG component (i.e., contact learning, distance learning, and blended learning), the coding schemes for both variables were extended inductively. Two coders independently coded 10% of the qualitative data to calculate inter-rater agreement (O'Connor and Joffe, 2020). An acceptable inter-rater agreement reliability was obtained for Social Configurations ($\alpha = 0.70$) and Basic Psychological Needs ($\alpha = 0.70$; Krippendorff, 2018). A distinction was drawn between positive and negative feelings and the number of relevant quotes were calculated for each institute.

For Practice integration (see "Social configurations", Table 5, label Practice integration), students' statements were deductively organized by the labels extracted from DSLQ (i.e., Practice integration): Communication about classroom practice, Integration of group products in classroom practice, Adjustments of group products after discussion or feedback, Application of knowledge created in TLGs during training assignments, and Application of knowledge created in TLGs during assignments for classroom practice. Inductively, students' statements were organized *via* the labels: *Discussions about practical experiences through ICT during distance learning*, *Conducting practical research as scheduled during blended learning*, and *Exchanging of practical experiences*

during distance learning. For Long-term orientation and goals (see "Social Configurations", Table 5, label Long-term orientation and goals), students' phrases were deductively organized *via* the labels extracted from DSLQ (i.e., Long-term orientation and goals): Description of collective goals, Description of individual goals, Communication about TLG goals, and Relation between TLG activities and group and/or individual goals. Inductively, students' phrases were organized *via* the label: *Achievement of goals in depth during blended learning*. For Shared identity and equal relationships (see "Social Configurations", Table 5, label Shared identity and equal relationships), students' narratives were deductively organized *via* the labels extracted from DSLQ (i.e., Shared identity and equal relationships): Reciprocal relationships between group members, Feeling of belonging to the group, Sense of equality between group members, and Feeling of safety to interact within the group. Inductively, students' narratives were organized *via* the labels: *Sense of equality because of contact learning and Informal conversations during distance learning*.

For Autonomy (see "Basic Psychological Needs", Table 6, label Autonomy), students' statements were deductively organized *via* the labels extracted from BPNQ (i.e., Autonomy): Take initiative, Ownership over TLG activities, Freedom of choice in content, Freedom of choice in collaborating partners, and Voluntary performance of tasks. Inductively, students' statements were organized *via* the label: *Choice of assessment conditions during blended learning*. For Relatedness (see "Basic psychological needs", Table 6, label Relatedness), students' phrases were deductively organized by the labels extracted from BPNQ (i.e., Relatedness): Sense of belonging, Content support, Emotional support, Eager to learn together and Care about TLG members. Inductively, students' phrases were organized *via* the labels: *Sense of belonging because of contact learning*, *Sense of relatedness through full distance learning instead of partly physical and partly online*, and *Emotional support during distance learning*. For Competence (see "Basic Psychological Needs", Table 6, label Competence), students' narratives were deductively organized *via* the labels extracted from BPNQ (i.e., Competence): Feeling competent in training assignments, Feeling competent in assignments for classroom practice, Feeling competent in social skills, Achieving results, Achieving goals, Receiving positive feedback, and Clear structure. Inductively, students' narratives were organized *via* the labels: *Achieving results during distance learning and Discussing study schedule after adjustment contact/distance learning*.

3. Results

Shapiro–Wilk and Levene's tests were used to evaluate the assumptions of normality and homogeneity of variance, respectively. The distribution departed significantly from normality for Practice Integration (Institute 1: $W(47) = 0.94$, $p = 0.02$); Long-term orientation

TABLE 5 Social configurations at the four different institutes.

	Institute 1	Institute 2	Institute 3	Institute 4
Practice integration				
Communication about classroom practice	+ (<i>n</i> = 1)	+ (<i>n</i> = 2)		
Integration of group products in classroom practice		+ (<i>n</i> = 3)		+ (<i>n</i> = 2)
Adjustments of group products after discussion or feedback	+ (<i>n</i> = 1)	+ (<i>n</i> = 2)		
Application of knowledge created in TLGs during training assignments	+ (<i>n</i> = 4)	+ (<i>n</i> = 3)	+ (<i>n</i> = 3)	+ (<i>n</i> = 1)
Application of knowledge created in TLGs during assignments for classroom practice	+ (<i>n</i> = 4)	+ (<i>n</i> = 1)	+ (<i>n</i> = 1)	+ (<i>n</i> = 1)
Discussions about practical experiences through ICT during distance learning	+ (<i>n</i> = 1)			
Conduction of practical research as scheduled during blended learning			– (<i>n</i> = 3)	
Exchanging of practical experiences during distance learning				– (<i>n</i> = 1)
Long-term orientation and goals				
Description of collective goals	+ (<i>n</i> = 2)			
Description of individual goals				+ (<i>n</i> = 2)
Communication about TLG goals	+ (<i>n</i> = 2)	+ (<i>n</i> = 1)		
Relation between TLG activities and group and/or individual goals	+ (<i>n</i> = 6)		+ (<i>n</i> = 7)	
Achievement of goals in depth	+ (<i>n</i> = 1)	– (<i>n</i> = 3)	– (<i>n</i> = 3)	
Shared identity and equal relationships				
Reciprocal relationships between group members	+ (<i>n</i> = 7)	+ (<i>n</i> = 6)	+ (<i>n</i> = 3)	+ (<i>n</i> = 3)
Feeling of belonging to the group	+ (<i>n</i> = 1)	+ (<i>n</i> = 1)	+ (<i>n</i> = 1)	
Sense of equality between group members	+ (<i>n</i> = 10)	+ (<i>n</i> = 2)	+ (<i>n</i> = 3)	+ (<i>n</i> = 1)
Feeling of safety to interact within the group	+ (<i>n</i> = 4)	+ (<i>n</i> = 2)	+ (<i>n</i> = 1)	+ (<i>n</i> = 1)
Sense of equality because of contact learning	+ (<i>n</i> = 3)			+ (<i>n</i> = 1)
Informal conversations during distance learning			+ (<i>n</i> = 1)	

+, positive experiences; –, negative experiences; empty box, no expressed experiences; *n*, number relevant quotes.

and goals (Institute 1: $W(47)=0.92$, $p<0.01$, Institute 2: $W(9)=0.78$, $p=0.01$); Shared identity and equal relationships (Institute 1: $W(47)=0.88$, $p<0.01$); Relatedness (Institute 1: $W(47)=0.95$, $p=0.04$); and Competence (Institute 1: $W(47)=0.94$, $p=0.01$). Homogeneity of variance could not be assumed for Long-term orientation and goals ($p=0.01$). These outcomes could be a consequence of the small number of respondents (see “Students in TLGs”). Hence, nonparametric testing was performed (Field, 2018).

Table 7 presents the descriptive data for the TLGs at the three institutes with respect to Social Configurations and Basic Psychological Needs. Kruskal-Wallis revealed that the variables Practice integration and Long-term orientation and goals differed significantly between the institutes. More specifically, significant differences were found between the institutes for Practice integration ($H(2)=19.84$, $p<0.001$), particularly between Institute 1 and Institute 2 ($p<0.05$) and between Institute 1 and Institute 3 ($p<0.001$). These were medium and large effects, respectively. Based on the rankings, students from Institute 1 ($n=47$, Mean Rank = 39.20) provided significantly higher scores for Practice integration than students from Institute 2 ($n=9$, Mean Rank = 21.56) and Institute 3 ($n=9$, Mean Rank = 12.06). A significant difference was found between the institutes for Long-term orientation and goals ($H(2)=9.94$, $p<0.01$). The follow-up analysis once again showed a significant difference, with a medium effect between Institute 1 and Institute 2 ($p<0.01$). Based on the ranking, students

from Institute 1 ($n=47$, Mean Rank = 36.60) experienced Long-term orientation and goals significantly more often than students from Institute 2 ($n=9$, Mean Rank = 15.33). For the remaining variables, no significant differences between the institutes were found.

To gain insight into the relationship between Social Configurations and Basic Psychological Needs of students in blended TLGs (see Correlation between social configurations and basic psychological needs; RQ3), students’ experiences of Social Configurations in the different institutes are first discussed (see Social configurations; RQ1). A brief overview of Social Configurations is presented for each institute in Table 5. Secondly, students’ perceptions of the fulfillment of Basic Psychological Needs across the institutes are discussed (see Basic psychological needs; RQ2). In Table 6, a brief overview of the Basic Psychological Needs for each institute is presented. In order to better understand the blended TLG context, students’ statements that pertained explicitly to this blended context are discussed in greater detail for the variables Social Configurations and Basic Psychological Needs.

3.1. Social configurations

Overall, students had positive feelings (+) with regard to Social Configurations in blended TLGs (see Table 5). Negative feelings (–) were expressed toward blended learning, distance learning and the

TABLE 6 Fulfilling of basic psychological needs in the four different institutes.

	Institute 1	Institute 2	Institute 3	Institute 4
Autonomy				
Take initiative	+ (n = 2)	+ (n = 1)		+ (n = 1)
Ownership over TLG activities	+ (n = 2)		+ (n = 3)	+ (n = 3)
Freedom of choice in content	+ (n = 3)	+ (n = 2)		+ (n = 4)
Freedom of choice in collaborating partners	+ (n = 2)			
Voluntary performance of tasks	+ (n = 1)			+ (n = 1)
Choice of assessment conditions		+ (n = 1)	– (n = 5)	
Relatedness				
Sense of belonging	+ (n = 3)	+ (n = 2)	+ (n = 1)	+ (n = 2)
Content support	+ (n = 11)	+ (n = 9)	+ (n = 4)	+ (n = 2)
Emotional support		+ (n = 1)		
Eager to learn together	+ (n = 5)	+ (n = 1)		
Care about TLG members		+ (n = 1)	+ (n = 1)	
Sense of belonging because of contact learning				+ (n = 1)
Sense of relatedness through full distance learning instead of partly physical partly online	+ (n = 1)			
Emotional support during distance learning		+ (n = 1)		
Competence				
Feeling competent in training assignments	+ (n = 10)	+ (n = 3)		+ (n = 1)
Feeling competent in assignments for classroom practice				
Feeling competent in social skills		+ (n = 1)		+ (n = 1)
Achieving results	+ (n = 5)	+ (n = 4)		+ (n = 1)
Receiving positive feedback	+ (n = 1)			+ (n = 1)
Clear structure		+ (n = 4)		
Achieving results during distance learning	+ (n = 3)		– (n = 7)	+ (n = 1)
Discuss study schedule after adjustment contact/distance learning		+ (n = 1)		

+, positive experiences; –, negative experiences; empty box, no expressed experiences; n, number relevant quotes.

depth of the learning. Students from all institutes experienced Practice integration (see Table 5, label Practice integration). For example, all of the students in blended TLGs reported positive feelings about the application of knowledge generated in the TLGs during training assignments: “The interview from the academic workshop [TLG], I could use it for my own minor” (Female 1 - Institute 1). Students reported both positive and negative feelings concerning blended learning and Practice integration (see Table 5, label Practice integration, Institutes 1, 3, 4). Although students were satisfied with how the ICT applications (in subgroups) allowed them to share practical experiences during blended TLGs: “First, just in a large group, than in smaller *Meets*” (Male 1 - Institute 1), students also felt there was insufficient time to share these practical experiences during distance learning: “[We discuss] in breakout rooms. That’s not every meeting. ... There is not always room to discuss what we do in practice” (Female 2 - Institute 4). Furthermore, practice research was sometimes delayed due to distance learning and TLG meetings were intermittently canceled: “I think that [distance learning] caused the research at school to start later, and I think that [distance learning] also caused several meetings to be canceled” (Female 3 - Institute 3).

Long-term orientation and goals was perceived by students from all institutes (see Table 5, label Long-term orientation and goals). For instance, students in blended TLGs reported positive feelings concerning the relation between TLG activities and individual goals: “This [giving feedback] allows me to get a better idea of how the theoretical framework is constructed, so that benefits my learning goals” (Male 2 - Institute 3). Students expressed both positive and negative feelings about the depth of the learning during blended learning and Long-term orientation and goals (see Table 5, label Long-term orientation and goals, Institutes 1, 2, 3). In blended TLGs, the depth of the learning (see also “Correlation between social configurations and basic psychological needs”, correlation between Long-term orientation and goals and Relatedness) was either achieved (Institute 1) or compromised (Institutes 2 and 3) insofar as goals were adequately or inadequately accomplished. “Due to the lack of physical contact ... I think we were very limited in what we wanted to get out of our network [TLG]” (Female 4 - Institute 2).

Wholly positive feelings were expressed by students from all institutes regarding Shared identity and equal relationships (see Table 5, label Shared identity and equal relationships). For instance,

students in blended TLGs reported positive feelings toward reciprocal relationships between the TLG members: “Everybody gets along well, so it’s just a very nice working atmosphere” (Male 1 - Institute 1). There were similar sentiments expressed with respect to the blended context and Shared identity and equal relationships, (see Table 5, label Shared identity and equal relationships, Institutes 1, 3, 4), with the difference between contact and distance learning being particularly notable. On the one hand, students noticed that contact learning helped to cultivate an atmosphere of equality (Institutes 1, 4): “I also like that [contact learning] the most because I feel it’s more equal there” (Female 2 - Institute 4). On the other hand, when informal conversations were organized during distance learning, the impact of distance learning on the interaction with other TLG members was minimal: “Those [little moments to catch up] are also sufficiently interspersed during meetings. So, yes, there has been some influence. But that’s not too bad” (Male 2 - Institute 3).

3.2. Basic psychological needs

Overall, students in blended TLGs expressed positive feelings (+) with regard to the fulfillment of Basic Psychological Needs (see Table 6). Negative feelings (–) were reported toward blended and distance learning. Students from all institutes experienced the fulfillment of the need for Autonomy in blended TLGs (see Table 6, label Autonomy). For example, students reported positive feelings concerning freedom of choice in content: “I was just able to do what I wanted to do and discuss what I wanted to discuss” (Female 5 - Institute 2). Students expressed both positive and negative feelings toward blended learning and the need for Autonomy (see Table 6, label Autonomy, Institutes 2, 3). While some students experienced positive feelings toward having autonomy over flexible assessment conditions during blended learning: “They offered some more space for extra submission dates” (Female 5 - Institute 2), other students experienced externally imposed pressure due to the mandatory assessment conditions whose fulfillment was sometimes threatened because of sudden switches between contact and distance learning: “We must make 40 h in a year [assessment condition: 40 h TLG work per academic year]. ... From college [Institute 3] it is an obligation. ... First, I was intrinsically motivated because I liked the subject. ... Now

I’m extrinsically motivated because I’m pushed by those hours” (Female 6 - Institute 3).

In the interviews, students from all institutes expressed fulfillment of the need for Relatedness in blended TLGs (see Table 6, label Relatedness). For instance, students had positive feelings about content support: “We are looking for a solution together, this has created more relatedness between the students” (Female 3 - Institute 3). Students expressed solely positive feelings toward blended learning and Relatedness (see Table 6, label Relatedness, Institutes 1, 2, 4). They experienced Relatedness as a result of having TLG meetings entirely at distance rather than being partly online and partly physically present: “That link between online and physical was just difficult” (Male 3 - Institutes 1). Furthermore, during distance learning students set goals to support each other emotionally: “First, talk about the lesson and then just talk about how it’s going. ... The PLG [TLG] has kept the same function, but it has also gained a bit of a different context” (Female 5 - Institute 2). Students also felt a sense of Relatedness due to experiencing similar difficulties: “I also feel a pretty strong connection ... Because we encounter some of the same struggles” (Female 7 - Institute 4).

Regarding the fulfillment of the need for Competence, overall, the students reported positive feelings toward blended TLGs (see Table 6, label Competence, Institutes 1, 2, 4). For example, students expressed that they became more competent in the training assignments: “I provide input and I can tell and share things with the people in that team [TLG]. ... I’ve grown in that compared to last time” (Female 2 - Institute 4). Students reported both positive and negative feelings toward distance learning and Competence (see Table 6, label Competence, Institutes 1, 2, 3, 4). Specifically, students experienced a sense of Competence when they achieved results despite distance learning (Institutes 1, 4): “But to see that it succeeded in the end, that does give a boost” (Female 1 - Institute 1). Also, students had positive feelings when obtaining a structured study schedule after discussing the modified schedule because of the sudden switch between contact and distance learning: “So, that’s kind of nice that we can just offer some more direction and some more clarity to each other” (Female 5 - Institute 2). However, students expressed negative feelings toward Competence, and, in particular, were disappointed with the results they achieved when the TLG project was delayed due to the isolation period: “I thought I would learn a lot. ... It’s just, because it’s so often postponed and so often ... canceled at the last minute, I do get a little more frustrated” (Female 6 - Institute 3).

TABLE 7 Descriptive statistics for social configurations and basic psychological needs for Institutes 1, 2, and 3.

	Institute 1 ^a n=48	Institute 2 n=9	Institute 3 ^b n=10	Kruskal–Wallis **p<0.05
Dimensions of social learning				
Practice integration **	3.04 (0.08)	2.33 (0.23)	1.82 (0.24)	< 0.01
Long-term orientation and goals **	3.03 (0.09)	1.93 (0.31)	2.78 (0.31)	< 0.01
Shared identity and equal relationships	3.30 (0.10)	3.44 (0.12)	2.89 (0.23)	0.14
Basic psychological needs				
Autonomy	2.84 (0.06)	3.11 (0.20)	2.60 (0.22)	0.06
Relatedness	3.16 (0.08)	3.16 (0.15)	3.00 (0.19)	0.62
Competence	3.25 (0.08)	3.26 (0.13)	3.10 (0.18)	0.78

Students scored the questions on a four-point Likert scale ranging from “Totally disagree” to “Totally agree.” Means and standard deviations (between brackets) are provided.^aFor dimensions of social learning n = 47.

^bFor dimensions of social learning n = 9.

3.3. Correlation between social configurations and basic psychological needs

To describe the correlation between the three dimensions of Social Configurations and the three aspects of Basic Psychological Needs in blended TLGs, first the results of the qualitative analysis are presented for each institute. Because of the uneven sample sizes among the participating institutes, results of the quantitative analysis should be interpreted with caution. Statistic significant correlations were found in Institute 1 with the largest group size. Next, the relations between the qualitative and quantitative outcomes are discussed. In Table 8, the outcomes of the quantitative analysis are presented for each institute.

Students from Institutes 1 and 4 referred to the relationship between Practice integration and Autonomy in the interviews that corresponded to the label *Autonomous choices regarding content* (see “Introduction”, variable 1): “You got to choose your own topic... Because it was all about what you wanted to learn and what you wanted to achieve” (Female 8 - Institute 4). Students in blended TLGs also highlighted two important preconditions for the relationship between Practice integration and Autonomy: (1) ownership over practice research: “To do things the way I like. ... I am given a lot of responsibility and I do appreciate that” (Male 4 - Institute 1), and (2) ownership over practice assessment: “In this minor ... you had to make your own assessment form” (Female 8 - Institute 4). There was no relationship found between the amount of experienced Practice integration and the fulfillment of the need for Autonomy for any of the institutes.

Students from Institutes 1, 2, and 4 described the relationship between Practice integration and Relatedness in the interviews that corresponded to the label *Sharing, support, and social skills* (see “Introduction”, variable 3). The students in blended TLGs opined that it was necessary to exchange practical experiences during distance learning (i.e., Sharing): “That you have more people around you that you can talk to about your internship. Because of course that is a bit less in this time” (Female 5 - Institute 2). Moreover, the students

experienced relatedness through sharing practical materials developed in the blended TLG (i.e., Sharing): “They are so enthusiastic about it [children’s book publication] too, so I do feel more of a connection with them” (Female 8 - Institute 4). The students in blended TLGs also asked for help from experts (i.e., Support) and enjoyed learning with them (i.e., Social skills): “I also really enjoy being able to ask questions to people I would not normally be able to ask questions to, like an elementary school principal” (Male 4 - Institute 1). There was no relationship found between the amount of perceived Practice integration and the fulfillment of the need for Relatedness.

During the interviews, students from Institutes 1, 2, and 4 made reference to the correlation between Practice integration and Competence that corresponded to the label *New knowledge* (see “Introduction”, variable 2): “As the year progresses you learn a lot more because ... so I could ... give my opinion, because I had more knowledge about it” (Female 9 - Institute 1). In blended TLGs, students also drew special attention to the precondition of achieving results through modifying practical materials after online TLG discussions: “We had a lot of consultation moments online. ... What can we improve? ... We made adjustments and then another prototype came out” (Male 1 - Institute 1). The students also felt that they achieved results despite distance learning because the materials developed in the blended TLG were wholly applicable in practice (Institutes 2, 4): “Looking back now, I do not mind at all that certain things did not work out physically, because it did bring us where we are now [children’s book publication]” (Female 8 - Institute 4). The more Practice integration the students experienced, the greater the perception that the need for Competence had been fulfilled ($\tau=0.34$, $p<0.010$; Institute 1).

For Institute 4, a relationship between Long-term orientation and goals and Autonomy that corresponded to the label *Personal goals* (see “Introduction”, variable 4) was expressed by the students in the interviews. The students in blended TLGs experienced freedom of choice over how to achieve their Personal goals: “We got information from different sources, and we processed all this to .. how we would like to present it. ... So, we really needed our own creativity” (Female 8 - Institute 4). There was no relationship found between the amount

TABLE 8 The results of Kendall’s Tau-b test for social configurations and basic psychological needs per institute.

Basic psychological needs	Social configurations		
	Practice integration	Long-term orientation and goals	Shared identity and equal relationships
Institute 1 (n = 48)			
Autonomy	< 0.01	0.20	0.38*
Relatedness	0.13	0.19	0.47**
Competence	0.34*	0.29*	0.64**
Institute 2 (n = 9)			
Autonomy	−0.13	−0.10	−0.54
Relatedness	0.55	0.42	0.09
Competence	0.52	0.45	0.26
Institute 3 (n = 10)			
Autonomy	−0.15	0.15	0.29
Relatedness	0.15	−0.03	0.35
Competence	−0.06	0.29	0.45

[0.11–0.30] = small correlation; [0.31–0.50] = medium correlation; [0.51–0.80] = large correlation.

* $p<0.010$; ** $p<0.001$.

of perceived Long-term orientation and goals and the fulfillment of the need for Competence.

The interviews for Institutes 1 and 2 showed a relationship between Long-term orientation and goals and Relatedness that we labeled as *Goal discussion*. Students in blended TLGs noted that they achieved goals due to discussions with TLG members: “Our goal was to make an infographic and to start working with a website. ... someone who knows about it joined us and ... we explained our whole process” (Male 3 - Institute 1). In contrast, the students in blended TLGs also opined that goals were negatively impacted by distance learning: “I think the goals we pursued were very limited because of the lack of physical contact” (Female 4 - Institute 2). There was no relationship found between the amount of perceived Long-term orientation and goals and the fulfillment of the need for Relatedness.

In the interviews, students from Institutes 1 and 3 referred to the correlation between Long-term orientation and goals and Competence that we labeled as *Goals in depth*. During the period of distance learning, the TLG goals were pursued at a deep level, which in turn led to a sense of competence among the students in blended TLGs: “Because of corona we went even further. .. And so, it’s actually much better no” (Male 1 - Institute 1). In contrast, students in blended TLGs also experienced a lack of purposiveness, which in turn led to doubt about their own effectiveness: “We cannot work on anything in a focused way. ... I feel like I’m just doing whatever” (Female 6 - Institute 3). The more Long-term orientation and goals was experienced, the more fulfillment of the need for Competence was experienced ($\tau=0.29$, $p<0.010$; Institute 1).

Students from Institute 1 made reference to the correlation between Shared identity and equal relationships and Autonomy in the interviews that we labeled as *Equality through volunteer input*. According to the students, volunteer input in blended TLGs helped to cultivate an atmosphere of equality: “At the end of the day, I think there’s quite a lot of volunteer input. So .. without an assignment attached to it” (Female 1 - Institute 1). The more students experienced Shared identity and equal relationships, the greater the perception that the need for Autonomy was fulfilled ($\tau=0.38$, $p<0.010$; Institute 1).

Students from all institutes referred to the relation between Shared identity and equal relationships and Relatedness in the interviews that corresponded to the label *Equality in an informal atmosphere* (see “Introduction”, variable 7): “There’s not so much of a hierarchy. ... the proper mutual appreciation ..., so that’s kind of nice” (Male 4 - Institute 1). The students in blended TLGs experienced reciprocal relationships among the TLG members, which in turn established a sense of Relatedness: “The contact in the network became easier and the learning together also, because I notice that in the meetings we really dare to react to each other, positively and negatively” (Male 3 - Institute 1). Students in blended TLGs also experienced secure relationships between TLG members, which in turn helped to foster a sense of connection (Institute 2) and made them eager to learn together (Institute 3): “It’s an .. atmosphere where we can just ask questions and where it’s also not crazy if you make a comment that everyone else knows and you do not understand” (Female 6 - Institute 3). Students indicated that reciprocal, equal relationships, and a sense of belonging were strengthened by physical contact between TLG members: “The connection is stronger. ... I see them more often [physically]. ... I feel like it’s more equal” (Female 2 - Institute 4). The more Shared identity and equal relationships the students experienced, the greater the perception that the need for Relatedness was fulfilled ($\tau=0.47$, $p<0.001$; Institute 1).

In the interviews, students from all institutes made reference to the coherence between Shared identity and equal relationships and

Competence that corresponded to the label *Scaffolding* (see “Introduction”, variable 6). Students began to equally participate in the blended TLG as their sense of competence increased over the course of the academic year (Institutes 1, 3 and 4): “In the beginning I was a little afraid that it was not good, because I had less knowledge. As the year progressed, I noticed that I dared to take more initiative” (Female 9 - Institute 1). Students also highlighted two important preconditions in the blended TLG regarding the relationship between Shared identity and equal relationships and Competence: (1) students felt competent because of the collective responsibility in the TLG: “You still have the experts, of course, and I’m still a student, but you do it together, so you’ll actually soon be an expert together” (Male 3 - Institute 1), and (2) students found a structured study schedule during distance learning as a result of the reciprocal relationships within the TLG: “Everyone is reconfiguring what do I need to do and how. And by also being able to discuss that in a PLG [TLG]” (Female 5 - Institute 2). The more students perceived Shared identity and equal relationships, the more fulfillment of the need for Competence they experienced ($\tau=0.64$, $p<0.001$; Institute 1).

4. Discussion

Undergraduate students in higher education often have to carry out a large amount of individual work as part of their studies, which can lead to a lack of connection between students and their educational institutions (Vrieling-Teunter et al., 2022a). This lack of contact can result in feelings of emotional loneliness and a lack of belonging that negatively impact upon students’ well-being, motivation for learning, and academic performance (Dopmeijer, 2021). While face-to-face TLGs can support students’ well-being and motivation (Vrieling-Teunter et al., 2022a), due to the COVID-19 measures, educational institutes – including TLGs – were forced to switch to blended learning (Meeter et al., 2020; Pokhrel and Chhetri, 2021). This more flexible way of learning may constitute a challenge for the Social Configurations of blended TLGs, which in turn can undermine students’ ability to fulfill Basic Psychological Needs (cf. Morbée et al., 2020). In order to gain insight into the variables that support students’ Basic Psychological Needs in blended TLGs, we investigated: (a) in which ways students experienced a variety in Social Configurations and fulfillment of Basic Psychological Needs of blended TLGs and (b) the extent to which Social Configurations of blended TLGs were related to students’ Basic Psychological Needs. These two inquiries culminated in three research questions whose conclusions we describe below.

In what ways do students experience variation in Social Configurations within blended TLGs? (RQ1).

In our interviews, it is evident that the students experienced positive and negative feelings toward Practice integration and Long-term orientation and goals. The differences in feelings toward Practice integration may stem, in part, from differences in how practice research was organized and how discussions about practical experiences took place within the institutes during distance learning. In one institute, discussions about practical experiences during distance learning were organized in (sub)groups using new functionalities within ICT. In other institutes, practice research was delayed and TLG meetings were canceled during distance learning. One potential explanation for this is the sudden switch to blended learning due to COVID-19 measures, and the fact that distance learning may have made it more challenging for students to

conduct practice research or exchange practical experiences. The differences in feelings expressed toward Long-term orientation and goals may be explained by how COVID-19 measures influenced the depth of students' learning goals. In one institute, the measures caused goals to be developed and pursued in depth, which in turn led to a competent feeling among students. In another institute, the measures led students to either superficially pursue or suspend goals, which made students feel ineffective and like they had failed to achieve results. Students in blended TLGs thus stressed the importance of pursuing goals in depth and achieving results to feel a sense of Competence. These findings are in line with [Locke and Latham \(2012\)](#) Goal Setting Theory, which posits that specific and challenging goals can lead to high motivation and satisfactory performance, because goal setting provides direction for actions and behaviors.

In what ways do students experience variation in the fulfillment of Basic Psychological Needs within blended TLGs? (RQ2).

Overall, interviewed students experienced positive feelings regarding the fulfillment of Basic Psychological Needs. Surprisingly, the students reported solely positive feelings toward the fulfillment of the need for Relatedness within blended TLGs. For instance, the students reported experiencing a relatively high fulfillment of the need for Relatedness even in situations characterized by full distance learning. This finding also emerged in [Admiraal's \(2022\)](#) study, which emphasized that the sense of Relatedness during COVID-19 was enhanced by whole-group distance learning. However, these results contradict the findings of previous studies within educational institutions in the Netherlands and other Western countries during COVID-19, which demonstrated that students experienced reduced fulfillment of the need for Relatedness (e.g., [Meulenbroeks, 2020](#); [Morbée et al., 2020](#)) and that the pandemic had emotionally impacted upon them ([Müller et al., 2021](#)). An explanation for the contradicted results could be the difference in the learning environment where the studies were conducted. Students in the present study and in the study by [Admiraal \(2022\)](#) were enrolled in group learning whereas students in the other cited studies were enlisted in individual learning paths.

To what extent are blended TLGs' social configurations related to students' basic psychological needs? (RQ3).

From the quantitative findings, especially in Institute 1, we found that the more students experienced Shared identity and equal relationships, the greater the fulfillment of Basic Psychological Needs they perceived. Also, the more students encountered fulfillment of the need for Competence, the more they experienced blended TLGs' Social Configurations. The interviewed students experienced more fulfillment of their Basic Psychological Needs when working voluntarily in an equal relationship (i.e., Equality through volunteer input) and in an informal atmosphere (i.e., Equality in an informal atmosphere). In relation to the level of perceived Competence, the interviewed students reported an increase in equal participation which was built up gradually (i.e., Scaffolding). They also highlighted the importance of collective responsibility in the blended TLG and the possibility of relying on a structured study schedule. Due to the COVID-19 measures and sudden switches between contact and distance learning, students' study schedules were regularly adjusted. Discussing the modified study schedule with other TLG members helped some of the interviewed

students to achieve a structured study schedule, as not all students are equally skilled in handling this flexible study schedule independently. These challenges in students' capabilities to plan and monitor their learning relate to findings of the studies of [Graham \(2019\)](#) and [Günes and Alagözlü \(2021\)](#). Their studies show that within learning environments in which contact and distance learning are continually alternating, high standards for students' self-regulation must be set because students need guidance to handle the autonomy to effectively direct their own learning. [Graham \(2019\)](#) also suggests that particularly students who lack self-regulation skills encounter difficulties during blended learning. In addition, the interviewed students in the present study perceived more Social Configurations when they created and shared new knowledge in the blended TLG (i.e., New knowledge) and when they pursued deep goals (i.e., Goals in depth). The practical use of materials developed in blended TLGs was also cited as being important for developing Competence. Conversely, according to the interviewed students, unclear goals led to feelings of incompetence.

These findings are in line with [Vrieling-Teunter et al. \(2022a\)](#), who found that there is a relationship between face-to-face TLGs' Social Configurations and Basic Psychological Needs among students. When comparing both studies (see "Introduction"), the following relationships for realizing student support are present in both face-to-face and blended TLGs: (1) Autonomous choices regarding content; (2) New knowledge; (3) Sharing, support, and social skills; (4) Personal goals; (5) Scaffolding; and (6) Equality in an informal atmosphere. One relationship that was reported in face-to-face TLGs but not expressed by students in blended TLGs is Autonomous choices regarding collaborating partners. Although students did express the importance of making autonomous choices in terms of collaboration partners (e.g., the importance of providing and receiving feedback in a familiar atmosphere), they did not relate these autonomous choices to TLGs' Social Configurations in the interviews. The students in the present study shed light on three new relationships within blended TLGs: i.e., Equality through volunteer input; In-depth goals; and Goal discussion. Regarding Equality through volunteer input, students underlined the importance of voluntary participation in blended TLGs to enhance equal relations between the TLG members. This finding is in line with [Gray and Stevenson \(2020\)](#), who described group relations' dynamic among volunteer participants as being one of equality, rather than hierarchy, since volunteer participants share an identity with others promoting feelings of belonging and impacting the participants' well-being. In addition, the students pointed out the importance of pursuing deep goals in dialog with others for fulfilling Basic Psychological Needs. Similar to [Locke and Latham \(2012\)](#), challenging but achievable goals can lead to high motivation when feedback from others is given regarding the goal-direction, so the approach to achieving the goal can be adjusted.

5. Conclusion and limitations

There are a number of limitations with the present study, which inform suggestions for follow-up research. A first limitation pertains to the low number of respondents ($n=70$) in the study (see "Data collection"). We chose to combine quantitative findings with qualitative data obtained from in-depth interviews with students from different teacher education institutes. This restricted the amount of participants that we could select for our analyses. Moreover, the sample consists

solely of teacher education students, and it is unclear whether the findings can be applied to other disciplines with similar small-scale teaching. Therefore, we must be careful to generalize the Social Configurations and fulfillment of Basic Psychological Needs to the experiences of all Dutch students in blended TLGs. Follow-up research is recommended in blended TLGs in the Netherlands and other (Western) countries, with particular attention being paid to securing a sufficiently large response group so that the results yield more insights and a better understanding of related processes and contextual factors (such as culture, national policies, etc.) can be considered.

A second limitation pertains to the reliability of the quantitative questionnaire for Basic Psychological Needs. For BPNQ, the value of the internal consistency of the scale Autonomy is $\alpha = 0.55$. Taking into account the number of items within the scale (4), these values are insufficient ($\alpha < 0.70$) for a reliable scale construct (Field, 2018). The value of internal consistency cannot be increased by removing items. However, all items correlate well with the scale (item-total correlation ≥ 0.3 ; Field, 2018). Moreover, in previous research this scale proved to be sufficiently reliable $\alpha = 0.71$ (see Vrieling-Teunter et al., 2022a). Therefore, we retained the scale Autonomy containing all the items. However, the BPNQ may lead to insufficiently consistent results for the scale Autonomy and thus should be interpreted with caution. Follow-up studies with larger and equally distributed sampled groups should ascertain the extent to which our scales are reliable.

A third limitation with the present study concerns the unpredictability of the form of education in which students in blended TLGs were taught due to COVID-19 measures. We conducted our research in a chaotic time in which switching between contact and distance learning was unplanned and depended on externally imposed COVID-19 measures. Therefore, blended learning in this context implies another interpretation of blended learning as was defined by Müller and Mildnerberger (2021), namely that it involves a thoughtful integration of contact and distance learning. This study adds to research in showing that institutes in higher education were able to implement and uphold TLGs in an unpredictable context in which the fulfillment of students' Basic Psychological Needs were guaranteed and showed relations with how the Social Configurations were perceived by students. A (quasi-) experimental study comparing several TLGs in different forms of learning contexts (i.e., contact, distance, planned and unplanned blended education) may help to identify differences in Social Configurations and their relations to students' motivation and well-being.

To conclude, the results of the present study show that, similar to Vrieling-Teunter et al. (2022a), within blended TLGs students perceived that there is a positive relation between Shared identity and equal relationships and the fulfillment of Basic Psychological Needs. Moreover, the students in this study perceived that there is a positive relationship between the fulfillment of the need for Competence and blended TLGs' Social Configurations. In-depth learning thus appears to be more challenging in distance learning, according to some students, while the unpredictability of the COVID-19 measures on the way that learning is organized also poses notable difficulties. However, even during the unpredictable period of the pandemic, the TLGs' Social Configuration was still related to more fulfillment of Basic Psychological Needs, especially concerning Shared identity and equal relationships, which indicates that TLGs have a positive influence upon the well-being of students during uncertain times. This means that in the development and design of higher education curricula,

educators should keep in mind that collective learning in TLGs is important for students' motivation and well-being, and that it is important to make conscious choices in this regard. Furthermore, experiencing collective learning may be important for students' motivation and well-being beyond the boundaries of their current TLGs for more general applications for professional development such as Community of Practice (Wenger et al., 2011), Professional Learning Communities (Huijboom et al., 2021) or learning networks.

Based on the findings the following success factors could be taken into account when organizing blended TLGs:

- Awareness of the difficulties that may be encountered during distance learning regarding the organization of practice based research and the exchange of practical experiences is important. For instance organizing (sub)groups using new functionalities within ICT can be supportive herein. [Practice Integration]
- The depth of students' learning goals can be a challenge in blended TLGs. For instance paying attention to the development and the pursuing of specific and challenging goals adequately in dialog with other TLG-members is pertinent. [Long-term orientation and goals]
- Equality in an informal atmosphere should be developed gradually, based on, for example, autonomous choices, ownership and voluntary input. [Shared identity and equal relationships, Autonomy]
- In blended TLGs – were students are enlisted in group learning – distant TLG-meetings organized in whole-group learning is recommended. [Relatedness]
- Collective responsibility, planning and monitoring of the learning processes, the utilization of developed tools in blended TLGs in educational practice, can lead to students' feelings of competence. [Competence]

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the cETO committee of the Open Universiteit under number U2019/03249/HVM. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2023.1135844/full#supplementary-material>

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Motivation to teach and preparedness for teaching among preservice teachers in China: The effect of conscientiousness and constructivist teaching beliefs

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“Preparedness for teaching” refers to the degree of confidence preservice teachers have, and reflects their ability. Developing preparedness for teaching is an important part of preservice teachers’ professionalization. A substantial body of literature has documented the critical influence of the motivation to teach on preparedness; however, how this relation is impacted by mediating and moderating mechanisms remains unclear. To respond to this gap in knowledge, the present study constructed a mediated moderation model through structural equation modeling and multigroup tests using 383 questionnaires completed by preservice teachers in China. The findings indicate that the preservice teachers’ genders, entry path, and levels of certainty about their future teaching career choices all influence their preparedness for teaching. Specifically, preservice teachers who believe that they will choose a teaching career in the future have more intrinsic motivation, stronger constructivist teaching beliefs, and a higher levels of teaching preparedness. Moreover, preservice teachers’ motivations to teach can positively predict their constructivist teaching beliefs and preparedness for teaching, but their constructivist teaching beliefs alone do not have a mediating effect on the relationship between motivation to teach and preparedness for teaching. However, the findings reveal that the constructivist teaching beliefs of highly conscientiousness group can partially mediate the relationship between the motivation to teach and the preparedness for teaching. Additionally, conscientiousness moderates the influence of constructivist teaching beliefs on preparedness for teaching. The study provides meaningful insights into the within-personal traits of how and when motivation to teach affects preparedness for teaching, which may be useful for the motivation best practices for preservice teacher recruitment, training, and support to create high-quality teachers.

KEYWORDS

motivation to teach, constructivist teaching belief, conscientiousness, preparedness for teaching, pre-service teachers

1. Introduction

Keeping preservice teachers (PSTs) consistently and efficiently committed to their own learning has become key to producing high-quality teachers (Sinclair et al., 2006). In 2018, the government of mainland China enacted an action plan titled “The opinions of comprehensively

deepening the reform of teacher construction in the new era,” which highlights the value and importance of high-quality teachers who are “happy to teach, suitable for teaching, and good at teaching.” Preparedness for teaching is often used as a learning outcome for PSTs—teachers with higher levels of preparedness are considered higher-quality teachers (Darling-Hammond et al., 2002; Stites et al., 2018; Van Rooij et al., 2019; Manowaluilou and Reeve, 2022). Based on Bandura’s (1977) social learning theory, PSTs’ preparedness for teaching can be affected by the long-term interaction between the environment and the individual. An individual’s perceptions and understanding of their environment are related to their will and ability to continue to commit to learning. People produce and execute actions based on their perceptions of their self-efficacy (Bandura, 1982); to some extent, an individual’s degree of confidence in their performance reflects their ability.

Notably, existing studies (e.g., Hechter, 2011; Lunenberg, 2011; Manowaluilou and Reeve, 2022) have confirmed that high self-efficacy influences engagement and performance and maintains self-development and self-adjustment among PSTs. Moreover, some studies have found that low self-efficacy impacts the decision to leave the teaching profession (e.g., Skaalvik and Skaalvik, 2007; Klassen and Chiu, 2011) and is moderately correlated with academic performance—indeed, it is negatively correlated with academic performance among high-achievers (e.g., Honicke and Broadbent, 2016; Talsma et al., 2019). Several studies (e.g., Tschannen-Moran and Hoy, 2001; Giallo and Little, 2003; Siwatu, 2007; Brown et al., 2015) have been conducted on the correlation between PST self-efficacy and preparedness for teaching, highlighting that preparedness positively affects teacher–student relationships, instructional strategies, and classroom management.

PSTs’ preparedness for teaching has not been sufficiently studied, despite its positive relationship to high-quality teacher (Hollins, 2011; Carter and Cowan, 2013). Several studies concern the sources (i.e., mastery experience, verbal persuasion, vicarious experience and physiological and affective states) that impact teacher self-efficacy (e.g., Poulou, 2007; Pfitzner-Eden, 2016; Clark and Newberry, 2019; Van Rooij et al., 2019) or the correlation or outcomes of self-efficacy (e.g., Oh, 2011; Jamil et al., 2012). Moreover, studies find that mastery experience impacts PSTs’ self-efficacy while verbal persuasion, vicarious experience, and physiological and affective states have smaller influence on PSTs (Pfitzner-Eden, 2016), and can predict but explain only 18% of preservice teachers’ preparedness for teaching (Clark and Newberry, 2019). Therefore, their preparedness must also be affected by other factors.

Regarding the development of PSTs, it is helpful to note that the psychological mechanisms for developing preparedness for teaching in situated teacher education programs remain a “black box” (Darling-Hammond, 2006). Drawing on social psychology, existing studies have used within-person designs to explain individuals’ performance and decisions across cultures and situations and over time (e.g., Schwartz, 2012; Schwartz et al., 2012; Vecchione et al., 2016). That is, PSTs’ psychological attributes (i.e., motivation to teach, personality, beliefs) provide the mechanisms for how they learn to become high-quality teachers (Rimm-Kaufman and Hamre, 2010). To date, few studies have simultaneously examined the psychological attributes (i.e., motivation to teach, personality, and beliefs) and preparedness for teaching of PSTs. For example, De Jong et al. (2013) find that PSTs’ personality (friendliness and extraversion) and

self-efficacy appear not to be related to teacher–student relationships, while the relationships among personality, self-efficacy, and teacher–student relationship have not been explored. Meanwhile, Klassen and Tze (2014) indicate that teachers’ self-efficacy and personality contribute a significant but small effect size for teaching effectiveness, while motivation and personality are strongly linked with teaching efficacy (Poulou, 2007). Shrestha and Dangol (2020) assert that a positive relationship exists between conscientiousness and motivation among technical and vocational education teachers in Nepal, whereas the relationship of each factor and teachers’ performance is unknown. What roles do PSTs’ psychological attributes (namely: motivation, belief, and personality)—which underpin their persistence to pursue teaching and thus their active learning—play in their preparedness for teaching?

As a starting point for teacher preparation, the motivation to teach is widely situated as what drives PSTs to learn, and is thus mainly reflected in the motivation to receive teacher education (Sinclair, 2008; Torsney et al., 2019). Being motivated to teach implies that PSTs understand their own abilities, interests, ambitions, and limitations and the roles and responsibilities, conditions, requirements, and environments central to their careers (Brookhart and Freeman, 1992). Existing studies (e.g., Day et al., 2007; Bruinsma and Jansen, 2010; Chesnut and Burley, 2015) have found a strong positive relationship between motivation to teach and commitment to teaching. However, PSTs’ motivations to teach can change over time (Sinclair, 2008), and different motivations have different relationships with the commitment to teach (Zhang et al., 2019). Therefore, further research on how motivation to teach, which is related to other psychological attributes, affects preparedness for teaching is necessary.

Additionally, “beliefs”—as a psychosocial trait—indicate an individual’s real tendency to evaluate particular situations consciously or unconsciously and are a stable action factor; however, they can be changed (Borg, 2001). Notably, beliefs can influence the level of personal commitment to learning (Clark and Peterson, 1986; Ravindran et al., 2005). Research has shown that PSTs mostly hold a constructivist view of teaching and learning (Ogan-Bekiroglu and Akkoç, 2009; Cansiz and Cansiz, 2019) and can be predicted by mastery experience (Cansiz and Cansiz, 2019; Wang et al., 2022); while Chinese PSTs do not (Sang et al., 2009); however, their views can be changed over time due to their learning environment (McMinn et al., 2020; Li and Huang, 2023). How does constructivist belief related to other psychological attributes contribute to PSTs’ preparedness for teaching?

In addition, a growing body of studies (e.g., Bacanlı, 2006; Bastian et al., 2017; Hartmann and Ertl, 2021) has confirmed that personality traits, as psychological qualities, represent consistent tendencies in PSTs’ actions and influence their career choices and willingness to continue teaching. Among the Big Five personality traits, conscientiousness is most directly related to motivation (McCrae and Costa, 1996) and most predictive of academic success (e.g., Furnham et al., 2003; Komarraju et al., 2009). However, how personality, as a stable element of psychological traits, especially conscientiousness affects PSTs’ learning to teach requires further investigation. For example, Oh (2011) asserts that personality, motivation, enactive mastery experience with social/verbal persuasion, and physiological/affective state can predict efficacy for classroom management, while how personality functions and what relationship among them are not

explored. Jamil et al. (2012) indicate that there have had an association between teacher self-efficacy and observed performance, personality, and beliefs, though no causal inferences can be drawn.

Taken together, the above-mentioned studies inspire the following question: *What is the effect of constructivist teaching beliefs and conscientiousness on the relationship between motivation to teach and preparedness for teaching among PSTs in China?* The present study aimed to answer this question to uncover insights useful for determining how best to support the development of high-quality PSTs.

2. Conceptual framework

2.1. Preparedness for teaching

Preparedness for teaching is derived from Bandura's concept of self-efficacy (Housego, 1990), which refers to people's "beliefs in their capabilities to organize and execute the courses of action to produce given attainments" (Bandura, 1997, p. 3). Self-efficacy consists of efficacy expectations and outcome expectations. An efficacy expectation is "the conviction that one can successfully execute the behavior required to produce the outcomes"; meanwhile, an outcome expectation refers to "a person's estimate [that] a given behavior will lead to [a] certain outcome" (Bandura, 1977, p. 193). An individual's sense of their self-efficacy is notably self-referential; that is, people evaluate and alter their thinking and behavior (Bandura, 1977). Therefore, self-efficacy is a future-oriented belief about the level of competence individuals expect to demonstrate in a given situation (Tschannen-Moran and Hoy, 2001). Studies (e.g., Bandura, 1982; Pajares, 1996; Pajares, 2006) have verified that self-efficacy exceeds final performance as a predictor of future performance.

However, PSTs evaluate their efficacy that differed from in-service teachers (Evans and Tribble, 1986; Putman, 2012). A study by Woolfolk and Hoy (1990) situated teaching efficacy as comprising two factors: efficacy expectations regarding the extent to which teachers can perform their duties, and outcome expectations regarding the belief that teaching can influence student learning. Housego (1990) used efficacy expectations instead of self-efficacy to refer to PSTs' perception of preparedness for teaching because PSTs did not believe their behaviors impacted student learning. As indicated by Tschannen-Moran and Hoy (2001) that until PSTs take responsibility for classroom teaching and management, their preparedness for teaching should be viewed as a holistic concept emphasizing more on efficacy expectations, and less on outcome expectations. Hence, we use "preparedness for teaching" to refer to PSTs' perception of self-efficacy.

Drawing on Bandura's social cognitive theory, Gibson and Dembo (1986) have constructed the concept of teacher efficacy with two components: personal teaching efficacy assuming that it reflected efficacy expectations, and teaching efficacy assuming that it reacted to outcome expectation. Housego (1990) concerns the development of student teachers' feeling of preparedness for teaching in the classroom-teaching performance and student receptiveness during their teacher education year. Later, Tschannen-Moran and Hoy (2001) developed a reasonably valid and reliable measure, namely the Ohio State teacher efficacy scale (OSTES), to explore teacher efficacy that is composed of instructional strategies, student engagement, and classroom

management. A large number of studies (e.g., Poulou, 2007; Klassen and Chiu, 2011; Putman, 2012; Van Rooij et al., 2019) have adopted the scale to conduct related research on PSTs' teacher efficacy. Accordingly, we used these three components of PSTs' self-efficacy to measure their preparedness for teaching.

2.2. Motivation to teach and preparedness for teaching

Drawing on Bandura (1977) self-efficacy theory, "motivation" is the cognitive source base of an individual's capacity to imagine future consequences. Dörnyei and Ushioda (2011) define "motivation" as the direction and magnitude of human behavior. Meanwhile, "motivation to teach" refers to something that "attracts individuals to teaching" and impacts "how long they remain in their initial teacher education courses and subsequently the teaching profession, and the extent to which they engage with their courses and the teaching profession" (Sinclair, 2008, p. 37). Given that teaching has become a relatively unattractive career and the related trend of high rates of teacher attrition, existing research on teacher motivation has revealed that motivation to teach is a critical factor in attracting potential teachers to the profession and in encouraging PSTs to continually engage in professional development (Sinclair, 2008; Han and Yin, 2016).

Watt and Richardson (2007) Factors Influencing Teaching Choice (FIT-choice) scale presents 12 kinds of teacher motivations, such as intrinsic value, social utility value, and perceived teaching ability. Using the FIT-Choice scale to compare motivations to teach across the United States, Turkey, the People's Republic of China, the Netherlands, Croatia, Germany, and Switzerland, they found that the similarities and differences in motivations to teach were related to differences in social and cultural values (Watt et al., 2012). Other scholars have similarly found that subgroups (such as elementary and secondary school educators) and cultural differences have also been related to differences in PSTs' motivations to teach (Heinz, 2015). Generally, PSTs' motivations to teach have been categorized into three types: intrinsic motives, extrinsic motives, and altruistic motives (e.g., Brookhart and Freeman, 1992; Thomson et al., 2012; Bergmark et al., 2018). Considering the traits of these three types reveals that PSTs primarily choose to go into teaching because it aligns with their altruistic, service-oriented goals and other intrinsic motivations—specifically, most teachers pursue their profession because they want to work with children and provide a service (Brookhart and Freeman, 1992). Additionally, the OECD (2005) concluded that the intrinsic benefits of teaching are related to intrinsic and altruistic motives and include working with children and adolescents and making a social contribution. Based on the suggestions of Brookhart and Freeman (1992) and the OECD (2005), the present study adopted the altruistic motive as an intrinsic motivation to refer to an individual's sense of accomplishment and value due to the nature of the career (e.g., enjoying working up with children and service teaching) and figured extrinsic motivations as the external characteristics of teaching (e.g., stable job/pay, high social status) or incentives from others that encourage individuals to pursue a teaching career.

An individual's desire to act to achieve a goal is positively related to the learning engagement of PSTs, and may also positively predict

teaching efficacy (Jaengaksorn et al., 2015). Research has shown that the motivation to teach affects professional learning outcomes (König and Rothland, 2012) and commitment to teaching (Sinclair, 2008) among PSTs. The more PSTs understand that their motivation to teach comes from within, the better they may be able to overcome constraints in their environments and teach more effectively (Bruinsma and Jansen, 2010). In line with Bergmark et al. (2018), compulsory school PSTs (primary and middle) highlighted that their school's caring mission and their intrinsic motives were the main reasons they chose teaching and for their success in their teacher training. In the first year of professional teaching, the interaction between PSTs' motivation and their teaching efficacy predicted the reality shock expectation (Kim and Cho, 2014). Additionally, intrinsic motivation is more stable than extrinsic motivation in the learning journey of PSTs; however, although motivation is relatively stable, PSTs typically develop in a negative direction if their motivations change (e.g., they stop teaching; Sinclair et al., 2006). A similar finding was also reported by Bruinsma and Jansen (2010): PSTs with extrinsic maladaptive motives had negative teaching experiences and remained in the profession for shorter periods of time. These findings reveal that PSTs' motivation to teach is the influencing factor in their preparedness for teaching. Therefore, we hypothesized that PSTs' motivation to teach might positively affect their preparedness for teaching (H1).

2.3. The mediator of constructivist teaching beliefs

"Beliefs" are "psychologically-held understandings, premises or propositions about the world that are felt to be true" (Richardson, 1996, p. 104). "Teaching beliefs" refer to the perceptions and values that teachers hold about teaching, and they influence teachers' views and practices about student learning, classroom management, and professional development, dominate teaching behaviors, and are more likely to influence teaching than the teachers' professional knowledge (Clark and Peterson, 1986). Generally, based on the underlying theoretical orientation toward learning, which corresponds with transmissive/behaviorist or constructivist beliefs (Handal, 2003; Hassad, 2011), teaching beliefs are categorized into two types: traditional (i.e., a teacher-centered approach) and constructivist (i.e., a student-centered approach; Woolley et al., 2004; Berger and Lê Van, 2019). "Traditional teaching beliefs" mean that teachers believe that the aim of teaching is to transfer knowledge and that students are recipients of knowledge; meanwhile, "constructivist teaching beliefs" imply diverse and varied approaches to teaching, including problem-oriented learning, inquiry learning, and cooperative learning by which students construct their own comprehensive knowledge (Sang et al., 2010).

Studies have revealed that the teaching beliefs of PSTs directly affect many aspects of their learning to teach, such as their epistemologies of teaching strategies, student learning, and academic achievement (Ravindran et al., 2005; Voss and Kunter, 2020). A survey of Italian teachers suggested that self-efficacy can also be positively influenced when teachers hold conservative values, such as self-imposed limits, adherence to tradition, and emphasis on security and stability (Barni et al., 2019). Another study indicated that when PSTs hold teaching beliefs involving shallow and superficial rote memorization, their emphasis on competitive student performance

can be positively predicted (Ravindran et al., 2005). Furthermore, PSTs who hold traditional teaching beliefs are confident about their classroom management and teaching strategies and their overall self-efficacy (Gürbüztürk and Sad, 2009).

Generally, in collectivist cultures, teachers may be more inclined to hold traditional teacher-centered beliefs and emphasize effective and fast face-to-face, direct teaching and controlled learning approaches. In contrast, in individualistic cultures, teachers tend to hold constructivist beliefs that are centered on student learning and may be more willing to spend time listening to students' opinions, respect students' choices, provide dialectical opportunities, and allow students to enjoy learning (Reeve et al., 2014). Of late, traditional teacher-centered beliefs are giving way to a more constructivist approach underpinned by the latest curriculum reform in China. According to the "Curriculum program and standards for compulsory education" issued in 2022, the main reform is rooted in constructivism; in particular, it emphasizes that students should actively build up competences and knowledge instead of transmitting directly from teachers (Tan, 2016). A body of studies has found that PSTs' teaching beliefs are likely to change as they progress through a teacher education program, especially those regarding practice teaching (e.g., Sheridan, 2016) and personal (e.g., subject enjoyment, experience sharing) and social support (e.g., peers' and mentors' support) during their induction (Decker et al., 2015; Voss and Kunter, 2020). Therefore, this study used PSTs' constructivist teaching beliefs developed throughout their teacher education programs in the context of China's recent educational reform as a research variable.

Normally, the constructivist teaching beliefs of PSTs could predict their epistemology, such as the knowledge development associated with integrating of technology into teaching in China (Sang et al., 2010) and their cognitive engagement with their goals (Ravindran et al., 2005). PSTs who hold constructivist teaching beliefs are better able to understand the variability and complexity of student learning styles and are more willing to become proficient in various of teaching methods to improve their preparedness for teaching (Jamil et al., 2012). It has also been confirmed that PSTs are more likely to hold constructivist teaching beliefs that motivate them to become elementary school teachers (Heinz, 2015). In addition, a high motivation to teach is a positive predictor of the constructivist teaching beliefs of PSTs, and positively influences their preparedness for teaching (Voss and Kunter, 2020). Constructive teaching beliefs may mediate the relationship between motivation to teach and preparedness for teaching. Therefore, we hypothesized that constructive teaching beliefs are a positive mediating factor in the relationship between motivation to teach and preparedness for teaching (H2).

2.4. The moderator of conscientiousness

The OECD (2005) advised that there is a need to better understand the factors of PSTs' educational success and entry into the profession. Studies on the pre-entry characteristics of PSTs identified that motivation, personality, and beliefs are predictive of their engagement and learning (e.g., Ravindran et al., 2005; Kim and Cho, 2014; Franz et al., 2022). Personality shapes individuals' determination to pursue a particular career, cognitive capacity development, and educational attainment (Kankaraš, 2017). Several

studies (e.g., Thornton et al., 2005; Eryilmaz, 2014) have also proven that a mature personality is key to the overall quality of preservice teachers and is also the core quality of teaching. “Personality traits” are stylistic and habitual patterns of affects, behaviors, and cognitions (Zillig et al., 2002; Jackson et al., 2010) and comprise “relatively enduring patterns of thoughts, feelings, and behaviours that reflect the tendency to respond in certain ways under certain circumstances” (Roberts, 2009, p. 140). Here, “patterns” and “relatively” mean that personality traits reflect a tendency to respond in certain ways in certain environments; along these lines, some aspects of personality may change in adulthood due to the influence of biological processes and needs (Roberts et al., 2006; Kawamoto, 2016). A study by Roberts (2006) based on social learning theory reported that the effect of environment on personality trait change was actually small; personality changes took a long time. The relatively fixed nature of personality has been verified as a moderator of susceptibility to environmental factors (Mertens et al., 2022). Meanwhile, scholars have also verified that personality does not predict PSTs’ desire to enter the teaching profession (Rockoff et al., 2011; Wiens and Ruday, 2014). A study by Perera et al. (2018) also indicated that models of teacher attrition, effectiveness, or selection should consider personality trait interactions instead of only the additive effects of personality; that is, personality may have a protective effect, as a moderator, on individuals’ behaviors.

In terms of PSTs, those who want to and do become teachers belong to a special group in terms of personality (Thornton et al., 2005). The Big Five traits, a widely used instrument for assessing personality, comprise five personality traits; namely: neuroticism (i.e., negative emotion, anxiety, and low self-esteem), extraversion (i.e., sociable and assertive), openness (i.e., curious and imaginative), agreeableness (i.e., sympathetic and easily moved), and conscientiousness (i.e., a high degree of responsibility and determination; Costa and McCrae, 1992; Ripski et al., 2011). A large number of studies have highlighted the importance of the relationship between PSTs’ personality traits and their performance, self-efficacy, and willingness to keep teaching. For example, a study by Franz et al. (2022) indicated that extraversion and neuroticism were crucial personality traits as PSTs seem to be rather homogeneous in terms of the other traits. Meanwhile, other studies have explored PSTs’ performance by connecting their cognitive abilities with different personality traits. Ripski et al. (2011) found that extraversion may change significantly during PSTs’ time in a teacher education program and benefit from their relationships with students. Wiens and Ruday (2014) examined the connection between teaching performance, feelings about teaching, and personality, and found that PSTs were highly agreeable and conscientious, which helped them achieve academic success. These findings are notably not consistent. However, “conscientiousness” refers to the willingness to follow the rules and to exert effort, which could be best viewed as a measure of trait-oriented work motivation (i.e., willingness to do; Schmidt and Hunter, 1998). Additionally, among the five personality traits, conscientiousness is most closely aligned with the characteristics expected of teachers in Chinese society (Li and Ye, 2009). Therefore, we studied the effect of conscientiousness on PSTs’ preparedness for teaching in China.

“Conscientiousness” is characterized as the degree to which an individual’s responsibility, order, impulse control, and laziness persistently and steadily influence their behavior (Jackson et al., 2010). Existing studies have reported conflicting findings about the effects of

conscientiousness. For example, Djigić et al. (2014), Baier et al. (2019), and Aydın et al. (2013) found that conscientiousness is an effective predictor of teaching efficacy, teaching enthusiasm, and classroom management. Meanwhile, a study by Shrestha and Dangol (2020) showed that highly conscientious vocational education teachers demonstrate high job performance, achieved through high levels of compliance and hard work. However, a study by Bastian et al. (2017) reported that different levels of conscientiousness might have different effects, and that conscientiousness may have a moderating effect on PSTs’ preparedness for teaching. The “well-adjusted” latent profile of teachers’ tendencies was also verified by moderately high levels of extraversion, openness, agreeableness, and conscientiousness (Perera et al., 2018). Given that the above-mentioned studies treat personality as a moderating variable (e.g., Barrick and Mount, 2005; Rockoff et al., 2011; Wiens and Ruday, 2014; Perera et al., 2018), we hypothesized that conscientiousness plays a moderating role in the relationship between motivation to teach, constructivist teaching beliefs, and preparedness for teaching in China (H3).

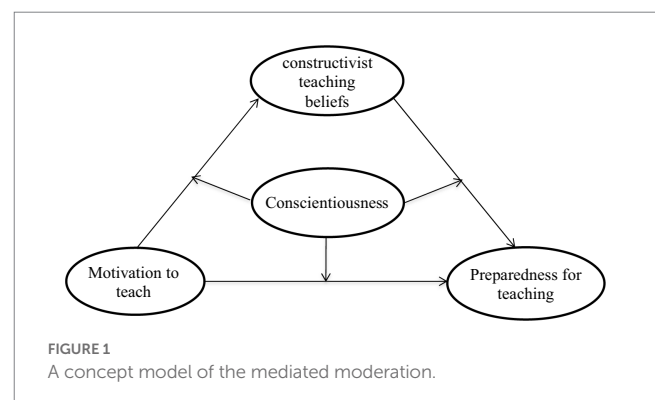
This study aims to expand the knowledge on the relationship of PSTs’ psychological attributes with their preparedness for teaching, as it is unclear how and when the motivation to teach affects preparedness to teach. Hence, we treat PSTs’ motivation to teach as the driving force behind their career choice, constructivist teaching beliefs as playing a mediating role, and conscientiousness as playing a moderating role to establish a mediated moderation model (see Figure 1).

3. Data and methods

3.1. Participants

Cluster sampling was employed to recruit a total of 400 master’s degree students (from the class of 2020) to complete a questionnaire. During teacher’s college, the participants majored in 15 different academic disciplines, including mathematics, English, Chinese language and literature, and physics. After excluding invalid questionnaires, 383 valid questionnaires were obtained, for an effective recovery rate of 95.75%. The subjects had a mean age of 24.20 years, with a standard deviation (SD) of 1.65 years.

Written informed consent was gathered from participants. The participants were advised of the purpose of the study and told that all data would be kept confidential and only used by the researchers for the purpose of the study. The participants were also informed that their participation was voluntary and that they could write down their



feelings and thoughts. They completed a paper-and-pencil questionnaire within 25–30 min in their classroom.

3.2. Measures

The “Preservice Teacher Personality and Readiness to Teach Scale” (written in Chinese) was created for this study. It includes four subscales, the Big Five personality dimensions, motivation to teach, constructivist teaching beliefs, and preparedness for teaching. In addition to detailing their demographic characteristics, the participants were asked to answer questions using 6-point Likert scales ranging from 1 (strongly disagree) to 6 (strongly agree). The following subscales were used to evaluate different variables.

3.2.1. Preparedness for teaching

The scale for preparedness for teaching was taken from the self-efficacy subscale of the Teaching and Learning International Survey (TALIS; OECD, 2019). The scale consisted of three dimensions; namely: instructional strategies, classroom management, and student engagement, with a total of 12 items. Among them, preparedness for instruction was measured using six items (e.g., teaching in a way that students can understand the content of the subject, explaining by giving different examples when students feel confused); preparedness for classroom management was measured using three items (e.g., keeping students disciplined in class and calming down hyperactive students); and preparedness for student engagement was measured by three items (e.g., clearly expressing the expectations for student behavior regarding helping students to recognize the value of learning). The mean scores for all items were combined, and the higher the total score, the more the individual’s situation was consistent with the description and the higher their preparedness for teaching. Confirmatory factor analysis (CFA) showed that the three-factor model of the scale for assessing preparedness for teaching had a mediocre fit (Hooper et al., 2008) with $\chi^2/df=4.732$, the Tucker-Lewis index (TLI)=0.88, the comparative fit index (CFI)=0.90, the goodness of fit index (GFI)=0.86, and root-mean-square error of approximation (RMSEA)=0.09. Cronbach’s α was 0.92.

3.2.2. Motivation to teach

The subscale for motivation to teach combined items from TALIS’s (OECD, 2019) motivation subscale to measure intrinsic and extrinsic motivation, with a total of seven items. Specifically, there were four items for intrinsic motivation (e.g., “I like teaching,” “I want a job spending time with kids and teenagers,” “I am very interested in teaching a particular subject”). Extrinsic motivation consisted of three items (e.g., “job stability,” “winter and summer breaks for teachers,” and “others think I am fit to be a teacher”). The mean scores of all the questions were combined, and the higher the total score, the stronger the PSTs’ motivation to become teachers. The CFA indicated that the scale had a mediocre fit (Hooper et al., 2008), with $\chi^2/df=4.38$, TLI=0.88, CFI=0.92, GFI=0.95, and RMSEA=0.09. The Cronbach’s α for the internal consistency of the scale was 0.81.

3.2.3. Constructivist teaching beliefs

This scale was adopted from TALIS (OECD, 2019) subscale and consisted of four items: “The teacher’s role is to help students to explore,” “The best way to learn is for the students to solve the

problems themselves,” “The teacher should allow students to solve a problem before offering the solution to the problem,” and “The process of thinking and reasoning is more important than specific course content.” Cronbach’s α was 0.72, composite reliability (CR) was 0.83 (>0.7), and the average variance extracted (AVE) was 0.551 (>0.5), showing acceptable reliability and validity.

3.2.4. Conscientiousness

This scale was derived from the Short Version of the Chinese Adjectives Scale of Big Five Factor Personality (BFFP-CAS-S) developed by Luo and Dai (2018). We used Chinese bipolar adjectives as test items and adopted a 6-point Likert scoring system. In the present study, the four conscientiousness items in the BFFP-CAS-S were adopted; Cronbach’s α was 0.733, CR was 0.83 (>0.7), and AVE was 0.558 (>0.5), showing acceptable reliability and validity.

3.3. Data analysis

We used a Maximum Likelihood estimation for the latent variable model evaluation with IBM SPSS version 22 and Amos 22.0. First, an analysis of variance (ANOVA) was used to analyze variations in the demographic characteristics of the PSTs to uncover the impacts of gender, undergraduate major, entry path, full-time teaching experience, and choice to pursue a teaching career on motivation to teach, constructivist teaching beliefs, and preparedness for teaching.

Considering the inclusion of measurement error, structural equation modeling (SEM) was conducted to analyze the presence, direction, and strength of relations between latent variables representing constructs. Because chi-squared values are sensitive to sample size, χ^2/df less than 3 was used as the fit criterion (Schreiber et al., 2006). In addition, CFI (>0.90), TLI (>0.90), SRMR (<0.08), and RMSEA (<0.06) were used as fitting indices (Hu and Bentler, 1999). The bootstrap technique was used to test the mediating effect, and zero was not included in the 95% confidence interval (CI) (Shrout and Bolger, 2002).

A multigroup SEM was constructed to test the moderating effect. As suggested by Byrne (2006, p. 255), “to ensure meaningful and credible interpretation of the structural paths, it is important to know that the measurement parameters are operating in the same way for both groups under study.” Therefore, the baseline model of best fit for each group separately was first tested to obtain the Chi-squared values (χ^2_{unre}) for all paths estimated individually; then, the two groups of paths were restricted to the same restricted model to obtain the Chi-squared values (χ^2_{re}) for all paths, and the baseline model and the restricted model were combined to form a nested model for statistical testing. If the $\Delta\chi^2$ of the baseline model is significant ($p<0.05$), the restricted model has a poor goodness of fit and therefore the hypothesis that the coefficients of the paths are the same is rejected, indicating that the existence of a moderating effect is supported. Conversely, if the $\Delta\chi^2$ is not significant ($p>0.05$), the existence of the moderating effect is not supported (Hair et al., 2010).

4. Results

The ANOVA results in Table 1 indicate that, except for student engagement, the differences in the preparedness for teaching of PSTs

TABLE 1 Demographic characteristics of preservice teachers and score differences for various variables.

Basic characteristics	Number of people	Motivation to teach	Intrinsic motivation	Extrinsic motivation	Teaching beliefs	Preparedness for teaching	Teaching	Classroom management	Student engagement
		M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD
Gender									
(1) Male	34	3.16 \pm 0.87	4.03 \pm 0.57	2.28 \pm 0.42	3.28 \pm 0.49	3.92 \pm 0.59	3.53 \pm 0.53	2.89 \pm 0.53	2.38 \pm 0.36
(2) Female	349	3.19 \pm 0.77	4.02 \pm 0.58	2.37 \pm 0.39	3.39 \pm 0.44	3.72 \pm 0.56	3.16 \pm 0.51	2.57 \pm 0.54	2.64 \pm 0.35
<i>t</i> value		−0.568	0.77	−1.23	−1.38	3.88	4.02	3.30	1.85
<i>p</i> value		0.571	0.939	0.219	0.168	0.000***	0.000***	0.001**	0.065
Cohen's value		0.10			0.24	0.68***			
Entry path									
(1) Entrance examination	347	3.18 \pm 0.39	4.01 \pm 0.57	2.35 \pm 0.40	3.37 \pm 0.45	3.74 \pm 0.57	3.18 \pm 0.52	2.59 \pm 0.54	2.62 \pm 0.35
(2) Entrance examination waived	36	3.30 \pm 0.40	4.13 \pm 0.59	2.50 \pm 0.30	3.52 \pm 0.35	3.92 \pm 0.60	3.33 \pm 0.52	2.69 \pm 0.58	2.40 \pm 0.38
<i>t</i> value		−1.67	−1.18	−1.57	−2.0	−1.79	−1.63	−1.08	−2.19
<i>p</i> value		0.10	0.24	0.12	0.046*	0.075	0.104	0.283	0.029*
Choosing a teaching career in the future									
(1) Yes	284	3.23 \pm 0.39	4.09 \pm 0.58	2.36 \pm 0.39	3.41 \pm 0.43	3.74 \pm 0.56	3.18 \pm 0.51	2.58 \pm 0.54	2.28 \pm 0.36
(2) No [†]	1	-	-	-	-	-	-	-	-
(3) Not sure	98	3.10 \pm 0.37	3.84 \pm 0.51	2.36 \pm 0.42	3.29 \pm 0.47	3.81 \pm 0.60	3.24 \pm 0.55	2.67 \pm 0.55	2.27 \pm 0.35
<i>t</i> value		2.72	3.72	0.02	2.49	−1.04	−1.04	−1.35	0.07
<i>p</i> value		0.007**	0.000***	0.986	0.013*	0.298	0.298	0.179	0.941

(1) There is only one person; therefore, the data are included in the case (3) calculation. (2) * $p < 0.05$, *** $p < 0.001$.

of different genders were significant ($p < 0.05$); specifically, compared with female students, male students were more confident in their preparedness for teaching. The differences in the constructivist teaching beliefs and student engagement efficacy of PSTs with different entry paths were also significant, with negative t -values ($p < 0.05$), and indicated that PSTs who were admitted into graduate programs for which entrance examinations were waived held more constructivist teaching beliefs and were more confident in their efficacy of student engagement. Meanwhile, the differences in the classroom management efficacy of PSTs with or without full-time teaching experience were significant ($p < 0.05$); in particular, PSTs with full-time teaching experience were more confident in their classroom management skills than those without such experience. In addition, the t -values for the variables of motivation to teach, constructivist teaching beliefs, and preparedness for teaching were not significant ($p > 0.05$) regarding whether PSTs majored in teacher education as undergraduate students, indicating that their scores for each variable did not differ depending on whether or not they majored in teacher education at the undergraduate level.

Overall, PSTs who wanted to pursue teaching had relatively strong motivations to teach and intrinsic motivations, and most held constructivist teaching beliefs and were confident in their student engagement skills. PSTs with full-time teaching experience were notably more confident in their classroom management skills.

TABLE 2 Correlations among the variables.

Item	1	2	3
1. Motivation to teach	1		
2. Preparedness for teaching	0.357**	1	
3. Constructivist beliefs	0.203**	0.211**	1
4. Conscientiousness	0.050	0.097	−0.081

** $p < 0.01$.

As Table 2 makes clear, our preliminary analyses revealed that the scales were reliable and offered basic data for SEM. As the variables in the study were self-reported, Harman's single-factor test was used to examine whether the results were affected by a common method bias. In addition to CFA, which rejected the single-factor model ($\chi^2 = 2253.313$, $df = 350$, $NFI = 0.593$, $IFI = 0.633$, $CFI = 0.631$, $TLI = 0.601$, $RMSEA = 0.119$), an exploratory factor analysis using SPSS 22.0 was also conducted to run this test. For the exploratory factor analysis, the unrotated factor solution showed that a single factor could account for only 32.318% of the total variance ($< 40.0\%$). Therefore, the single-factor model was rejected by both the confirmatory and exploratory factor analyses, indicating that common method variance did not impair the results.

An SEM model was constructed to analyze how the motivation to teach and constructivist teaching beliefs influence PSTs' preparedness for teaching. The main variables were first standardized to reduce multicollinearity and improve the convergence of the model. The structural equation model test results showed a good fit (Figure 2): $\chi^2/df = 1.743$ (< 3), $p < 0.001$, $CFI = 0.991$ (> 0.95), $TLI = 0.98$ (> 0.95), $RMSEA = 0.044$ (< 0.06), and $SRMR = 0.0232$ (< 0.08).

The model was further tested; the results are provided in Table 3. Regarding direct effects, the direct effect of motivation to teach on constructivist teaching beliefs was significant ($\beta = 0.264$, $p < 0.01$). The direct effect of constructivist teaching beliefs on preparedness for teaching was not significant ($\beta = 0.105$, $p > 0.05$). The direct effect of motivation to teach on preparedness for teaching was significant ($\beta = 0.537$, $p < 0.001$), indicating H1 was supported. To test the mediating role of constructivist teaching beliefs in the relationship between motivation to teach and preparedness for teaching, zero was included in both the unstandardized 95% CI of $[-0.027, 0.171]$ ($p = 0.076$) and the standardized 95% CI of $[-0.018, 0.076]$ ($p = 0.150$) after 2,000 bootstrap replications, indicating that constructivist teaching beliefs did not mediate this relationship, which did not support H2 (see Table 4).

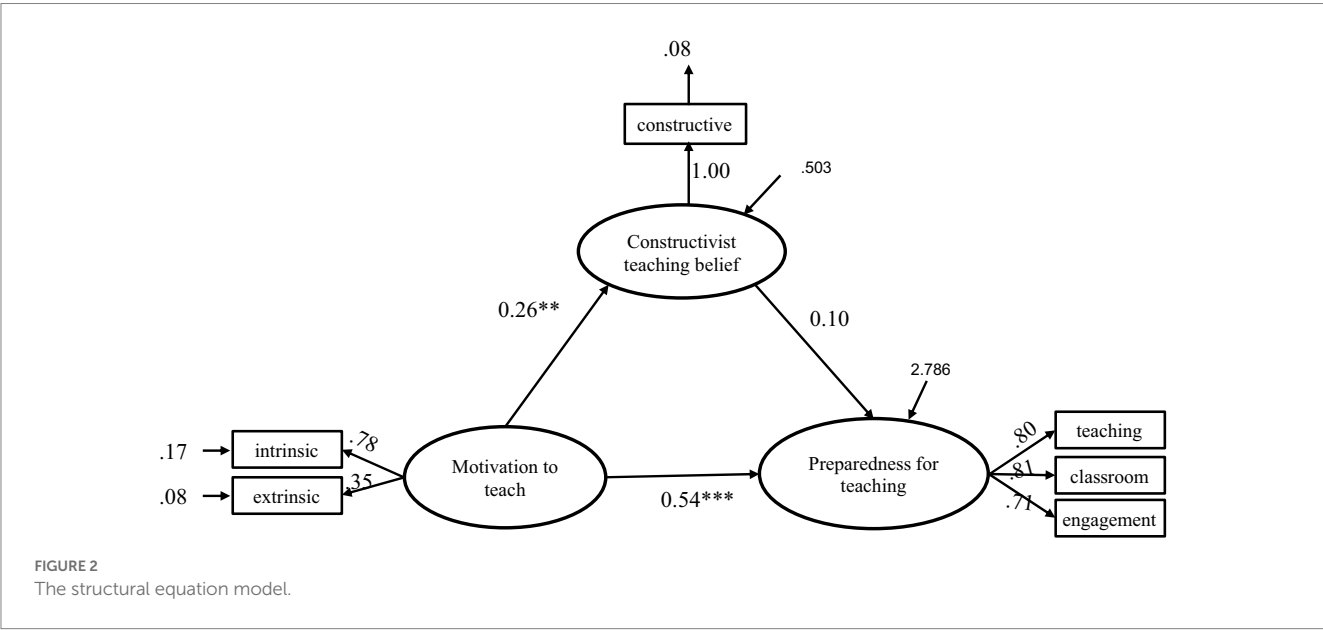


TABLE 3 Multigroup analysis: Testing for path coefficients invariance across high and low score group conscientiousness ($N=383$).

Structural model	χ^2	df	$\Delta\chi^2$	Δdf	χ^2/df	p	CFI	TLI	RMSEA	SRMR
Model 1 Baseline model	18.72	14	-	-	1.34	0.18	0.99	0.98	0.03	0.03
Model 2 Restricted model	27.21	17	8.49	3	1.60	0.05	0.98	0.97	0.04	0.03
Model 3 Motivation to teach \rightarrow Constructivist beliefs	18.91	15	0.19	1	1.26	0.22	0.99	0.99	0.03	0.03
Model 4 Constructivist beliefs \rightarrow Preparedness for teaching	25.26	15	6.54*	1	1.68	0.047	0.98	0.96	0.04	0.06
Model 5 Motivation to teach \rightarrow Preparedness for teaching	19.74	15	1.04	1	1.32	0.18	0.99	0.98	0.03	0.06

* $p < 0.05$.

To test the moderating effect of conscientiousness, the participants were divided into a high-score group ($n = 221$) and a low-score group ($n = 162$) using the mean value obtained from the conscientiousness scale. The goodness-in-fit indices for the SEM run with low and high score groups are provided in Figure 3. SEM results for the low score group showed a goodness in fit: $\chi^2/df = 0.95$ (< 3), $p < 0.001$, CFI = 1.00 (> 0.95), TLI = 1.00 (> 0.95), SRMR = 0.03 (< 0.08) and RMSEA = 0.00 (< 0.06). Results for the high score group reported the same goodness in fit to the data: $\chi^2/df = 1.73$ (< 3), $p < 0.001$, CFI = 0.99 (> 0.95), TLI = 0.97 (> 0.95), SRMR = 0.03 (< 0.08) and RMSEA = 0.058 (< 0.06). As seen in Table 3, the evidence by a significant chi-square difference ($\Delta\chi^2 = 8.49$, $df = 3$, $p = 0.05$) indicates that there were marginally significant differences in path estimates of low versus high score groups between the baseline model (model 1) and the restricted model (model 2). Additionally, the chi-square difference was different among paths. The paths from motivation to teach to constructivist beliefs ($\Delta\chi^2 = 0.19$, $df = 1$, $p = 0.22$) and motivation to teach to preparedness for teaching ($\Delta\chi^2 = 1.04$, $df = 1$, $p = 0.18$) did not differ significantly between the two groups. However, the paths from constructivist beliefs to preparedness for teaching ($\Delta\chi^2 = 6.54$, $df = 1$, $p < 0.05$) was significantly higher in the group that scored high on the conscientiousness subscale than in the low group. Overall, H3 was supported. These findings reveal that the conscientiousness of PSTs plays a moderating role in the influence of constructivist teaching beliefs on preparedness for teaching. Thus, highly conscientious PSTs with relatively strong constructivist teaching beliefs are likely to demonstrate relatively high levels of preparedness for teaching; conversely, PSTs that are not very conscientious with relatively strong constructivist teaching beliefs are likely to demonstrate relatively low levels of preparedness for teaching.

5. Discussion

The present study provides several essential findings that further knowledge of the effects of PSTs' within-person factors on their preparedness for teaching, especially in the context of China. More specifically, motivation to teach can be a powerful factor in PSTs' preparedness for teaching and constructivist teaching beliefs. We found that constructivist teaching beliefs alone did not mediate between motivation to teach and preparedness for teaching. Moreover, the conscientiousness of PSTs was an interfering factor in the second

TABLE 4 Structural equation model path estimation.

Path relationship	B	SE	t value	β
Direct effect				
Motivation to teach \rightarrow Constructivist belief (a)	0.258	0.126	2.9**	0.264
Constructivist beliefs \rightarrow Preparedness for teaching (b)	0.199	0.199	1.611	0.105
Motivation to teach \rightarrow Preparedness for teaching (c)	1.00	0.492	3.35***	0.537
Indirect effect				
$a \times b$	0.051	0.034	1.408	0.028

** $p < 0.01$, *** $p < 0.001$.

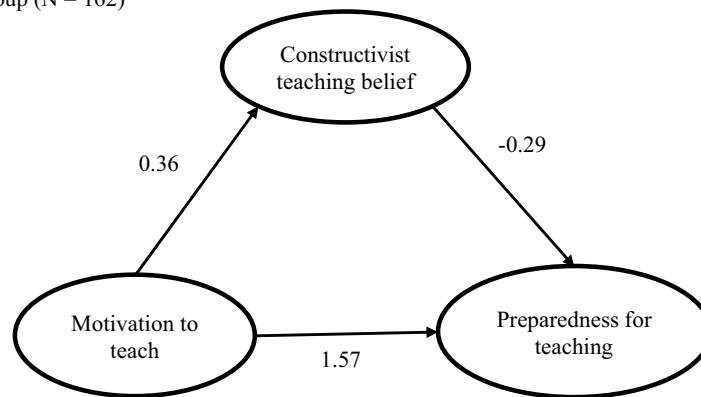
half of the intermediary model (i.e., constructivist teaching belief and preparedness for teaching).

5.1. Differences in demographic characteristics

First, the results of the present study showed that among the participants, male students were more confident in their preparedness for teaching than female students; this supports some previous research (e.g., Klassen and Chiu, 2010). Across careers, male students are usually more confident in their abilities, while females usually have low self-confidence, even if they have similar abilities to males (Bandura et al., 2001). In addition, participants with teaching experience exhibited confidence in classroom management and preparedness for teaching, consistent with previous findings (e.g., Vaudroz et al., 2015).

Furthermore, the present study found that, among the participants, PSTs who entered graduate programs in teacher education for which entrance examinations were waived were more confident regarding student engagement and had stronger constructivist teaching beliefs than those who entered programs with entrance examinations. Similar to many previous studies (e.g., Sinclair, 2008; Jaengaksorn et al., 2015), we indicate that the potential role of motivation to teach in becoming a quality teacher among PSTs should not be underestimated, especially in China. PSTs who planned to become teachers exhibited a motivation to teach, intrinsic motivation, and constructivist teaching beliefs. Moreover, the results of the present

Low score group (N = 162)



High score group (N = 221)

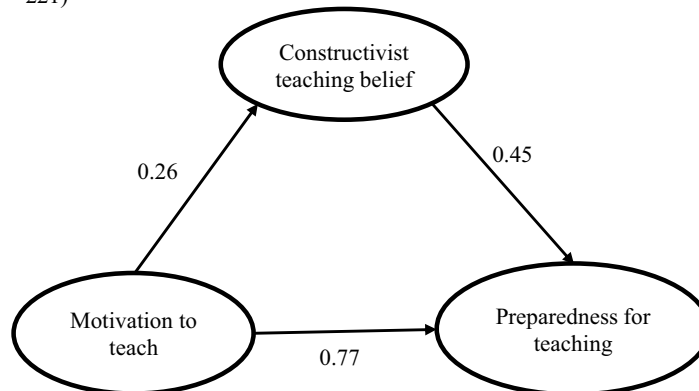


FIGURE 3
SEM for the low and high conscientiousness score.

study were similar to those reported by Zhang et al. (2013), confirming that some characteristics of the teaching career itself, such as promoting socialization and society's love for children, attract preservice teachers to teaching. For PSTs who are admitted to graduate programs, priority should be given to those who "will choose a teaching career in the future," and the number of graduate students enrolled in programs that waive entrance examinations should be increased.

5.2. The relationship between motivation to teach, constructivist teaching beliefs, and preparedness for teaching

Second, the results of the present study, in line with previous studies (e.g., Jaengaksorn et al., 2015; Lysaght et al., 2018) indicated that motivation to teach positively impacts on both constructivist teaching beliefs and preparedness for teaching. Notably, motivation to teach had a greater direct influence on preparedness for teaching ($\beta = 0.54$, $p < 0.001$) than constructivist teaching beliefs ($\beta = 0.26$, $p < 0.01$), indicating that the potential role of motivation to teach in PSTs becoming quality teachers should not be underestimated. Motivation to teach varies depending on the sociocultural

environment (Watt et al., 2012). The results of the present study are highly similar to those in Watt et al. (2012) study, which was conducted in different sociocultural contexts (e.g., Australia, the United States, Norway, and Germany) as well as to the results of a study by Guo and Sun (2018). Taken together, these findings confirm that the internal characteristics of the teaching career, such as serving society, giving back to society, enjoying teaching, and helping students grow, enhance the positive perceptions of PSTs and consistently drive effective learning.

5.3. Testing the moderation model

Unexpectedly, we found that PSTs' constructivist teaching beliefs did not directly influence preparedness for teaching and did not mediate the relationship between motivation to teach and preparedness for teaching. This unexpected finding differs from the results of some previous studies (e.g., Jamil et al., 2012). However, our finding is aligns with Baier et al. (2019) study which indicated that, in terms of personality, constructive beliefs might be a less important predictor of teacher effectiveness. The result was also consistent with Dong et al. (2015) study, which found that a strong belief in constructivist teaching positively impacts student engagement and

learning but does not predict PSTs' technological pedagogical content knowledge.

Based on the potential impact of the environment, established by social learning theory, constructivist beliefs are influenced both by the individual's subjective interpretation of their active experience and their interactions with others (Mascolo and Fischer, 2004). Teachers' beliefs are most profoundly influenced by their own long-term educational experiences as students, subject knowledge, and social cultures (Kagan, 1992; Pajares, 1996; Richardson, 1996). Scholars have previously suggested that PSTs' teaching beliefs are relatively stable (e.g., Darling-Hammond, 2006; Korthagen et al., 2006; Vidović and Domović, 2019). Ye et al. (2022) reported that Chinese PSTs who cared for students and acted responsibly while teaching were immersed in learning a kind of teacher morality through social interactions. Additionally, Levin (2015) indicated that teaching beliefs about moral and ethical dilemmas and societal issues affect teaching (e.g., politics, poverty, economics). Notably, teachers generally accept existing sociocultural beliefs (Kaur and Noman, 2015), which the present study inferred as possibly related to PSTs' long-term immersion in traditional education, therefore may play a role in stabilizing belief systems in China. Along these lines, an existing study reported that Chinese teachers tend to hold traditional teaching beliefs (Sang et al., 2009) and another indicated that teachers in collectivist cultures mostly ascribe to traditional teacher-centered pedagogies (Reeve et al., 2014). Under the prevailing sociocultural belief that teacher-centered pedagogy is the most effective and efficient approach to advancing student learning outcomes, PSTs understand that Chinese teachers bear a professional responsibility to promote student growth and development, and are influenced by the traditional beliefs of teaching to the test and teacher-centeredness that allow PSTs to perceive the limitations of their environments. This perception causes PSTs to lower their constructivist teaching beliefs and thus choose to adapt to their environments.

From our unexpected finding, the present study further found that the constructivist teaching beliefs of highly conscientious PSTs partially mediate the relationship between their motivation to teach and their preparedness for teaching. Furthermore, conscientiousness, in its relationship with motivation to teach, constructivist teaching beliefs, and preparedness for teaching, has a moderating effect on the second half of the intermediary model (i.e., the path from constructivist teaching beliefs to preparedness for teaching); that is, among highly conscientious PSTs, the stronger their constructivist teaching beliefs, the higher their preparedness for teaching; conversely, among PSTs that are not very conscientiousness, the stronger their constructivist teaching beliefs, the weaker their preparedness for teaching.

Conscientiousness is closely related to some professional characteristics, such as efficacy, goal setting, and overcoming obstacles (Wendling and Sagas, 2020). A personality trait that includes persevering and doing one's best, conscientiousness has been shown to improve teaching efficacy (Bayona and Castañeda, 2017). Regarding conscientiousness, this study deepened the findings of Sang et al. (2009), who showed that under the influence of Confucian culture, collective consciousness has challenged the constructivist teaching beliefs of PSTs in China. Specifically, this study indicated that conscientiousness, as a personality trait characterized by responsibility and loyalty, allows PSTs to overcome their intrinsic conflicts and positively influences their

preparedness for teaching. This finding may be explained by the facts that coping and defense mechanisms may help people to reconfigure information in a way that inoculates them from the necessity to change and that individuals who can take responsibility for themselves will engage in habits that will enable them to attain their goals (Roberts, 2009). When coupled with high conscientiousness, in terms of understanding teacher duties and the sense of responsibility for students' learning, constructivist teaching beliefs can even enhance the positive impact of motivation to teach on preparedness for teaching.

6. Conclusion

The present study is one of only a few studies to consider the impact of motivation to teach, constructivist teaching beliefs, and conscientiousness on PSTs' preparedness for teaching. Drawing on social learning theory, most previous studies have focused on how the interaction effects between the contextual and personal factors of PSTs influence their preparedness for teaching (e.g., Clark and Newberry, 2019). In the present study, we investigated within-personal traits of PSTs that affect the relationship between the motivation to teach and preparedness for teaching and explored the mediated moderation effect of conscientiousness and constructivist teaching beliefs in the Chinese context. Our research filled a gap in social learning theory to explain the psychological attributes that come from the individuals' responses to the environment. This study notably confirmed and deepened the findings of previous studies on the positive effects of motivation to teach (e.g., Sinclair, 2008; Jaengakorn et al., 2015); specifically, this study showed that PSTs' motivation to teach could be strengthened by constructivist teaching beliefs that align with the spirit of existing educational reforms in China. However, this study also unexpectedly revealed that constructivist teaching beliefs do not facilitate PSTs' preparedness, indicating that PSTs may have internalized Chinese traditional culture. Additionally, conscientiousness played a protective role in promoting the moderating effect on the relationship between constructivist teaching beliefs and preparedness for teaching, indicating that the personalities of PSTs should be considered when teaching PSTs constructivist teaching beliefs to facilitate their preparedness for teaching.

This study had some limitations and, therefore, can inspire some directions for future research. The results of the present study highlight the moderating effect of PSTs' conscientiousness on the relationship between constructivist teaching beliefs and preparedness for teaching; however, this study was limited in its focus on context- and personality-related factors, with conscientiousness selected due to the unique social context in China. Given that teachers' roles, responsibilities, and social norms often differ across countries, much more research is necessary to understand the effect of conscientiousness and its place in the process of PSTs' teacher education, including recruitment, training, and retention, across countries. Moreover, the unexpected effect of constructive teaching beliefs opens up new questions about what mechanisms can change or maintain beliefs (Decker et al., 2015; Sheridan, 2016; Voss and Kunter, 2020); this should be the subject of further investigation.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

JH, GS, and WH contributed to conception and design of the study. WH organized the database. JH and GS performed the statistical analysis. JH wrote the first draft of the manuscript. JH, GS, and WH wrote sections of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Developing a CVTAE-based conceptual framework for examining emotions in higher education teaching: a systematic literature review

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A number of studies on higher education (HE) teachers' emotions have been carried out, but overall, the literature on this issue is relatively limited, even though HE teaching can be regarded as an emotional endeavor and represents an important topic in HE research. The main goal of this article was to develop a conceptual framework for examining teaching-related emotions of HE teachers by revising and extending the control-value theory of achievement emotions (CVTAE) developed to systematically classify existing findings on emotions in HE teachers and to identify a research agenda for future studies in this field. Therefore, we conducted a systematic literature review on empirical studies investigating HE teachers' teaching-related emotions to gain insights into (1) the theoretical concepts and approaches used to study HE teachers' emotions as well as the (2) antecedents and (3) consequences of experienced emotions identified in the existing studies. By applying a systematic literature review, 37 studies were found. Based on the conducted systematic review, we propose a CVTAE-based conceptual framework for examining HE teachers' emotions in HE teaching with additional components relating to both antecedents and consequences of HE teachers' experienced emotions. We discuss the proposed conceptual framework from the theoretical perspective, pointing out new aspects that should be considered in future research on HE teachers' emotions. From the methodological perspective, we address aspects related to research designs and mixed-method approaches. Finally, we list implications for future higher education development programs.

KEYWORDS

higher education teachers, systematic review, teaching related emotions, emotion regulation, antecedents and consequences of emotions

1. Introduction

Although a growing body of research concerning the emotions of schoolteachers has been conducted over the last 20 years, the emotions of teachers in higher education (HE) have been of little interest to researchers thus far. In 2007, Pekrun stated, “To date, next to nothing is known about professors’ emotions experienced in classroom teaching, and the role these emotions play in the quality of their teaching, their professional development, and their wellbeing, burnout, and physical health” (p. 604) (Pekrun, 2007). We argue that HE teachers’ emotions should be acknowledged in research because emotions guide behavior and are thus likely to influence the quality of teaching and, as a result, the learning outcomes of HE students. In addition, emotions are linked to personal wellbeing. These associations have been repeatedly confirmed for schoolteachers (Frenzel, 2014), but research on HE teachers is comparatively scarce. We further propose that teaching-related emotions of HE teachers could be particularly salient, as academics must negotiate the demands of multiple roles simultaneously (e.g., Lai et al., 2014), which could be especially emotionally taxing owing to the potential tensions arising between the different roles (e.g., Avargues Navarro et al., 2010). Additionally, HE teachers frequently do not have (much) professional education in the teaching domain and are thus, at best, loosely formally guided in their professionalization processes. It should also be noted that the pressure on HE teachers due to (mandatory) student evaluations is intense and unrelenting (e.g., Roxå and Mårtensson, 2011), in particular when such evaluations co-determine a teacher’s academic career. This is likely to cause various negative emotional side effects and tensions, especially for those who have a strong teaching orientation, but are compelled to enhance their research at the same time. In sum, the above-mentioned studies underline the variability of factors linked to teaching-related emotions of HE teachers and make the systematic examination of theoretical approaches and empirical findings touching upon the emotional experiences of HE teachers an important agenda in HE research.

Among existing theoretical models that have been used for examining emotions experienced in achievement and academic settings (e.g., Fredrickson, 2001; Scherer, 2005; Gross, 2010), the most prominent one is the control-value theory of academics emotions (CVTAE, Pekrun, 2006). This theory was developed based on appraisal-orientated approaches to emotions (Moors et al., 2013). It explains (achievement) emotions in educational settings and has been frequently applied in conjunction with the emotions of school students and HE students. This theory states that emotions are evoked based on two antecedent appraisals, namely control and value appraisals. If learners perceive the environment as controllable and (intrinsically) valuable, positive emotions typically occur (e.g., enjoyment). Conversely, if an environment or learning activity is experienced as uncontrollable and relevant, negative emotions usually result (e.g., anxiety or hopelessness). As a consequence, these emotions influence attitudinal changes, motivational, cognitive, and regulatory processes, implying different types of attempts to manage the emerging emotions.

Although CVTAE provides a solid basis for studying emotions in academic contexts and for classifying antecedents and

consequences of affective experiences, it focuses predominantly on the affective phenomena of learners. Therefore, a specification and elaboration of a modified conceptual framework including the revision of existing theoretical approaches such as CVTAE seem to be necessary for a systematic examination of various factors connected to the emergence and processing as well as the consequences of emotions experienced by HE teachers. Consequently, we seek to review the existing empirical studies on teaching-related emotions of HE teachers systematically, considering both theoretical approaches and findings in order to extend the CVTAE into a modified conceptual framework that reflects aspects specific to teaching-related emotions within the HE context. Based on the modified conceptual framework, a broader picture can be painted to obtain a systematic and holistic overview of what is already known about HE teachers’ emotions and what aspects of teaching-related emotions of HE teachers are still underrepresented in the current studies. Furthermore, methodological issues of research on teaching-related emotions of HE teachers could be analyzed and implications for teaching development programs could be derived.

2. Research questions and aim of the study

The main goal of this review was to revise the CVTAE (Pekrun, 2006) to modify the conceptual framework for examining HE teachers’ teaching-related emotions by classifying antecedents and consequences specific to HE teachers’ emotions. For this purpose, we identified the following research questions for our systematic literature review, including both theoretical issues and empirical findings touching upon HE teachers’ teaching-related emotions.

First, we sought to gain insight into the theories and models of emotions used to study the emotions of HE teachers and to check for CVTAE in particular (Pekrun, 2006).

RQ 1: How widely is CVTAE (Pekrun, 2006) used as a theoretical framework for studying HE teachers’ teaching-related emotions? What other theoretical concepts and approaches were used in existing studies?

Second, we were interested in antecedents linked to HE teachers’ teaching-related emotional experiences.

RQ 2: What kinds of antecedents specific to teaching-related emotions experienced by HE teachers were identified in the existing research and how can the revealed antecedents be classified?

Third, we sought to investigate the consequences of the emotions experienced by HE teachers.

RQ3: What kinds of consequences were reported as being linked to the experienced teaching-related emotions in HE teachers, and how can the revealed consequences be classified?

3. Methods

In order to answer the research questions outlined above, we conducted a systematic literature search and a stepwise analysis of the selected studies.

3.1. Search terms and databases

An initial systematic literature search was undertaken by the main author in May 2020 in selected databases in education and psychology (ERIC, PubPsych, PsycINFO, Web of Science), following the current standards defined in the PRISMA statement (Page et al., 2021). The keywords in their diverse combinations, linked with Boolean Operators (AND/OR), were “emotion,” “affect,” “emotion regulation,” “emotion management,” “HE teaching,” “HE teachers,” “higher education teaching,” “higher education teachers,” “university teaching,” “university teachers,” “university lecturers,” and “university instructors.” Furthermore, following the “standard systematic review practice” (Petticrew and Roberts, 2006, p. 104), experienced researchers in this research field were contacted and asked for further literature suggestions (in this case: the co-authors).

3.2. Selection criteria

Formal criteria included that articles (1) were written in English or German and (2) were published between 2000 and 2020. Several researchers around the turn of the millennium emphasized the role of emotions in school teaching as well as in HE teaching (e.g., Hargreaves, 1998, 2000), but also stressed that especially the latter was a largely under-researched area (Martin and Lueckenhausen, 2005). In recent years, there has been a slight increase in publications, which is why we considered it promising to investigate publications within this timespan. Regarding the study design, we picked only studies that (3) were empirical (quantitative, qualitative, or mixed method), as the aim was to provide an evidence-based overview of HE teachers’ emotions. Furthermore, we selected only studies (4) whose subjects were HE teachers (and not, e.g., tutors). Regarding the content of the studies, we were solely and explicitly interested in HE teachers’ teaching-related emotions. Consequently, we selected studies that (5) examined HE teachers’ emotions regarding teaching and excluded studies that addressed constructs other than teaching-related emotions, such as profession-related emotions such as work satisfaction, wellbeing, stress, or burnout (e.g., Azeem and Nazir, 2008; Abdullah and Akhtar, 2016). To ensure the quality of the articles, we included only studies published in (6) peer-reviewed journals due to their trustworthiness in academia and their rigorous review processes (Nicholas et al., 2015).

3.3. Study collection process and data extraction

The study collection process is graphically illustrated in a flow chart (see Figure 1). Altogether, 679 records were identified (239 in ERIC, 51 in PubPsych, 212 in PsycINFO, and 177 in Web of Science [including the SSCI, the SCI, and the A & HCI]). A total of 145 duplicates were removed. The examination for formal criteria lead to the exclusion of four articles (three articles were not written in English or German, and one article was published before 2000). By screening the titles and abstracts of the remaining 530 titles, 482 articles were sorted out gradually: 252 studies did not

take place in an educational setting, the subjects of a further 106 articles were not HE teachers (but students or [preservice] teachers, tutors, or other faculty), 116 articles did not focus on HE teachers’ emotions, and an additional eight articles were sorted out because they did not appear in peer-reviewed journals ($N = 3$) or were not empirical in nature ($N = 5$). The main author examined full texts of the remaining 48 articles as well as of 39 further articles that experts in this research field recommended for closer examination. If there were doubts regarding the inclusion of articles, at least two authors discussed the respective articles until a consensus was reached. A total of 50 out of these 87 studies were eventually excluded (21 from among the expert recommendations and 29 of the further articles): 26 articles only focused on related constructs (such as identity or wellbeing), 21 articles did not focus on HE teachers’ teaching-related emotions, and in three other studies, no systematic observation took place. No further studies could be identified by cross-referencing the included studies. In total, 37 studies were included in this literature review. A summary of the included studies is presented in Table 1, providing information on the research objective, sample and country, empirical approach, and data collection strategy.

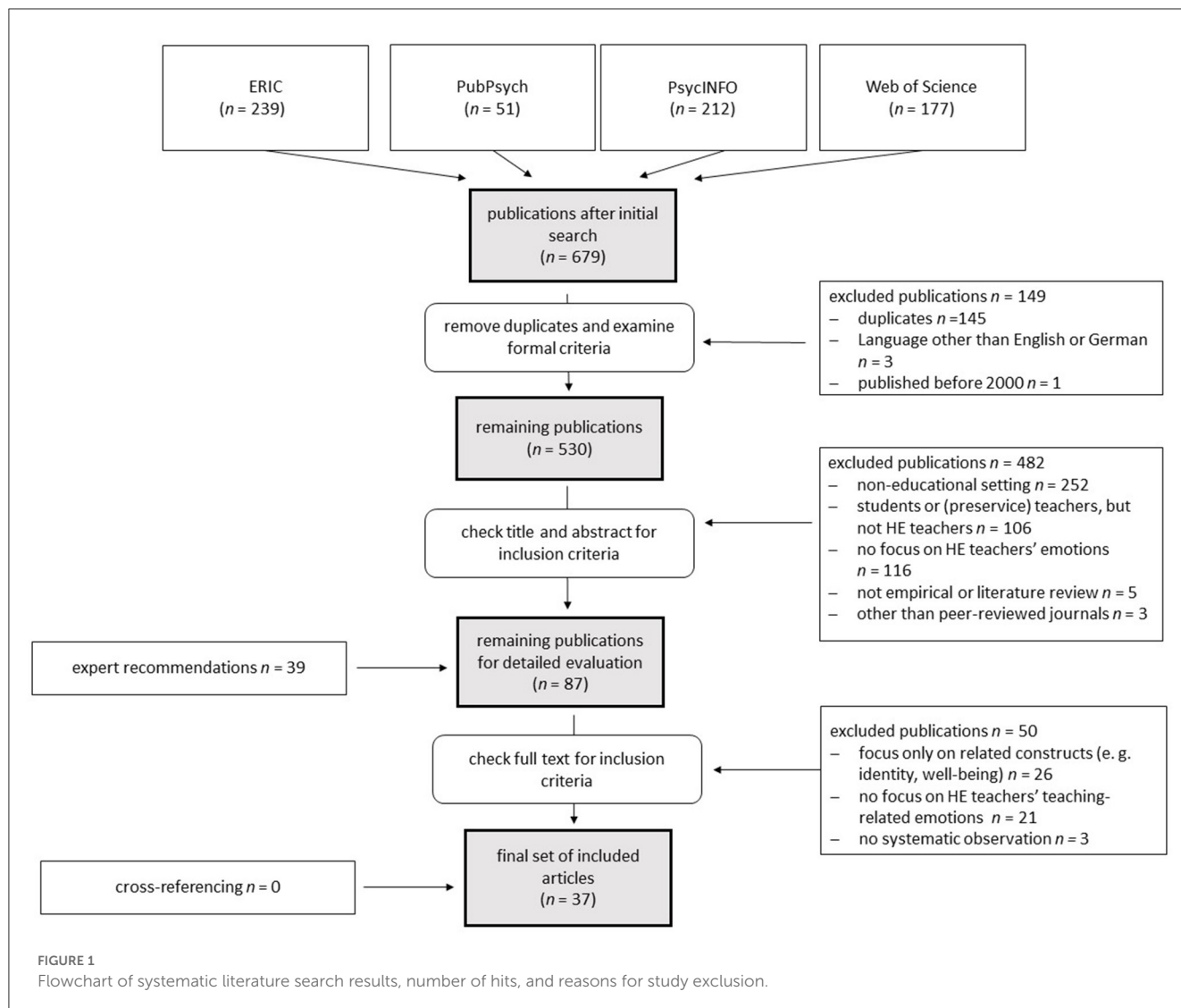
4. Results

4.1. RQ 1: How widely is CVTAE used as a theoretical framework for studying HE teachers’ teaching-related emotions? What other theoretical concepts and approaches were used in existing studies?

To answer RQ 1, we analyzed the theoretical concepts and approaches of emotions used in the included studies (see Table 2). The results showed that CVTAE (Pekrun, 2006) was referred to in 10 out of the 37 included studies.

Regarding the understanding of what emotions are, the analysis revealed that six out of the 37 included studies that explicitly stressed their multi-componential understanding of emotions. “Multi-componential” refers to the assumption that emotions consist of various emotion components (e.g., Kleinginna and Kleinginna, 1981; Scherer, 2005), which are presumed to interact during an emotional episode. They include cognitive processes (e.g., appraisals and judgments), experiential or affective processes (e.g., positive or negative feelings), physiological processes (e.g., peripheral arousal and central nervous activation), expression (e.g., gestures and facial expressions), and behavioral tendencies (e.g., preparations for action), whereby the affective component is particularly characteristic of emotions (Frenzel et al., 2015). In contrast, one of the included studies referred to a dichotomous understanding of emotions, following Kemper’s theory (1978), which divides emotions into positive and negative emotions (Zhang et al., 2019).

Two studies referred to Fredrickson’s (2001) broaden-and-build theory of emotion (Lutovac et al., 2017; Thies and Kordts-Freudinger, 2019a). This theory states that experiencing positive emotions broadens one’s momentary thought-action repertoires, resulting in the construction of persistent individual resources on different levels (physical, intellectual, social, and psychological). A



social-psychological-orientated approach to emotions was used in three studies, insofar that the social nature of teachers' emotions was emphasized (e.g., Postareff and Lindblom-Ylänne, 2011; Hagenauer and Volet, 2014a; Zhang et al., 2019). Teaching can be regarded as a social practice (Zembylas, 2005), and thus teachers' emotions are not only influenced by their own individual reality but also by the social context and the relationships which are formed within it.

Thirteen studies focused on approaches related to different aspects of emotion regulation after experiencing teaching-related emotions, namely emotion regulation strategies (five studies), emotional labor or emotion work (eight studies), and emotion display rules (four studies) [note that two studies made use of all three approaches]. Emotion regulation can be described as an attempt to "influence which emotions we have, when we have them, and how we experience [them]" (Gross, 2010, p. 497). This includes a set of different processes on physiological, behavioral, and cognitive levels (Gross and Thompson, 2007; Gross, 2010), in accordance with the multi-component understanding of emotions described above. These strategies include, e.g., cognitive strategies,

such as cognitive reappraisal (i.e., to reinterpret or re-evaluate an emotional situation), or response-focused strategies, such as suppressing the expression of emotions. In a similar vein, emotional labor or emotion work is defined as the effort to display the emotion that is perceived as being the expected emotion (e.g., Hochschild, 1983). This can be achieved through one of the following coping strategies: (1) surface acting (i.e., displaying emotions that are not felt but are perceived as appropriate) or (2) deep acting (i.e., attempting to truly experience the expected emotions). The appropriate *display of emotion* in specific contexts and interaction settings can be defined using Ekman and Friesen's (1969) concept of "emotion display rules." These cognitively represented rules influence the individual display of emotion in accordance with cultural and/or professional definitions of acceptable display modes for emotions (e.g., Matsumoto et al., 2008; Mendzheritskaya et al., 2018).

Regarding the emergence of emotions, six studies made use of appraisal theories. According to appraisal theories, an emotion is triggered by an individual's evaluation of a corresponding situation. Consequently, the same situation can cause different emotions in

TABLE 1 Summary of empirical studies on emotions in HE teaching.

References	Research objective	Sample and Country	Empirical approach	Method/data collection strategy
Badia et al. (2019)	HE teachers' online teaching related emotions and influencing factors (teaching approach, individual characteristics)	N = 965 HE teachers; Spain	Quantitative	Online questionnaire
Badia Gargante et al. (2014)	Structure of HE teachers' emotions about teaching and teaching approaches	N = 198 HE teachers; Latin America (Peru/Colombia/Chile/Mexico/Argentina)	Quantitative	Online questionnaire
Bahia et al. (2017)	HE teachers' emotional states as a result of Bologna-related changes	N = 12 HE teachers with extensive teaching experience; Portugal	Qualitative	Semi-structured interviews
Bennett (2014)	Emotions of HE teachers applying innovative teaching methods (Web 2.0)	N = 16 HE teachers in various disciplines with diverse teaching experience; UK	Qualitative	Interviews
Coppola et al. (2002)	Presents a qualitative study of role changes that occur when faculty become online or "virtual" professors	Instructors in ALN settings; US	Qualitative	Interpretative Study
Cowie (2011)	Antecedents of EFL (English as a Foreign Language) teachers' emotions	N = 9 EFL teachers; Japan	Qualitative	Phenomenological interview (3 interviews with each teacher)
Flodén (2017)	HE teachers' perceptions of student feedback and its relation to teaching choices	N = 75 HE teachers; Sweden	Quantitative	Online questionnaire
Gates (2000)	HE teachers' handling of emotions during teaching and the relationship to their purpose of facilitating students	N = 9 HE professors; US	Qualitative	Observation And interviews
Hagenauer et al. (2016)	Cross-cultural differences in HE teachers' emotion display and teacher-student-relationship	N = 15 HE teachers in teacher education; Australia N = 9 HE teachers in teacher education; Germany	Qualitative	Semi-structured interviews
Hagenauer and Volet (2014b)	HE teachers' emotion display when teaching and interacting with students	N = 15 HE teachers in teacher education; Australia	Qualitative	Semi-structured interviews
Hagenauer and Volet (2014a)	Variety and antecedents of HE teachers' emotions in teaching and interacting with students.	N = 15 HE teachers in teacher education; Australia	Qualitative	Semi-structured interviews
Harlow (2003)	Emotions and emotion management of faculty and its variation by race	N = 58 (29 white, 29 African-American faculty members at a university with 91 % white student population); US	Qualitative	In-depth interviews
Kordts-Freudinger (2017)	Study 1: HE teachers' emotions and their approaches to teaching Study 2: Emotions of HE teachers, emotion-regulation strategies and approaches to teaching Study 3: HE teachers' emotions and approaches to teaching	Study 1: N = 145 HE teachers; Germany Study 2: N = 198 HE teachers; Germany Study 3: N = 76 HE teachers; Australia and New Zealand	Quantitative	Online questionnaire
Kordts-Freudinger and Thies (2018)	HE teachers' emotions, their emotion regulation strategies and approaches to teaching	N = 104 HE teachers of different disciplines; Germany	Quantitative	Questionnaire
Kowai-Bell et al. (2012)	(Study 2): Emotional responses of professors to evaluations on the platform "rate my professors"	N = 33 pre-tenured and tenured professors; US	Quantitative	Questionnaire / experimental design
Lahtinen (2008)	HE teachers' views on sources, emotions and distress in pedagogical interaction	N = 8 HE teachers in various disciplines (7 female); Finland	Qualitative	Interviews
Löfström and Nevgi (2014)	Exploring drawings of HE teachers in order to get an understanding of their emotions in teaching.	N = 86 academics, participating in a university pedagogy course; Finland	Qualitative	Visual grammar approach (creative approach)
Lutovac et al. (2017)	HE teachers' emotional reactions to student feedback	N = 7 pedagogically trained HE teachers with varied experience; Finland	Qualitative	Semi-structured interviews
Martin and Lueckenhausen (2005)	HE teachers' emotions and their conceptual changes in scholarly thinking or practice over a semester	N = 31 HE teachers teaching first- or second-year classes in various disciplines; Australia	Qualitative	Interviews

(Continued)

TABLE 1 (Continued)

References	Research objective	Sample and Country	Empirical approach	Method/data collection strategy
Meanwell and Kleiner (2014)	Emotional dimensions of first-time teaching	<i>N</i> = 86 first-time HE teachers (graduate students); US	Qualitative	Reflection papers
Mendzheritskaya et al. (2018)	Study 1: Cross-cultural comparison of emotional display rules in German and Russian HE teachers	Study 1: <i>N</i> = 159 HE teachers; Germany and Russia	Mixed method	Study 1: Experimental design; online questionnaire
	Study 2: Cross-cultural comparison of antecedents of HE teachers' negative and positive affect and its display in teacher-student interactions	Study 2: <i>N</i> = 46 HE teachers; Germany and Russia	Quantitative + Qualitative	Study 2: Semi-structured interviews
Myyry et al. (2020)	To examine the emotions higher education teachers associate with assessment	<i>N</i> = 16 HE teachers; Finland	Qualitative	Interview study
Nowakowski and Hannover (2015)	Emotional reactions of HE teachers to student course evaluations	<i>N</i> = 183 HE teachers; Germany	Quantitative	Experimental designs
Postareff and Lindblom-Ylänne (2011)	Emotions and confidence within six different teacher profiles (teaching approaches)	<i>N</i> = 97 HE teachers in various disciplines; Finland	Qualitative	Semi-structured interviews
Quinlan (2019)	Examines emotional episodes in teaching in order to illuminate the underlying moral concerns of higher education teachers	66 poems, written by <i>N</i> = 46 HE teachers; UK/US/Canada/Australia	Qualitative	Poems
Ramezanzadeh et al. (2016)	Examine emotions and emotion navigation regarding (in-) authenticity in teaching	<i>N</i> = 20 Iranian adjunct teachers; Iran	Qualitative	2 semi-structured interviews
Regan et al. (2012)	Emotions when teaching in an online learning environment (distance learning)	<i>N</i> = 6 HE teachers teaching in special-education teacher programs; US	Qualitative	Focus group
Storrie et al. (2012)	Clinical trainers' emotions when dealing with students with mental health issues	<i>N</i> = 16 clinical trainers/teachers in the health sciences; Australia	Qualitative	Semi-structured interviews
Stupnisky et al. (2019)	Role of emotions in predicting university faculty teaching and research performance and to validate newly adapted multi-item measures of faculty emotions	<i>N</i> = 312 Early-career faculty (assistant professors); US	Quantitative	Online questionnaire
Stupnisky et al. (2016)	Variation in new faculty members' emotions and their correlates with perceived teaching and research success	Study 1: <i>N</i> = 18; US	Study 1: Qualitative	Focus groups
		Study 2: <i>N</i> = 79 pre-tenured faculty members; US	Study 2: Quantitative	Online questionnaires
Thies and Kordts-Freudinger (2019a)	Investigation of relationship between intensity of 4 positive state emotions, different work domains and cognitive appraisals	<i>N</i> = 50 university academics; Germany	Quantitative	Online questionnaires
Thies and Kordts-Freudinger (2019b)	Intra-individual analysis of university academics' current state emotions, value and control appraisal dimensions	<i>N</i> = 50 university academics; Germany	Quantitative	Online questionnaires
Trigwell (2012)	HE teachers' emotions in teaching and their approaches to teaching	<i>N</i> = 175 HE full-time teachers with recent teaching experience; Australia	Quantitative	Online questionnaire
Tunguz (2016)	Emotional labor of academics and its variation due to tenure and gender	<i>N</i> = 180 faculty members of 3 Midwestern colleges; US	Quantitative	Online questionnaire
Vannini (2006)	Professors' (emotional) experience of in-/authenticity in teaching	<i>N</i> = 46 (assistant, associate and full) professors; US	Qualitative	Semi-structured in-depth interviews
Wang (2014)	Identify HE teachers' emotions in order to promote ICT-supported language instruction	Study 1: <i>N</i> = 30 EFL HE teachers; Taiwan	Mixed method	Online questionnaire and open ended questions
		Study 2: <i>N</i> = 6 EFL HE teachers; Taiwan	Qualitative	Interview
Zhang et al. (2019)	Mediating role of academic self-efficacy in the relationship between emotions in teaching and teaching styles	<i>N</i> = 232 academics; China	Quantitative	Online survey

TABLE 2 Theoretical concepts and approaches of emotions, indicating study authors, years of study, and the number of studies that used this concept/approach.

Theoretical concept/approach	Number of studies, authors and publication year
Multi-component understanding of emotion (e.g., Kleinginna and Kleinginna, 1981; Scherer, 2005)	6: Trigwell (2012), Badia Gargante et al. (2014), Stupnisky et al. (2016), Kordts-Freudinger (2017), Thies and Kordts-Freudinger (2019a), Myrsky et al. (2020)
Dichotomous classification of emotions (Kemper, 1978)	1: Zhang et al. (2019)
Appraisal theories (e.g., Moors et al., 2013)	6: Hagenauer and Volet (2014a), Hagenauer et al. (2016), Kordts-Freudinger (2017), Thies and Kordts-Freudinger (2019a,b), Myrsky et al. (2020)
Control-value theory of Achievement Emotions (CVTAE; Pekrun, 2006)	10: Hagenauer and Volet (2014b), Löfström and Nevgi (2014), Wang (2014), Hagenauer et al. (2016), Stupnisky et al. (2016, 2019), Quinlan (2019), Thies and Kordts-Freudinger (2019a,b), Myrsky et al. (2020) [10]
Broaden-and-build theory of emotions (Fredrickson, 2001)	2: Lutovac et al. (2017), Thies and Kordts-Freudinger (2019a) [2]
Social-psychological approach to emotion (e.g., Zembylas, 2005)	3: Postareff and Lindblom-Ylanne (2011), Hagenauer and Volet (2014a), Zhang et al. (2019)
Emotion regulation strategies (e.g., Gross, 2010)	5: Regan et al. (2012), Hagenauer and Volet (2014b), Hagenauer et al. (2016), Kordts-Freudinger (2017), Kordts-Freudinger and Thies (2018)
Emotional labor/ work (e.g., Hochschild, 1983)	8: Gates (2000), Harlow (2003), Bennett (2014), Hagenauer and Volet (2014b), Meanwell and Kleiner (2014), Hagenauer et al. (2016), Ramezanzadeh et al. (2016), Bahia et al. (2017)
Emotion display rules (e.g., Ekman and Friesen, 1969)	4: Hagenauer and Volet (2014b), Hagenauer et al. (2016), Tunguz (2016), Mendzheritskaya et al. (2018)
No explicit emotion theory/approach used	10: Coppola et al. (2002), Martin and Lueckenhausen (2005), Vannini (2006), Lahtinen (2008), Cowie (2011), Kowai-Bell et al. (2012), Storrie et al. (2012), Nowakowski and Hannover (2015), Flodén (2017), Badia et al. (2019)

different people, depending on their respective appraisals (for an overview, see Moors et al., 2013).

No assignment to any emotion theory could be made in 10 studies. This means that the authors did not point out in an explicit manner what emotion theory or approach is applied as a theoretical framework in their studies.

In sum, 27 out of 37 included studies made use of one or more theoretical approaches when examining HE teachers' emotions. Furthermore, the results demonstrated that 10 studies used CVTAE (Pekrun, 2006) as the theoretical model for investigating the emotions of HE teachers. This renders it the most widely used theory when examining HE teachers' emotions within the included studies.

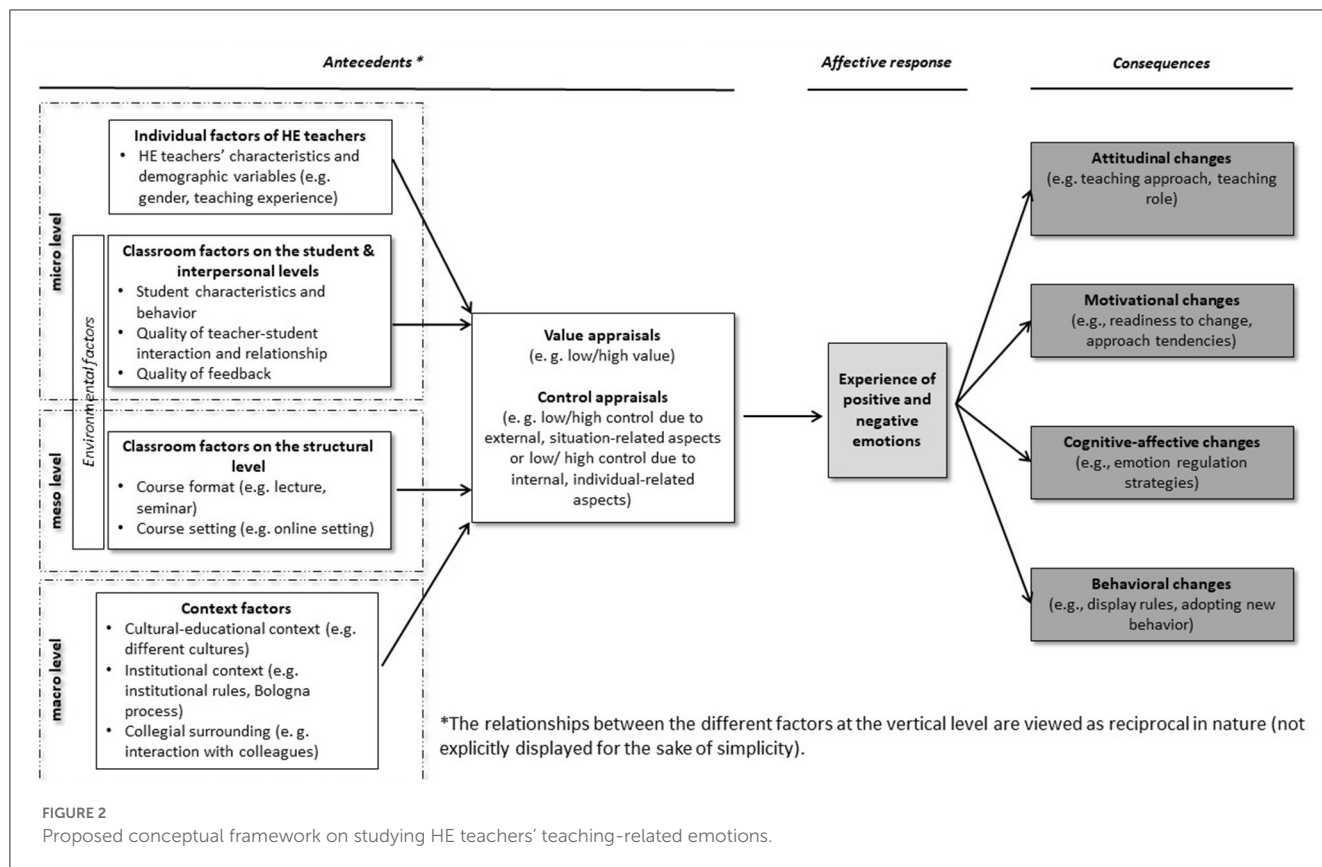
Control-value theory of achievement emotions is considered a further development of frequently referenced appraisal theories with an underlying multi-componential understanding of emotions. Additionally, CVTAE allows for a precise subdivision into antecedents and consequences of emotions. On this basis, the results of studies dealing with both antecedents and consequences of HE teachers' emotions can be classified systematically, and the new dimensions specific to emotional experiences in the HE context could be added to the existing components of CVTAE. The undertaken classification of involved studies and identification of new aspects relating to antecedents and consequences of HE teachers' emotions resulted in the proposed conceptual framework (Figure 2). The proposed framework demonstrates how components of the CVTAE can be extended by additional factors connected to antecedents of emotions, affective responses, and consequences of the experienced emotions for a better understanding of the unique characteristics of HE teachers' teaching-related emotions.

4.2. RQ 2: What kinds of antecedents specific to teaching-related emotions experienced by HE teachers were identified in the existing research and how can the revealed antecedents be classified?

Following the proposed framework which extends Pekrun's CVTAE (2006), this section is devoted to empirical results on antecedents of emotions. The findings are grouped according to the proposed conceptual framework within the section "antecedents" (cf. Figure 2). From the included studies, we identified different antecedents of HE teachers' emotions on the micro, macro, and meso levels (for an overview, see Fend, 2008) that are related to value and control appraisals of varying intensity. First, we present studies that shed light on individual factors of HE teachers on the micro level (see Section 4.2.1) because the majority of the included studies considered these factors to be relevant variables (or covariates) when analyzing HE teachers' teaching-related experienced emotions, their antecedents, and their consequences. In Section 4.2.2, we analyze results from studies focusing on environmental factors on the micro level (classroom factors on the student and interpersonal levels, see Section 4.2.2.1) and meso level (classroom factors on the structural level, see Section 4.2.2.2). According to CVTAE (Pekrun, 2006), the factors named above influence value and control appraisals and play an important role in the emergence of emotions. We additionally describe broader context factors identified in the studies as antecedents of emotions on the macro level (see Section 4.2.3).

4.2.1. Individual level of HE teachers

Flodén (2017) showed that *teaching experience* plays a role in the perception of feedback, indicating that HE teachers with less teaching experience were more nervous about receiving feedback and reported more negative emotions pertaining to student feedback compared to more experienced teachers. An emotion that often accompanies limited teaching experience is



anxiety, or its less intensive forms reflecting fear and insecurity (Hagenauer and Volet, 2014a; Meanwell and Kleiner, 2014), which could be explained by a lower perception of one's own control over the environment. In line with this, performance anxiety can be triggered by other emotions, such as worries about a lack of preparedness (Quinlan, 2019). Related to teaching experiences in general, novel situations of any kind (e.g., teaching in a new position, applying a new teaching method or new technology, teaching a new group of students, and teaching in a new country) can evoke positive emotions (e.g., anticipatory joy), but these typically also go hand-in-hand with feelings of insecurity (Hagenauer and Volet, 2014a). Comparable findings were reported by Lahtinen (2008), who stressed that negative experiences are related to unpredictable and uncertain conditions of teaching and discrepancies in expectations and beliefs that cannot be easily managed. Regarding the use of information and communication technology (ICT), Wang (2014) found that teachers who are less familiar with technology were more nervous and anxious about using ICT in the learning context (e.g., if they were not able to fix the system by themselves). Difficulties encountered with equipment and the resulting loss of time caused frustration. In a similar vein, Bennett (2014) found some HE teachers to be frustrated, infuriated, or desperate if they perceived situations as being out of their control (e.g., if the university's system was not reliable). Furthermore, they experienced fear of exposure if they felt that their own knowledge regarding the technology was not adequate. Regan et al. (2012) confirmed these results by outlining that HE teachers felt disconnected, uncertain, and frustrated because they experienced a lack of control and sufficient technology-based knowledge. Further

sources of frustration included HE teachers not being able to adapt their teaching based on students' gestures, questions, or behavior.

Attempting to enhance one's teaching practice can also be regarded as a novel situation, which also can influence the perceived control of HE teachers over their environments. Martin and Luekenhausen (2005) explored the emotions of Australian HE teachers in one institution who were willing to adopt new teaching practices or rethink their teaching roles. Approaching new practices and roles was accompanied by a mixture of emotions, especially negative ones, such as confusion and anxiety. The emotional impact was particularly observable when the teachers adopted a more student-centered teaching approach. Moving toward a more student-centered teaching approach is a source of insecurity in terms of the more unpredictable nature of student behavior in the classroom.

In an intersectional view, Harlow (2003) showed an interaction between HE teachers' race and teaching experience: Less experienced HE teachers with an African American background reported fear, nervousness, and concern regarding "making a mistake" (p. 355). In addition to anxiety, limited teaching experience can also lead to surprising moments that may be either negatively or positively perceived. In general, first-time teachers were surprised by the high emotionality of first-time teaching (Meanwell and Kleiner, 2014). However, "surprise," but with less negativity, seems to be an emotion also prevalent in the accounts of more experienced teachers (Hagenauer and Volet, 2014a; Kordts-Freudinger, 2017). In general, perceiving oneself as an expert in the field triggers positive emotions, such as enjoyment (Löfström and Nevgi, 2014).

In some studies, a *gender effect* was revealed, e.g., with female teachers reporting more negative emotions associated with feedback from students (Flodén, 2017). Furthermore, male HE teachers reported a slightly higher level of pleasure derived from online teaching as compared to their female counterparts (Badia et al., 2019), and “new” (pre-tenured) female faculty members reported overall higher values for teaching (Stupnisky et al., 2016).

Regarding the *value for teaching compared to research*, there are a few studies that report in part contradictory results: Thies and Kordts-Freudinger (2019b) investigated university instructors’ discrete emotions and appraisal antecedents several times a day in a sample of 50 academic staff members in Germany to analyze the state-related emotion-appraisal associations throughout the workday. Their results show that enjoyment, pride, and relief were experienced with a higher intensity in the domain of teaching as compared to the domain of research. More specifically, teaching-related activities such as preparing or holding lectures seem to provoke stronger positive emotions as compared to research-related activities (e.g., the implementation and analyzing of research content). Stupnisky et al. (2019) tested a model of university instructors’ discrete emotions for perceived teaching and research success using a single-measurement, retrospective questionnaire. It was shown that the sample of 312 assistant professors on the tenure track in the U.S. and Canada reported overall high levels of enjoyment, moderate levels of anxiety, and low levels of boredom in teaching and research. Furthermore, value appraisals of teaching and research were positively associated with enjoyment and negatively associated with anxiety and boredom. Differing from the results obtained by Thies and Kordts-Freudinger (2019a), HE teachers in this study reported significantly more enjoyment in research than in teaching. However, they experienced less success in research as compared to teaching, which could also explain why faculty reported slightly more anxiety in research. Nevertheless, HE teachers in this study attributed more value to research than to teaching (Stupnisky et al., 2019). Furthermore, the results of a study by Postareff and Lindblom-Ylänne (2011) showed that their sample of Finnish HE teachers typically enjoyed teaching more than marking exams, theses, or doing preparation or post-processing work for their courses (Postareff and Lindblom-Ylänne, 2011). HE teachers in this study disliked lecturing as a particular teaching form most of all, but some teachers also disliked group methods that were activating in nature.

Teachers who express a high identification with the *teaching role* and who are highly committed to teaching typically express very positive emotions with regard to teaching, including passion and “love” for teaching itself, as well as for the subject they are teaching (Postareff and Lindblom-Ylänne, 2011; Bennett, 2014; Hagenauer and Volet, 2014a). In contrast, when HE scholars do not identify with the teaching role but view themselves solely as researchers, they typically experience more emotions that are negative or do not feel emotionally involved at all (Postareff and Lindblom-Ylänne, 2011). More specifically, Vannini (2006) found in his qualitative study on the (emotional) experience of authenticity in teaching that moments of authenticity occurred if teachers valued their teaching roles. However, only minority of the professors in the study stated that teaching was important for their identity. Furthermore, he found that mixed emotions regarding

authenticity can occur if professors navigate between their different roles as researcher and teacher. If the professors in the study perceived themselves more as a researcher than a teacher, teaching could feel like a burden, accompanied by frustrated authenticity, boredom, apathy, or even disdain toward students. Regarding the teaching role in online teaching, Badia et al. (2019) associated appropriate emotions in online teaching with teachers’ roles. Their results showed that satisfaction and pleasure are associated with teachers who are concerned with ensuring that learners acquire and retain knowledge. In contrast, when the acquisition of content is paramount to the teaching approach, a significant negative relationship between these two emotions was found. Hence, the understanding of roles is important in that teachers who intend to develop students’ skills and want to support them find online teaching satisfactory and enjoyable. In contrast, teachers who are instead focused on content and technology aspects are more likely to feel fear and stress.

4.2.2. Environmental factors

The following two sections refer to environmental factors as antecedents of emotions, namely classroom factors. First, study results that we have assigned to classroom factors on the structural level are presented (see Section 4.2.2.1). This is followed by results on classroom factors on the student and interpersonal level (see Section 4.2.2.2).

4.2.2.1. Classroom factors on the structural level

Most important classroom factors considered from a structural perspective cover the aspects of course formats and settings including novel technology-based formats. Regarding the influence of the *course format* on HE teachers’ emotions, Löfström and Nevgi (2014) made use of a creative approach in their study. They explored drawings by HE teachers in order to obtain an understanding of their emotions in teaching. Most of the drawings depicted positive emotions ($n = 40$), followed by neutral drawings ($n = 30$), drawings of mixed emotions ($n = 12$), and drawings of negative emotions ($n = 4$). The results showed that emotions in teaching are contextual. While positive emotions (e.g., enjoyment, contemplation, and curiosity) are mostly experienced in small group settings with engaged students and a learner-focused teaching approach, negative emotions (e.g., isolation, anxiety, and discontentment) are more likely to be experienced in lectures with a more content-focused approach due to students’ lack of engagement or interest.

The *course setting*, i.e., teaching with new technology, was found to cause mixed emotions, with negative emotions dominating (Regan et al., 2012; Bennett, 2014). In her study on the effect of change processes on HE teachers’ emotions, Bennett (2014) found an increased fear of exposure (e.g., not knowing the correct answers to students’ online questions), negative emotions due to dependence on technical systems, and fear of humiliation and ridicule (e.g., being laughed at). Potential failure to meet the institution’s standards, as evidenced by negative reactions from colleagues, caused an emotional burden on those who applied technology-based teaching methods. Such a change in teaching practice may also require teachers to overcome potentially contrary institutional-cultural norms. The negative emotions found in a

study by Regan et al. (2012) on distance learning included that some lecturers felt restricted because everything that they said was recorded, which was perceived as “unnerving” (p. 208); others felt isolated, supporting the importance of social interaction for HE teaching. There were also reported feelings of helplessness or insecurity when lecturers sought to adapt to the role of a “conveyor of information” (p. 210) in the distance-learning setting.

Almost all lecturers in a study on HE teachers’ role changes due to the use of an asynchronous web-based learning platform reported that teaching online requires more time and effort, which in turn leads to dissatisfaction or frustration (Coppola et al., 2002). However, the fact that online teaching was experienced as challenging was by no means perceived only in a negative sense. It was precisely this circumstance that stimulated enthusiasm and fascination and challenged creativity (Coppola et al., 2002). Furthermore, teaching with new technology was experienced as convenient and efficient (Coppola et al., 2002; Wang, 2014), e.g., because questions did not have to be answered multiple times (Coppola et al., 2002). Wang (2014) found that HE teachers are generally satisfied when using ICT because they perceive students as more motivated and concentrated as well as being better in interactions and more willing to give answers.

4.2.2.2. Classroom factors on the student and interpersonal level

Students’ behavior can have an important impact on HE teachers’ emotions. In total, eight of the studies included in this review provide insights into this antecedent of emotions. Disruptive behavior in the classroom and students being late or absent were reported as sources of anger by Japanese HE teachers (Cowie, 2011). In particular, students blaming the teacher in an aggressive way (e.g., for their grading) causes negative feelings in HE teachers and is perceived as a professional identity threat (Lahtinen, 2008). Hagenauer and Volet (2014a) found that limited student engagement (e.g., lack of interest), as well as over-engagement (e.g., being too dominant, not willing to discuss fixed opinions in a constructive manner), can be a source of negative emotions, mainly annoyance. Similarly, Gates (2000) found that HE teachers felt irritated or angry if students behaved in a disruptive manner (e.g., arriving to class late or leaving early without notification, talking to other students instead of listening, and complaining about grades or assignments).

On the other side, students making progress or seeing students succeed was reported as a source of pleasure (Hagenauer and Volet, 2014a), joy (Myrsky et al., 2020), satisfaction, and pride (Vannini, 2006). Overall, students and their classroom behavior can challenge a teacher’s feeling of passion for teaching. This is reflected in the fact that teachers’ joy/passion for teaching varies across different classrooms of students (Hagenauer and Volet, 2014a).

A specific emotional challenge for HE teachers arises from interactions with students who are in personal crisis (Quinlan, 2019) or who exhibit mental health issues, as shown in the study by Storrie et al. (2012) on teachers mentoring a clinical practicum. Dealing with such students can evoke feelings of helplessness and powerlessness, but also fear-related feelings (e.g., due to offensive behavior).

Lahtinen (2008) argues that unrealistic expectations in *teacher–student interaction* can lead to negative feelings. More generally, she

notes that the management of relationships between the teacher and students but also among students triggers many emotions in HE teachers (see also Cowie, 2011). In a similar vein, Hagenauer and Volet (2014a) determined that negative emotions arise when expectations with regard to positive teacher–student interactions (e.g., student engagement in class) are not fulfilled (see also Mendzheritskaya et al., 2018) or if students cross boundaries of the teacher–student relationship (e.g., phoning HE teachers during the weekend). Positive emotions of delight or pleasure result if expectations are fulfilled (e.g., motivated students who contribute constructively in class). Harlow (2003) showed that the quality of the teacher–student interaction and ultimately also teachers’ emotions differed based on U.S. HE teachers’ race, and the interaction between race and gender. HE teachers with an African American background teaching at an American university with a 90% white student population reported greater frustration but also anxiety because they perceived that their intellectual authority (competence and qualification) was more frequently challenged by student behavior (referred to as the “racial double standard”).

Both *receiving feedback from students* and *delivering feedback to students* can be regarded as an emotional issue in the teacher–student interaction. Delivering feedback to students can cause negative feedback for HE teachers if they fear that their pedagogical expertise might be questioned; such an experience can be regarded as a threat to a teacher’s identity (e.g., Lahtinen, 2008). Furthermore, grading was experienced less joyful compared to giving formative feedback (Myrsky et al., 2020). Boredom was triggered by monotonous assessment methods, whereas joy was experienced if novel summative assessment methods (e.g., learning diaries) were implemented and if students or colleagues supported the assessment practice. Relief was experienced when working together with colleagues, as it enhanced constructive alignment and justice (Myrsky et al., 2020).

Higher education teachers reported receiving direct positive feedback from students as a source of positive emotions (Hagenauer and Volet, 2014a). Furthermore, Lutovac et al. (2017) provided evidence of the relevance of student feedback for HE teachers’ emotions and their professional development. Positive student feedback was experienced as encouraging, whereas negative feedback was typically perceived as emotionally daunting. Similarly, in an experimental set-up with German HE teachers, Nowakowski and Hannover (2015) determined that qualitative feedback in student evaluations had a stronger influence on emotions than the quantitative data; this was especially true when the students’ remarks were negative. Using a vignette approach, Kowai-Bell et al. (2012) found correlations between anonymous ratings on the “Rate My Professors” platform and U.S. professors’ (anticipated) emotions, with positive ratings leading to a positive mood and negative ratings, respectively, to a negative mood.

4.2.3. Context factors

As mentioned above, we identified broader context factors on the macro level in the included studies. These factors are related to cognitive appraisals but are also linked to the experiencing of emotions and their consequences (e.g., the expression of emotions). For this reason, the contextual factors are listed as antecedents of

emotions but are separated from the environmental factors within the proposed conceptual framework.

Hagenauer et al. (2016) found cultural differences in understanding which HE teachers' emotions are appropriate to express while communicating with students. Especially, the role of cultural-pedagogical context is evident regarding the display of negative emotions (Mendzheritskaya et al., 2018). Furthermore, it was found that the perception of the characteristics of quality teacher–student relationships is likely to vary across cultural-educational contexts, depending on underlying institutional and cultural norms, values, and practices (Hagenauer et al., 2016).

The *institutional context* played a role in the following four studies: Cowie (2011) found that negative emotions were evoked if HE teachers perceived a strong hierarchy or a lack of trust in their institution. In contrast, positive emotions were evoked if the HE teachers had the impression of improvement taking place within the institution. In an interview study by Ramezanzadeh et al. (2016), 20 Iranian adjunct teachers reported on their emotional lives in connection to their perceived authenticity in teaching. In particular, anger was related to attempts to challenge the expectations of the educational system, low salaries, and the inadequate quality of teaching due to existing policies. Quinlan (2019) used poems in order to gain access to teachers' emotions in teaching. She found that emotions can be triggered by institutional rules that should be followed (e.g., no food allowed in the classroom) as well as by self-disclosure (how much of myself should I reveal?). Furthermore, negative emotions might be triggered if the purity of the research subject is violated (e.g., due to the demand of giving “sexy presentations,” p. 1670). Bahia et al. (2017) demonstrated for a sample of Portuguese HE teachers that the Bologna process, i.e., higher education reforms in Europe, triggered ambivalent emotions in HE teachers, but with negative emotions dominating. Many of the interviewed HE teachers described the Bologna process as a threat to their professional identity. Specifically, they experienced their professional autonomy as being threatened, which ultimately caused a decrease in teaching enthusiasm and an increase in sadness, in part because the extended teaching load resulted in less time for individual students. In addition, the HE teachers reported concern and dissatisfaction due to publication pressure, which was experienced as a limitation on their academic freedom. Other emotions that were mentioned were fear and anger. Both dissatisfaction and pressure were experienced as a result of the increasing impact of evaluations, particularly student evaluations.

Higher education teachers interact not only with students but also with their colleagues. This *collegial surrounding* also forms a part of the context. Cowie (2011) study on Japanese HE teachers revealed that interactions with colleagues were often a source of positive emotions, but in case of differences in educational values, could also engender negative emotions. Stupnisky et al. (2016), too, confirmed the relevance of perceived collegiality in the department for HE teachers' emotions in teaching: HE teachers experienced more positive emotions in teaching when collegiality was perceived as better, and when the teachers exhibited personal balance between work and leisure. Moreover, the results of a more recent study by Stupnisky et al. (2019) showed that perceived collegiality predicted value, which in turn

negatively predicted teaching anxiety and positively predicted teaching enjoyment.

4.3. RQ 3: What kinds of consequences were reported as being linked to the experienced teaching-related emotions in HE teachers, and how can the revealed consequences be classified?

Adopting the well-known proposition of the CVTAE that “achievement emotions affect the cognitive, motivational, and regulatory processes mediating learning and achievement[...]” (Pekrun, 2006, p. 326) for the context of HE teaching, we consider HE teachers' emotional experiences as associated with cognitive, motivational, and regulatory processes linked to teaching practices. CVTAE refers to the so-called consequences of experiencing achievement emotions, stressing the causality and the impact of experienced emotions on individual's cognitive, motivational, and behavioral changes. At the same time, due to the correlative designs applied predominantly in the reviewed studies, it is not possible in each case to infer causal relationships between the analyzed variables from the perspective of the inferential statistics. Therefore, we followed the considerations of the authors regarding the possible effect directions as well as the propositions of the CVTAE concerning the consequences of experienced emotion while summarizing and grouping the research results within our framework into aspects relating to attitudinal changes (Section 4.3.1), motivational changes (Section 4.3.2), changes in cognitive-affective regulation processes (Section 4.3.3), and changes in behavioral regulation processes (Section 4.3.4).

4.3.1. Attitudinal changes

The analysis of the included studies revealed that attitudinal changes as a consequence of HE teachers' teaching-related emotions mainly refer to HE teachers' teaching roles and approaches.

Although research has shown that teaching approaches are significant for teaching behavior and student learning, little is known about the link between HE teachers' emotions and teaching approaches or between HE teachers' emotions and emotion regulation (Kordts-Freudinger, 2017). The few available studies have consistently found a positive correlation between HE teachers' positive emotions or affect and a student-centered approach to teaching, which also includes the establishment of a positive climate in the classroom (Postareff and Lindblom-Ylänne, 2011; Trigwell, 2012; Badia Gargante et al., 2014; Meanwell and Kleiner, 2014; Kordts-Freudinger, 2017; Kordts-Freudinger and Thies, 2018).

The pattern of the interrelationship between HE teachers' negative emotions and their teaching approaches is less clear. Generally speaking, no correlation between negative emotions or affect and a teaching-centered approach has been found (e.g., Trigwell, 2012; Badia Gargante et al., 2014; Kordts-Freudinger, 2017). However, with regard to distinct negative emotions, Kordts-Freudinger (2017) detected a positive correlation between anger and boredom and a teacher-centered teaching approach, whereas

Trigwell (2012) revealed a positive association between anxiety and embarrassment and this orientation. Additionally, teachers employing a more teacher-centered approach to teaching exhibited lower levels of pride. The missing overall interrelation between negative emotions and a teacher-centered teaching approach might be traced back to the varying functions of negative emotions in terms of activation or deactivation. Furthermore, the beliefs of teachers regarding professional behavior likely interfere with the direct link between negative emotions and classroom behavior, indicating emotional management. Zhang et al. (2019) found that HE teachers' emotions in teaching, assessed by the *Emotions in Teaching Inventory* (Trigwell, 2012), can directly predict HE teachers' teaching styles. They focused on two so-called "Type-I-teaching styles," including a legislative and a liberal style, and two "Type-II-teaching styles," including an executive and a conservative one (see Appendix 1 of the study by Zhang et al., 2019 for key characteristics of the teaching styles). More precisely, the results showed that HE teachers scoring higher on positive emotions tended to use Type I and Type II teaching styles with Type I styles prevailing, whereas HE teachers scoring higher on negative emotions used more Type II teaching styles. They further found that HE teachers' teaching-related emotions indirectly influence their teaching styles through the mediating role of academics' self-efficacy in teaching and research.

The reconsideration of a teacher's role can be a response to their experiencing negative feelings while teaching. Lahtinen (2008) stressed that more intensive reflection on whether the role of the learning facilitator or the role of the learning evaluator is dominant in a teacher's behavior is evoked by unpleasant emotional experiences.

4.3.2. Motivational changes

We found in our analysis that motivational changes as consequences of emotions have only been examined in a few studies, predominantly focusing on the effects of students' feedback or rethinking teachers' roles. The results of the existing research on this matter include the investigation of approach tendencies and readiness to change or improve one's own teaching practice as a consequence of the experienced emotions. Nowakowski and Hannover (2015) showed in a German sample of HE teachers that positive feedback from students' course evaluations was positively connected with an emotional experience of positive valence and negatively linked to the motivation to improve one's future teaching.

Furthermore, if receiving positive student feedback was important to HE teachers, i.e., the value of feedback was high, it influenced the improvement of their teaching (Flodén, 2017). The results of Flodén's study also indicated that HE teachers who reported positive feelings toward receiving student feedback used the feedback more to improve their teaching, as compared to teachers with more negative feelings associated with student feedback. Instead, the latter group rather introduced unnecessary elements in their teaching in order to avoid negative feedback by pleasing students. Next, emotions of anxiety and discomfort experienced while adopting new teaching practices and teaching roles are connected to conceptual change in

lecturers' mindsets, including rethinking not only their own but also the students' roles in the teaching-learning process and reflecting on the nature of knowledge and knowledge construction in the subject/discipline (Postareff and Lindblom-Ylänne, 2011).

4.3.3. Cognitive-affective changes

The use of response-focused *emotion regulation strategies*, such as sharing negative emotions with friends or colleagues after negative emotional experiences, was reported by HE teachers in interviews (Hagenauer and Volet, 2014a). Other response-focused regulation strategies reported as reactions to negative emotions experienced were rationalization or acceptance of the situation by the adaptation of expectations (Hagenauer and Volet, 2014a).

Further strategies for dealing with emotions in teaching were observed by Gates (2000), including HE teachers' hiding their emotions or using cognitive strategies such as redefining a situation by holding particular definitions of students or responding selectively to stimuli (e.g., by remembering positive interactions). Another way for HE teachers to prevent the emergence of negative emotions caused by unfavorable student feedback and evaluations is by *distancing themselves* from these emotions (Hagenauer and Volet, 2014a). Distancing oneself from student evaluation seems to become easier as the teaching experience increases, as demonstrated by Kowai-Bell et al. (2012). This phenomenon is reflected in the words of an experienced professor: "After 30 years and tons of reviews, anonymous comments (are) not a big deal" (p. 347).

Some studies highlighted that HE teachers became aware that dealing with emotions associated with student feedback required professional support. Lutovac et al. (2017) showed, for instance, that distancing oneself from students' feedback and reflecting on it more rationally can be learned through pedagogical training and social exchange. The authors note that lecturers are frequently isolated within their departments, amplifying the need for out-of-department pedagogical training opportunities for HE teachers, especially for those at the beginning of their teaching careers (see also Meanwell and Kleiner, 2014).

Few authors considered further factors influencing emotion regulation after experiencing challenging emotions in HE teachers. For example, Bennett (2014) derived from the results of her study that more intensive emotional work is required when difficulties occur external to HE teachers' control as compared to difficulties internal to one's control. Kordts-Freudinger (2017) and Kordts-Freudinger and Thies (2018) found a positive correlation between adaptive emotion regulation (high cognitive reappraisal and low expressive suppression) and a student-centered teaching approach, which is linked to the experience of positive emotions. In comparison, HE teachers with a more teacher-centered approach reported a higher level of emotion suppression.

4.3.4. Behavioral changes

We categorized behavioral changes due to experienced emotions into *display rules* and *adopting new behavior*.

4.3.4.1. Display of emotions

In general, the display of positive emotions as a consequence of experiencing positive emotions occurs often (Hagenauer and Volet, 2014a; Hagenauer et al., 2016; Mendzheritskaya et al., 2018). How teachers communicate their emotions in the classroom can be regarded as a part of their professionalism, as the appropriate communication of emotions fulfills relevant pedagogical functions, including its importance in the shaping of the teacher–student relationships (Hagenauer and Volet, 2014b). Gates (2000) argues that HE teachers also manage their emotions “to model for students particular affective norms” (p. 502) and to use the expression of emotions for socializing students into the preferred role as “questioning, reflective, and responsible learner” (p. 502).

Kordts-Freudinger and Thies (2018) revealed an interrelation between the emotional display and domination teaching approaches. The findings demonstrated a positive link between a student-centered teaching approach and both the controlled display of positive and negative emotions and an uncontrolled display of positive emotions (Kordts-Freudinger and Thies, 2018).

Ramezanzadeh et al. (2016) identified the physical display of emotions as one strategy for dealing with ambivalent emotions. However, other studies found that HE teachers tend to suppress negative emotions due to the belief that the open expression of negative emotions is unprofessional and would interfere with communication and learning (Hagenauer and Volet, 2014a; Hagenauer et al., 2016; Mendzheritskaya et al., 2018). Cultural differences regarding the display rules of HE teachers were examined in a few studies (e.g., Hagenauer and Volet, 2014b; Mendzheritskaya et al., 2018), indicating, e.g., that lecturers in Germany expressed their anger more openly in class compared to their Australian counterparts (Hagenauer and Volet, 2014b), and that Russian lecturers claimed to express their emotions more genuinely than German instructors did (Menzheritskaya et al., 2018). In addition to cultural differences, there seem to be differences in displaying emotions by the status of faculty members. More specifically, Tunguz (2016) reported that untenured, “low-power” American male faculty reported putting more effort into displaying authoritative emotions (such as anger) when experiencing classroom incivility (e.g., chatting and using mobile phones) in comparison to male faculty who were tenured. Interestingly, this difference was not observed for female faculty. The author traces this finding back to the buffering role of job autonomy in the experience of emotional labor: the traditional gender role (whereby female lecturers are not expected to express authoritative emotions) seemed to impede this effect for female tenured faculty.

4.3.4.2. Adopting new behavior

Coppola et al. (2002) shifted the perspective from the consequences of experiencing emotions to the consequences of expressing emotions. The authors pointed out that the energy and humor that instructors normally experience in the classroom are difficult to convey in asynchronous learning. One consequence of teaching in asynchronous learning networks is that instructors need different tools to express emotions. From the results, it was concluded that online learning environments require better instructional skills, including communication, organization, and motivation (Coppola et al., 2002). Regan et al. (2012), in their study

on distance learning, reported that HE teachers experiencing mixed emotions in digital environments use typical problem-oriented coping strategies such as participating in technological training, offering synchronous office hours, or phoning students to deal with their negative emotions.

Ramezanzadeh et al. (2016) found that, in order to deal with ambivalent emotions, faculty members sought dialogue with learners, colleagues, and administrators, and they held internal discourse. In Harlow’s study (2003), female professors of color reported investing extensive energy in emotion management, reflecting the merging of two factors: blackness and femaleness. To cope with the fear of making a mistake in front of students, they used coping strategies—among others, overly preparing their lessons (“perfectionism”) and teaching more authoritatively (Harlow, 2003).

5. Discussion and conclusion

We conducted the presented systematic literature review to develop a conceptual framework by expanding and revising CVTAE (Pekrun, 2006) for studying teaching-related emotions of HE teachers based on the existing empirical literature. By applying for a systematic literature review, 37 studies were found. First, we analyzed what theoretical concepts and approaches were used in the identified studies for examining HE teachers’ teaching-related emotions to gain insight into the approaches used and to explore how widely CVTAE (Pekrun, 2006) was used in this research field (RQ 1). We found that the majority of the included studies (27 out of 37 included studies) made use of one or more theoretical approaches when examining HE teachers’ emotions. These results are in line with observations made by Pekrun (2019) that there has been a shift from undertheorized research (see also Quinlan, 2016) toward research that is mostly theory-based. We support Pekrun’s (2019) view that this is important for generating a more consistent body of research findings and interpretations. Furthermore, the results demonstrated that 10 out of 37 included studies used CVTAE (Pekrun, 2006) as the theoretical model for investigating the emotions of HE teachers. This represents the highest number of studies applying one specific theory.

Therefore, the components of CVTAE were revised and extended for a new conceptual framework for examining antecedents (RQ 2) and consequences (RQ 3) of HE teachers’ teaching-related emotions (see Figure 2). Specifically, additional groups of factors at the micro-, meso-, and macro-levels (for an overview, see Fend, 2008) were integrated into the “antecedents”-component, and differentiated groups of consequences were identified within the “consequences”-component, separated into attitudinal, motivational, affective-cognitive, and behavioral aspects.

Thus, we deduced that environmental factors are antecedents of HE teachers’ teaching-related emotions on different levels. We grouped antecedents of emotions into environmental factors on the micro level, i.e., classroom factors on the student and interpersonal level (e.g., students’ characteristics and behavior, quality of teacher–student interaction/relationship, quality of feedback to and from students), and on the meso level, i.e., classroom factors on the structural level, including, e.g., the course format (e.g., lecture,

seminar) and the setting (e.g., distant teaching / online teaching). Furthermore, the above-mentioned environmental aspects were often analyzed in relation to individual factors of HE teachers on the micro level, such as their demographic variables (e.g., gender, teaching experience). Next, we found that identified factors not only to be related to cognitive appraisals as antecedents of emotions but also to directly influence (to some extent) the experiencing of emotions and their consequences (e.g., the expression of emotions). Additionally, we found broader context factors on the macro level as an antecedent of emotions, i.e., the cultural-educational context (e.g., different cultures), the institutional context (e.g., Bologna process, institutional rules), and the collegial surrounding (e.g., interaction with colleagues). Regarding consequences of experienced emotions in HE teachers, we defined four groups of factors reflecting attitudinal changes relating to teaching roles and approaches, motivational changes linked to readiness to change own teaching practices, cognitive-affective changes associated with emotion regulation, and behavioral changes including the emotional display and adopting new behavior.

Examining the included studies of the systematic review, it can be seen that some areas of the framework have been more addressed in existing studies than others. Much of the reviewed studies cover individual factors and classroom factors on the student and interpersonal levels as well as cognitive-affective changes and behavioral changes in emotions. However, research gaps exist in the area of classroom factors on the structural level, more precisely on course formats. There is also little research on motivational and attitudinal changes due to emotions, which should be addressed more in future studies.

Furthermore, due to the complexity and context specificity of the phenomenon of HE teachers' emotions and emotion regulation, an adequate research methodology is required. Most of the reviewed studies applied a cross-sectional design (generally relying on non-representative samples) and have used either interviews (in various forms) or questionnaires as data collection methods to assess emotions retrospectively. Only Thies and Kordts-Freudinger (2019a,b) assessed in two studies emotions at the moment they occurred and conducted intra-individual analysis. Overall, qualitative studies were more common than quantitative ones (see Table 1). Future research is needed that goes beyond these qualitative and correlational research designs. We would also like to suggest that researchers take advantage of the complementary nature of qualitative and quantitative research on HE teachers' emotions and their regulation by applying mixed-methods designs, including experimental, longitudinal, and within-person research, as suggested as well by Pekrun (2019). This could contribute to gaining a deeper understanding of underlying temporal and causal relations when studying HE teachers' emotions.

In addition, the multi-component nature of emotions permits the use of assessment methods that capture other components, such as physiological, expressive, or motivational aspects of emotion. To the best of our knowledge, no study on HE teaching has yet directly assessed such components. We recommend their inclusion in addition to the methods already employed, to validate past results and to integrate the multi-component perspective upon which current theorizing on emotions is built.

Overcoming the aforementioned methodological issues can provide researchers in the field of HE teachers' emotions with research designs allowing for a more profound examination of causal associations between the different components of the proposed conceptual framework. For instance, the predominantly correlative investigated links between experienced emotions and motivational, cognitive-affective, or behavioral changes in HE teachers could be tested with other research designs including other research and statistical methods.

Future research could also be complemented by social-psychological approaches to emotions (Manstead and Fischer, 2001). They do not only highlight the core role of relationships in emotional interactions (Boiger and Mesquita, 2012), but also suggest an additional appraisal category—namely “social appraisal,” reflecting the fact that “behaviors, thoughts, or feelings of one or more other persons in the emotional situation are appraised in addition to the appraisal of the event *per se*” (Manstead and Fischer, 2001, p. 222).

Furthermore, it would be beneficial to examine the interplay of various antecedent factors identified for the proposed conceptual framework while studying HE teachers' emotions. For instance, when research on HE teachers' emotions and emotion regulation is conducted, the complexity and context specificity of the HE field must be thoroughly considered. Considering the interrelations between cultural factors and pedagogical practices (Volet, 2001) represents a promising approach for investigating the influence of *cultural context* on the affective phenomena of HE teachers. Following this approach, we have argued that what is perceived as an “appropriate” teaching practice in HE (including appropriate emotion display) varies across cultural-educational contexts. Thus, the possibility of generalizing results to other cultural-educational contexts (e.g., disciplines, institutions, and countries) is limited; if attempted, it must be approached with caution and restraint.

The classification of antecedents into micro-, meso-, and macro-levels demonstrated the complementarity of some factors such as classroom factors. Accordingly, we suggest including both the individual perspective focusing on relationships and interaction between teachers and students and the institutional perspective relating to teaching and organizational culture while investigating the role of the classroom factors in the emotional experience of HE teachers. As mentioned above, it should also be kept in mind that academics must negotiate the demands of multiple roles simultaneously (e.g., Lai et al., 2014; Thies and Kordts-Freudinger, 2019a), which might be especially emotionally challenging owing to the potential tensions arising between the different roles (e.g., Avargues Navarro et al., 2010). It should also be noted that due to educational reforms in Europe, i.e., the Bologna process, there is considerable publication pressure and an extended teaching load (Bahia et al., 2017). This is likely to cause various negative emotional side effects and tensions, especially for those who have a strong teaching orientation but are compelled to enhance their personal research qualifications and output as well (e.g., Wilson and Holligan, 2013). This potential conflict provides a battleground for competing emotions. Thus, future research has to take into account the complexity of the institutional field in which HE teachers are placed, with its multiple demands that ultimately could also affect

teaching-related emotions (e.g., addressed in the study by [Bahia et al., 2017](#)).

As far as the complexity of HE is concerned, not only the Bologna process and other effects of neoliberal policies but also the COVID-19 pandemic have led to sudden changes in the teaching practices of HE teachers. This review has only considered publications until May 2020 and also includes studies that investigated HE teachers' emotions in the context of online teaching/teaching with technology; however, recent research has shown that emergency remote teaching has been experienced as highly emotional by HE teachers ([Okoye et al., 2021](#)) and has increased the speed with which digital media and forms of online teaching have been integrated into university teaching in general. This rapid change raises concerns but also hopes in HE teachers ([Eringsfeld, 2021](#)) and needs further exploration. Considering that only a few studies are addressing the role of teaching format in HE teachers' affective experiences, future studies must take the impact of new technologies and subsequent changes in the HE teaching and learning environment into account.

Based on the results obtained, we would also like to point out some implications for teaching praxis and programs for teaching support. Accordingly, findings connected to different components of the proposed framework (e.g., display rules as a behavioral consequence) should be considered and included when designing professional development programs for HE teachers. This is also important because, e.g., the way HE teachers display their emotions can have an impact on students' learning ([Mendzheritskaya and Hansen, 2019](#)). Furthermore, opportunities for social reflection should be created, as sharing and discussing one's teaching-related experiences and emotions can support teachers' development ([Pekkarinen et al., 2023](#)). Professional development programs could also contribute to higher levels of perceived control when HE teachers are faced, e.g., with new situations in teaching (especially for HE teachers with little teaching experience), which could in turn lead to the experiencing of more positive teaching-related emotions.

However, this literature review has some limitations. Our database search failed to find articles that experts in this research field recommended for further analysis. Possible explanations could be that we used general search terms such as emotions and affect and did not include specific types of emotions, such as anxiety or physiological reactions such as arousal, and that we only searched four databases. In order to avoid missing relevant articles, the search scope should be expanded in future literature searches. Furthermore, it must be taken into account that we categorized consequences of emotions (e.g., motivational changes due to emotions) based on study results originating from correlational designs that do not allow causal conclusions from the statistical point of view. As noted above, the increased use of mixed-method designs would be fruitful in allowing causal interpretations.

To sum up, CVTAE ([Pekrun, 2006](#)) seems to provide a fruitful theoretical foundation to explain not only students' achievement

emotions but also teachers' emotions, as teaching in HE can also be regarded as an achievement-related situation. We expanded and revised it for the context of HE teachers. Thereby, we identified additional groups of antecedents that go beyond the environmental factors, i.e., individual factors of HE teachers on the micro level and broader context factors on the macro level, e.g., institutional context factors. Thus, the proposed framework takes specifics of HE teachers (such as the different roles as teachers and researchers) into account that were not addressed in the CVTAE ([Pekrun, 2006](#)). We suggest that the proposed CTVAE-based conceptual framework (see [Figure 2](#)) could be a productive avenue when examining HE teachers' emotions with new theoretical, methodological, and practical perspectives. With its theoretical and empirical foundation, it could aid in building a starting point for research attempts in this field and could help to close existing research gaps.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

NM reviewed the literature and extracted the data. NM and JM decided on the inclusion of articles and took the lead in writing the manuscript. MH, GH, MS, and KT wrote sections of the manuscript. GH, MH, RK, MS, and KT provided critical feedback and contributed to the discussion. All authors contributed to the conception of the literature review. All authors approved the final version of the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Daily automated feedback enhances self-regulated learning: a longitudinal randomized field experiment

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The goal of the present study was to investigate the effects of automatically generated, adaptive feedback on daily self-regulated learning (SRL) in an experimental field study. University students reported their application of SRL strategies in the morning and in the evening over the course of 36 days using electronic learning diaries. Students were randomly assigned to the experimental group with feedback (LDF, $n=98$) or the control group without feedback (LD, $n=96$). Based on their self-reports, students in group LDF received daily written feedback regarding their satisfaction with the study day, adherence to time schedule, procrastination, and effort. This feedback either reinforced students in their study approach (confirmative feedback), encompassed information on learning outcomes or processes (informative feedback), or included feed forward on how to improve learning processes (transformative feedback). Multilevel analysis of daily process data revealed better average goal setting, planning and adherence to time schedule, as well as higher self-efficacy, and satisfaction with the study day in group LDF compared to group LD. Motivation, procrastination and effort were not affected by feedback. In contrast to the process measures, pre-post comparisons of students' self-reported general use of SRL strategies (trait measures) did not reveal any effects of feedback on SRL. Further explorative analyses investigated the effects of confirmative, informative, and transformative feedback on next day's learning behavior, showing that confirmative and transformative feedback had stronger effects on students' satisfaction and procrastination than informative feedback. Transformative feedback, which included specific strategies for moving forward, was effective in improving time management. Results provide theoretical insight into the interplay of feedback and SRL and offer practical implications regarding the design of feedback in a learning context.

KEYWORDS

self-regulated learning, individual feedback, learning diaries, ambulatory assessment, multilevel analysis

1. Introduction

Self-regulated learning (SRL) describes the activities that a student performs in order to plan, monitor and regulate cognition, motivation, and behavior to achieve self-set goals (Zimmerman, 2002). SRL is a key competence associated with study success at all educational levels (Dent and Koenka, 2016; Theobald, 2021) and it lays the foundation for lifelong learning

(Richardson et al., 2012; Schneider and Preckel, 2017). Since SRL is an iterative, cyclical process, learning activities such as study sessions are interconnected via internal feedback loops: The outcome of one learning activity (e.g., satisfaction) impacts the following learning activity (e.g., increased motivation) (Butler and Winne, 1995; Thurlings et al., 2013). External feedback that provides learners with evaluative information about their progress can enhance SRL by supporting monitoring and reflection (Butler and Winne, 1995). Hence, feedback constitutes a powerful, corrective tool to foster learning outcomes (Hattie and Timperley, 2007; Wisniewski et al., 2020).

Technological advancements allow for feedback to be generated automatically (Cavalcanti et al., 2021), thus providing an opportunity for cost-efficient large-scale interventions in educational settings. However, despite long research traditions for SRL and feedback (Butler and Winne, 1995; Nicol and Macfarlane-Dick, 2006; Panadero et al., 2018), this possibility is not investigated intensively in empirical research thus far—particularly not in the context of daily feedback through learning diaries.

We want to bridge this gap by analyzing the effect of individual feedback on SRL using a randomized control trial in a field study with fine-grained daily process measures of SRL. From a theoretical point of view, this study provides deeper insights into how – and more specifically which type of – feedback affects the SRL process. Further, results can inform practitioners on the linkage of two important areas of learning and instruction in order to support SRL among learners.

1.1. Literature review

1.1.1. Self-regulated learning as a recurring process

SRL constitutes a multidimensional construct that encompasses cognitive, metacognitive and volitional strategies that students apply in order to attain self-set goals (Boekaerts, 1999). According to the process model of SRL (Zimmerman, 2002), each study session is divided into three phases: a forethought phase, a performance phase, and a self-reflection phase. An adapted version of Zimmerman's process model builds the theoretical foundation of the current study, in which we focus on the variables presented in Figure 1.

In the forethought phase, learners set goals and make plans about how to proceed, whereby motivational states such as self-efficacy and intrinsic motivation affect how students approach their learning. Self-efficacy refers to learners' judgments of their capabilities to organize courses of action to attain their study-related goals (Bandura, 1986). Research has repeatedly shown that self-efficacy is correlated with academic performance (Honicke and Broadbent, 2016). Intrinsic motivation "...refers to doing something because it is inherently interesting or enjoyable" (Ryan and Deci, 2000, p. 55) and is closely related to academic performance (Richardson et al., 2012).

During the performance phase, learners may choose cognitive strategies (such as organization or elaboration strategies) that support task execution. Meanwhile, they have to monitor their learning by observing whether they are still on track in order to perform the task (metacognitive strategies). Moreover, the application of volitional, self-control strategies supports the regulation of effort and ensures a continual, active engagement with the learning material. A lack of self-control strategies can result in academic procrastination, which

refers to a "voluntary delay of an intended course of study-related action despite expecting to be worse off for the delay" (Steel and Klingsieck, 2016, p. 37). Procrastination is associated with lower academic performance, but can be reduced through interventions (van Eerde and Klingsieck, 2018).

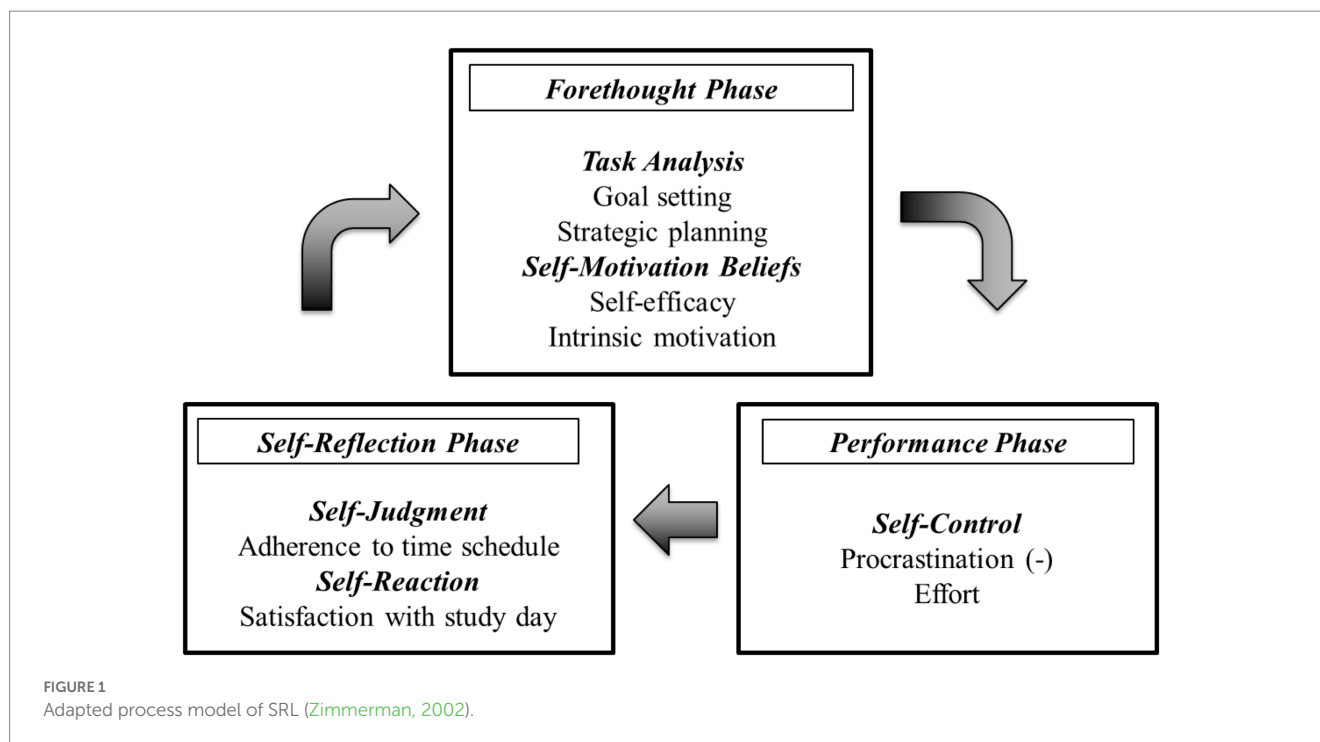
In the self-reflection phase, learners evaluate their learning outcomes, i.e., whether they achieved their self-set goals (Winne and Hadwin, 1998). Thus, SRL is an active and constructive process whereby ongoing comparisons between the current and desired learning outcomes stimulate reflective processes. As SRL is a cyclic process, study sessions are interrelated via internal feedback loops (Thurlings et al., 2013). For instance, based on the learning outcomes, a learner could decide to change goals or learning strategies (Winne and Hadwin, 1998). Consequently, studying on one day depends on the internal feedback derived from the previous day, which in turn is likely to influence the forethought phase of next day's learning process and the decisions that are taken such as goal setting and planning (Butler and Winne, 1995). Ideally, learners use the ongoing internal feedback loops to self-regulate their study activities which, in turn, depends on learners' ability and willingness to monitor their studying (Narciss, 2008).

1.1.2. Measuring and fostering SRL in daily life

Researchers frequently relied on retrospective self-report questionnaires to measure SRL (Roth et al., 2016). Yet, retrospective self-reports lack situation specificity (Winne et al., 2002) and not necessarily reflect a reliable and valid measure of students' actual behavior in a given situation. Further, self-report questionnaires conceptualize SRL as a trait (Panadero et al., 2016b), whereas process models emphasize that SRL should rather be viewed as a state that varies over time depending on the learning context (Zimmerman, 2002). Hence, more fine-grained measures are needed to capture the dynamic adaptations in SRL strategies that occur during the learning process. Think aloud protocols, observations, or log-file analysis constitute valuable alternatives to retrospective questionnaires (Winne and Perry, 2000; Greene et al., 2011). However, these methods are time- and cost-intensive since raw materials need to be coded according to a coding scheme (Veenman, 2011) and therefore cannot be applied on a daily basis over an extended period of time. In contrast, diary methods capture "live as it is lived" (Bolger et al., 2003; Schmitz et al., 2011) and allow investigating individual differences in situative SRL over time.

Learning diaries, also sometimes called reflection protocols, learning-logs, or learning journals, typically contain open questions and closed Likert-type items, which cover the whole self-regulation cycle. Learners self-report their application of SRL strategies before and after a learning session, which complies with the dynamic nature of SRL and reduces the biases of retrospective questionnaires (Bolger et al., 2003; Klug et al., 2011). Variables of the forethought phase are measured before studying, whereas performance and self-reflection variables are assessed after each study session (Klug et al., 2011; Liborius et al., 2019; Bellhäuser et al., 2021). Thereby, learning diaries serve to measure SRL as a state in an ecologically valid setting since learners complete them in their natural learning environment (Schmitz and Wiese, 2006). Further, learning diaries can be used economically when the analyses focus on close-ended items that do not require extensive coding procedures.

However, measuring SRL with learning diaries is linked inseparably to reactivity effects: By prompting students to self-monitor



their learning behavior, reflection processes are triggered that can lead to increased SRL behavior (Panadero et al., 2016b). Further, they can function as study reminders, stimulate reflection and enhance students' awareness on the interrelatedness of different SRL components (Schmitz and Perels, 2011). While learning diaries seem to be a useful tool to foster SRL in school children (Glaser and Brunstein, 2007; Perels et al., 2009), findings on the effectiveness of learning diaries in the university context are inconsistent. Some studies revealed an increase in some SRL facets through diary keeping (Dignath et al., 2015), others did not find any effects on achievement (Bellhäuser et al., 2016), or even a negative effect on students' intrinsic motivation (Dörrenbächer and Perels, 2016). Researchers suggested that learning diaries are only effective when integrated within a comprehensive SRL framework (Zimmerman and Paulsen, 1995) or when combined with a SRL training (Fabriz et al., 2014; Bellhäuser et al., 2016; Dörrenbächer and Perels, 2016). Otherwise, students might become frustrated since they do not know how to change their study behavior and lose their motivation (Panadero et al., 2016b).

External feedback that guides learners towards successful task completion constitutes one possibility to facilitate the transfer from reflection to actual behavioral change (Narciss, 2008; Shute, 2008). Receiving positive feedback on goal achievement should thereby also enhance learners' motivation. For instance, repeated feedback on goal achievement should promote learners' self-efficacy to achieve their goals (Bandura, 1986). In addition, feedback on goal achievement fosters perceived competence, which enhances students' intrinsic motivation (Ryan and Deci, 2000).

However, providing external feedback takes time and effort and is therefore oftentimes not feasible for instructors when confronted with large groups of students. Technological advancements in recent years offer the possibility to generate automatic, adaptive feedback in a cost-efficient way. Yet, to date, research on the effects of automatically generated, adaptive feedback on daily reported SRL is largely missing.

1.1.3. The interplay between SRL and feedback

Narciss (2008, p. 127) defines feedback as "all post-response information that is provided to a learner to inform the learner on his or her actual state of learning or performance." Feedback is derived from internal sources of information (e.g., a learner self-monitors task performance or goal progress) or external sources of information (e.g., teachers, peers, or a computer) in order to reduce the gap between the actual level of performance and the desired goal (Evans, 2013). According to Hattie and Timperley (2007), effective feedback¹ provides information on goals (*feed up*), current performance related to goals (*feed back*), and specific suggestions (*feed forward*) about how to close the gap between current performance and goals (see Shute, 2008, for a review on the design of effective feedback). Further, feedback can address four different levels (Hattie and Timperley, 2007):

First, outcome feedback includes information on task accomplishment, e.g., a student receives the correct solution to a task (Narciss, 2008). Outcome feedback, e.g., knowledge on results, is rather unspecific and provides little guidance on how to self-regulate learning (Butler and Winne, 1995) because it lacks the *feed forward* on how to proceed. Nonetheless, Vollmeyer and Rheinberg (2005) showed that students who expected to receive outcome feedback used better SRL strategies even before the feedback had actually been presented to them. Announcing feedback might cause learners to work more carefully as they expect an evaluation of their outcomes.

Second, process feedback draws the learners' attention towards the relationship between the use of a specific learning strategy and their performance in order to induce deeper learning (Balzer et al., 1989).

¹ Note that Hattie and Timperley (2007) distinguish between feedback (as a general concept) and *feed back* (as a part of effective feedback whereby learners receive information on their current performance related to their goals).

Process feedback typically includes *feed forward*, i.e., it encompasses strategic hints on how to proceed to overcome obstacles and to apply more efficient learning strategies (Shute, 2008). Hence, process feedback can be viewed as part of scaffolded instruction or as tutoring feedback (Nicol and Macfarlane-Dick, 2006; Narciss, 2008; Perry et al., 2008) that facilitates students' monitoring and reflection, and thereby fosters the development of self-regulated learning strategies, which makes the process level a particularly good target for interventions.

Third, learners generate internal self-regulation feedback in addition to the abovementioned external feedback sources. This type of feedback is generated through self-monitoring of task engagement and performance, providing continual internal feedback on motivation, understanding, and goal progress (Butler and Winne, 1995). Internal self-regulation feedback is an important aspect of self-regulated learning, as it allows learners to adjust their learning strategies based on their self-reflection and self-assessment. By consciously engaging in reflective processes and modifying their SRL strategies accordingly, learners have the potential to boost their learning outcomes (Narciss, 2008). In line with this, Panadero et al. (2017) showed positive effects of self-assessment interventions, where students had to monitor and self-evaluate their own work, on self-regulated learning and self-efficacy. Panadero and colleagues describe self-assessment as a core element of self-regulated learning since it supports the generation of internal feedback (Panadero et al., 2016a, 2018, for an overview). Learning diaries, for instance, can serve as instructional tool to facilitate self-assessment and to encourage reflection (Kluger et al., 2011; Panadero et al., 2016b).

Fourth, feedback about the self as a person, e.g., "You are a great student," even shows detrimental effects on students' performance (Kluger and DeNisi, 1996) by drawing students' attention on the self and away from the actual task. Praise at the self level has the potential to boost SRL and performance but only if students change their beliefs about the role of effort for successful learning (Hattie and Timperley, 2007). For instance, praise regarding effort or engagement (e.g., "You are a great student because you really worked hard") can lead to increased self-efficacy for performing well (Schunk, 2012). However, praising effort alone might not suffice to foster SRL, but students need to know how to apply strategies in order to *feed forward*.

1.1.4. Combining learning diaries with feedback to enhance self-regulated learning

Feedback (on all four levels) influences the process of SRL and constitutes a catalyst for change in motivation and behavior. Thus, we assume that combining internal self-regulation feedback and external process feedback should provide an ideal starting point to promote SRL. In the present study, students completed learning diaries that encouraged them to set goals and to reflect on their goal achievement after learning. That is, completing these learning diaries should guide students' generation of internal self-regulation feedback and stimulate reflection (*feed back*) and goal setting (*feed up*). However, learning diaries alone might not be sufficient to increase SRL, since they hardly provide specific guidance on how to change SRL strategies to improve learning (*feed forward*). Hence, additional, external process feedback can facilitate monitoring and interpreting internal feedback by supporting a realistic and correct comparison between desired goals or standards (*feed up*) and the actual outcome (*feed back*). Further, explicit strategy suggestions (*feed forward*)

included in the process feedback can help students to successfully adapt their strategies.

There is meta-analytic evidence that supports the assumption that feedback boosts the effects of learning diaries on achievement and motivation (Dignath et al., 2017): While studies that tested the effectiveness of learning diaries reached only a moderate average effect (Cohen's $d=0.28$), studies that included teacher feedback on learning diary entries yielded high effects ($d=0.83$). However, most of these studies investigated the effect of learning diaries with open-ended items (as opposed to close-ended items), and feedback focused on outcome only. Moreover, none of these studies had used a randomized control trial. Wäschle et al. (2014) also demonstrated the power of individualized feedback on SRL, showing that externally provided visual feedback helped students to improve their time management. However, this study focused on only one aspect of SRL (time management) while neglecting other important aspects, e.g., goal setting, self-efficacy, and motivation. Hence, despite theoretical groundwork on the synergetic effects of SRL and feedback (Butler and Winne, 1995; Nicol and Macfarlane-Dick, 2006), empirical studies on the direct effects of feedback on daily reported SRL are scarce.

1.2. Research aims and hypotheses

Although feedback loops are an integral part in the SRL process, there is not much empirical research on how internal and external feedback interact within the SRL cycle. We want to fill this gap by investigating the effects of automatically generated individual feedback on metacognitive and motivational aspects of SRL in an experimental field study using daily morning and evening learning diaries. The ambulatory assessment via electronic learning diaries serves as part of the intervention and at the same time as fine-grained, ecologically valid measures of the SRL process (Roth et al., 2016). However, we assume that learning diaries alone as an intervention (LD) will not be sufficient to significantly improve SRL strategies over the course of five weeks. In contrast, additional process feedback (LDF) should help students to correctly monitor and adapt their learning strategies. Our design thus allows us to test whether feedback can boost positive effects of learning diaries on SRL. We chose the process level because feedback on other levels would not be feasible: Task feedback requires more context information than what is possible to collect within a learning diary, feedback about self-regulation by definition is an internal process, and feedback about the self can even be detrimental for performance.

Hence, we hypothesize that students who keep a learning diary and receive feedback on their entries will show better SRL strategies over time compared to students who keep a learning diary without receiving feedback (LD).

More specifically, we expect that group LDF will report more goal setting (H1), planning (H2), a higher self-efficacy (H3) and higher intrinsic motivation (H4) in the morning diary compared to group LD over the course of the study. Further, we hypothesize that group LDF will report a higher satisfaction with the study day (H5), more adherence to self-set time schedule (H6), higher effort (H7) and less procrastination (H8) in the evening diary compared to group LD over the course of the study. In addition to the process measures of SRL, we apply retrospective self-report questionnaires before (t1) and after

(t2) the intervention period in order to test, whether feedback has an effect on trait SRL.

Second, we investigate how feedback affects daily SRL processes depending on the type of feedback. According to Narciss (2008), feedback can have reinforcing, information, or guiding function. For instance, feedback can reinforce students in their study approach (*confirmative feedback*), it can encompass information on learning outcomes or processes (*informative feedback*) or include *feed forward* on how to improve learning processes (*transformative feedback*). Therefore, we explore the effects of receiving confirmative, informative, or transformative feedback regarding self-reported planning, motivation, satisfaction with the study day, adherence to time schedule, procrastination, and effort on next days' SRL.

Research questions, hypotheses, and methods have been preregistered via the Open Science Framework (OSF²) prior to conducting the study.

2. Method

2.1. Participants

Initially, $N=256$ university students from a large university in South-Western Germany had registered for the study and were randomly assigned to either the learning diary with feedback (LDF, $n=129$) or the learning diary without feedback (LD, $n=127$) condition. We included only subjects into the analysis who had responded to the pre- (t1) and post- (t2) intervention questionnaires and filled in at least half of the learning diaries (18 out of 36 diary entries). Hence, the final sample consisted of $N=194$ (LDF: $n=98$, LD: $n=96$; $n=117$ female) students who were on average 22 years old ($M=22.21$, $SD=2.72$, [17; 35]). Subjects came from various fields of study, e.g., economics and political science (34%), teacher training (20%), natural sciences (20%), arts and humanities (12%), social sciences (8%), and languages (6%). On average, students were in their fourth semester ($M=3.91$, $SD=2.59$, [1, 13]). Students completed on average 30 out of 36 diary entries ($M=30.09$, $SD=3.60$, [19; 36]). As expected, the randomly assigned groups (LDF and LD) were comparable with respect to gender, age, semester, and self-reported use of SRL strategies at t1 (all p -values >0.05 , see Table 1). Groups did not differ in their overall number of learning diaries completed. Furthermore, the number of complete diary entries was not systematically related to SRL at t1 (Pearson's r between -0.11 and 0.07 , all p -values >0.05).

2.1.1. Dropout analysis

Dropout rates were comparable in group LDF and LD ($\chi^2(1)=0.28$, $p=0.60$). Dropouts ($n=62$) did not differ from participants who completed the study with regard to gender, age, semester, as well as SRL strategies at t1 (all p -values >0.05 , see Table 1). However, there was a small, yet non-significant trend that those who dropped out were more likely to report higher self-efficacy at t1

[$t(254)=-1.85$, $p=0.07$]. Further, dropouts completed significantly fewer learning diaries compared to participants.

2.2. Design and procedure

Students registered for the study online via a link to the pre-questionnaire (t1) provided via SoSci Survey³ (Leiner, 2019). Before starting the questionnaire, students received additional information on the study procedure and data privacy. They were informed that data will be processed anonymously, and that data will only be used for scientific purposes. After reading the terms and conditions, students gave us their informed consent and were passed on to the pre-questionnaire. When registering for the study, students were randomly assigned to one of the experimental conditions (LDF or LD). During the survey period (running 5 weeks from 15th of January until 19th of February, see Figure 2), students in both groups filled in daily electronic learning diaries, which comprised a morning and an evening questionnaire. Additionally, students in group LDF received daily, automated feedback throughout the whole survey period. This corresponds to a between-subjects designs (feedback vs. no feedback) with daily assessment of the dependent variables (Lischetzke et al., 2015). The day after the last learning diary has been sent out, students were asked to answer the post-questionnaire (t2) within 1 week. Students who filled in t1, t2 and completed at least 27 learning diaries (75%) received 50 € for participation.

2.3. Daily learning diary

The electronic learning diary as well as the feedback were implemented via SoSci Survey. Students could fill in the learning diary using their personal computer, laptop, tablet, or smartphone. Daily diaries comprised a morning questionnaire (available from 6 a.m. to 3 p.m.) and an evening questionnaire (available from 4 p.m. to 2 a.m. on the next day). Students received daily invitations via e-mail to fill in the morning and evening questionnaire, respectively. They were asked to fill in both parts every day even if they did not perform study-related tasks on a given day. The learning diary included open questions as well as closed Likert-type questions ranging on a scale from 1 ("not true") to 6 ("true"). Making an entry in the morning and evening required about 10 minutes altogether.

The learning diary covered the forethought, performance, and self-reflection phase of the SRL circle (see Table 2; grey feedback blocks were only presented in group LDF). SRL items relevant in the forethought phase (goal setting, planning, motivation, and self-efficacy) were assessed in the morning. In the morning questionnaire, students wrote down their study goals in an open text field and indicated whether they consider these goals ambitious. Further, students reported their time goals and plans (number of hours planned for lecture and independent study time). In a last step, students indicated their study motivation and self-efficacy beliefs for that moment. Items relevant in the performance and self-reflection phase (adherence to time schedule, satisfaction with study day,

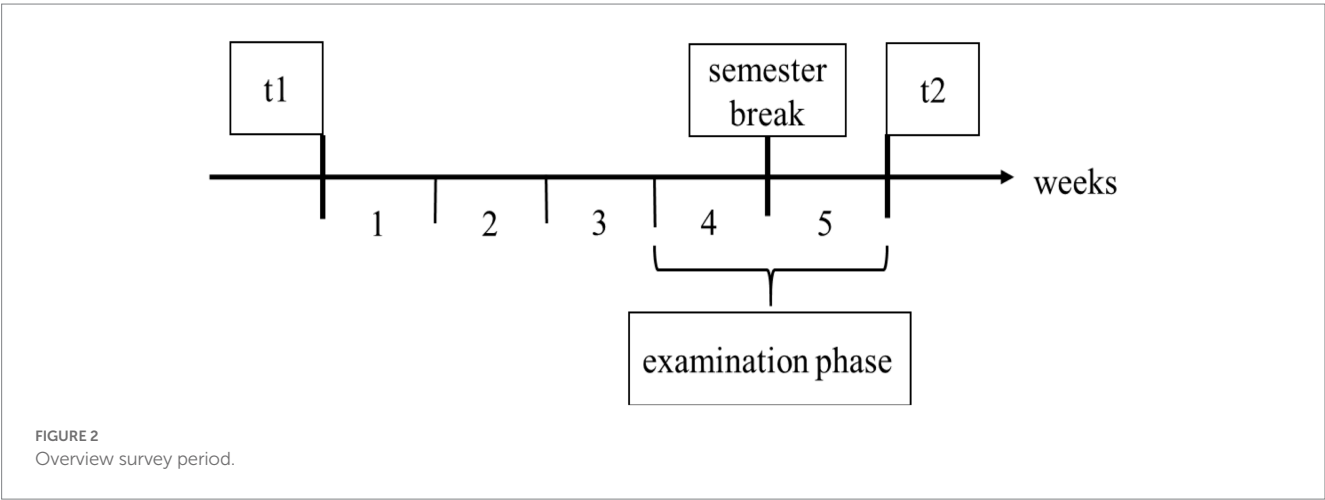
2 Link to OSF project blinded for peer review: https://osf.io/mf58p/?view_only=711661eab32849bdb0496c740c6191a3

3 <https://www.soscisurvey.de/>

TABLE 1 Baseline comparisons between experimental groups (LD, LDF) and dropout analysis.

	LDF (n=98)	LD (n=96)	p	Participants (n=194)	Dropouts (n=62)	p
Gender (n female)	58	59	0.365	117	30	0.158
	M (SD)	M (SD)		M (SD)	M (SD)	
Age	21.99 (2.51)	22.44 (2.93)	0.254	22.21 (2.72)	22.57 (3.14)	0.384
Semester	3.98 (2.42)	3.83 (2.77)	0.696	3.91 (2.59)	3.72 (2.27)	0.616
Planning _{t1}	2.90 (1.24)	2.79 (1.27)	0.557	2.84 (1.25)	2.77 (1.09)	0.677
Self-Motivation _{t1}	3.83 (1.11)	4.05 (1.20)	0.190	3.94 (1.16)	4.03 (1.25)	0.608
Self-efficacy _{t1}	3.73 (0.89)	3.77 (0.95)	0.749	4.01 (0.92)	3.75 (0.76)	0.066
Reflection _{t1}	3.17 (1.08)	3.32 (0.93)	0.320	3.24 (1.01)	3.17 (1.10)	0.612
Procrastination _{t1}	3.71 (1.36)	3.73 (1.34)	0.945	3.72 (1.35)	3.95 (1.15)	0.233
Volition _{t1}	3.03 (1.03)	3.16 (1.05)	0.353	3.09 (1.04)	2.98 (1.00)	0.465
Number diary entries	29.99 (3.52)	30.19 (3.70)	0.703	30.09 (3.60)	6.21 (6.62)	<0.001

Bolded means indicate significant group difference (two-tailed test, $p < 0.05$).



procrastination, and effort) were assessed in the evening questionnaire. Lastly, students indicated whether they performed study-related tasks on that day. The last-mentioned item was used as a filter item in subsequent data analysis in order to sort students in groups that did versus did not study on that day.

2.4. Experimental manipulation: feedback

Students in the feedback condition received additional, daily feedback which provided information on goals (*feed up*), current performance (*feed back*), and suggestions how to close the gap between current performance and goals (*feed forward*). The feedback intervention consisted of three components. First, in the morning questionnaire, students received adaptive *feed forward* if they reported low intrinsic motivation or planning (see Table 2). Second, in the evening questionnaire, students were shown their study goals and time goals they had set themselves in the morning (*feed up*) in order to facilitate their generation of internal feedback in terms of satisfaction ratings. Third, students indicated their satisfaction with the study day, adherence to self-set time schedule, procrastination, and effort. In case of the adherence to self-set time

schedule, students had the additional option to indicate that they did not make a time schedule, which corresponds to the “no schedule” feedback.

Based on their self-reports, written feedback on their satisfaction with the study day, adherence to self-set time schedule, effort and procrastination was provided (*feed back*). If someone indicated high values on the respective scales (“5” or “6” on a 6-point Likert scale), *confirmative* feedback was provided which reinforced students’ regarding their study approach. Students who reported medium (“3” or “4”) values on the respective scales received *informative* feedback indicating that there is room for improvement while students reporting low (“1” or “2”) values received *transformative* feedback which encompassed an additional strategy suggestion (*feed forward*). Table 3 provides an overview of all possible feedback sentences. Feedback was generated automatically by Sosci Survey based on students’ self-reports and was provided daily throughout the whole survey period (36 days).

For feed forward suggestions, we used strategies that were part of empirically tested SRL trainings (Schmitz and Wiese, 2006; Bellhäuser et al., 2016; Dörrenbächer and Perels, 2016). For example, to foster intrinsic motivation we applied the utility-value-intervention approach based on Wigfield and Eccles (2000). In this approach,

TABLE 2 Overview on the daily diary items and feedback in the morning and evening questionnaire.

Morning questionnaire	
Variable	Item
Study goals	Today, I am setting myself the following study goals: [open text field]
Number of hours planned for attending lectures or courses	Today, I am planning to invest the following time for studying in-class: [open text field]
Number of hours planned for self-study	Today, I am planning to invest the following time for self-study: [open text field]
Goal setting	Today, I am setting myself ambitious goals. [Likert-type]
Planning	Today, I have a specific plan, according to which I will perform today's study-related tasks. [Likert-type]
LDF: Students received adaptive <i>feed forward</i> , if they reported low planning on the previous item ("1" or "2" on 6-point scale): "Please check your timetable: How much time do you need to complete the tasks on your to-do-list? Have you added a time-buffer for unexpected events? Please sort your tasks according to their importance and urgency."	
Intrinsic Motivation	Today, I study because I enjoy the topics. [Likert-type]
LDF: Students received adaptive <i>feed forward</i> , if they reported low motivation on the previous item ("1" or "2" on 6-point scale): "Please reflect why today's learning topics are relevant and useful for you."	
Self-efficacy	Today, I know how to proceed to have a successful study day. [Likert-type]
Evening questionnaire	
LDF: Students were shown their goals and time plans they made in the morning (<i>feed up</i>): In the morning, you set the following study goals: [open text field of morning diary was displayed] In the morning, you planned to invest: [number of hours] for self-study and [number of hours] for studying in-class.	
Satisfaction with study day	I am satisfied with what I have achieved today (study-relevant). [Likert-type]
Adherence to time schedule	Today, I adhered to my time schedule. [Likert-type] + Outside Option: "I have not made myself a time schedule today."
Procrastination	Today, I have postponed unpleasant tasks. [Likert-type]
Effort	Today, I invested effort while studying (in-class and self-study) [Likert-type]
LDF: Students received written feedback on satisfaction with study day, adherence to time schedule, procrastination and effort (<i>feed back</i> and <i>feed forward</i> formulation see Table 3)	
Study day	Did you perform study-related tasks today? (1 = "yes"; 0 = "no")

LDF, Learning diary with feedback. Grey blocks were only presented in group LDF.

TABLE 3 Overview on daily written feedback provided in the evening questionnaire on satisfaction with study day, adherence to time schedule, procrastination, and effort.

Variable	Feedback	
Satisfaction with study day	Confirmative feedback ["5" or "6" on 6-point scale]	You are very satisfied with what you have achieved today.
	Informative feedback ["3" or "4" on 6-point scale]	You are somewhat satisfied with what you have achieved today.
	Transformative feedback ["1" or "2" on 6-point scale]	You are not satisfied with what you have achieved today. Try to set yourself goals for tomorrow. That's motivating!
Adherence to time schedule	Confirmative feedback ["5" or "6" on 6-point scale]	You perfectly adhered to your time schedule. You know how much time you need to achieve your goals. Very good!
	Informative feedback ["3" or "4" on 6-point scale]	You only partially adhered to your time schedule today. When did you deviate from your timetable and why?
	Transformative feedback ["1" or "2" on 6-point scale]	You did not adhere to your time schedule today. Which tasks took more or less time than expected?
	Transformative feedback ["0" Outside option: I have not made myself a time schedule today.]	You did not make yourself a time schedule today. Try to make yourself a To-Do list tomorrow and think about how much time you need to achieve each goal on your list.
Procrastination	Confirmative feedback ["5" or "6" on 6-point scale]	You did not postpone unpleasant tasks today. Very good!
	Informative feedback ["3" or "4" on 6-point scale]	You postponed some unpleasant tasks today. Maybe, you can try to reward yourself if you have reached your goals?
	Negative Feedback ["1" or "2" on 6-point scale]	You postponed unpleasant tasks today. Try to divide your goals into smaller sub goals tomorrow.
Effort	Confirmative feedback ["5" or "6" on 6-point scale]	You invested a lot of effort while working today. Very good!
	Informative feedback ["3" or "4" on 6-point scale]	You invested some effort while working today, but there is room for improvement!
	Transformative feedback ["1" or "2" on 6-point scale]	You did not invest much effort while working today. You can do more!

participants are instructed to write down reasons why a certain learning topic is relevant and useful for attaining their personal goals which should increase intrinsic motivation for studying this topic (van der Beek et al., 2020).

2.5. Measures

All of the self-report measures presented below were assessed on a six-point Likert scale ranging from “not true” to “true.”

2.5.1. Daily self-regulated learning: state measures

The morning questionnaire contained SRL items on goal setting, planning, motivation, and self-efficacy. Satisfaction with the study day, adherence to time schedule, procrastination, and effort were assessed in the evening questionnaire (see Table 1). We adopted SRL items from a previous diary study by Liborius et al. (2019). We used single items to assess each of the abovementioned variables, which is common in studies that use daily assessment in order to assure participants commitment with the repeated measurements (Bolger et al., 2003; Fisher and To, 2012). The diary variables (aggregated across all measurement points) correlated substantially with the corresponding trait variables at t1 (e.g., state procrastination with trait procrastination: $r = 0.43$, $p < 0.001$), indicating validity of the state measures (see Table 4).

2.5.2. Self-regulated learning: trait measures

We measured trait SRL strategies before (t1) and after the intervention period (t2) by means of self-report questionnaires. We used the short SRL questionnaire for university students (SRL@U, Bellhäuser and Schmitz, 2017) to assess goal setting (4 items, i.e., “I set myself challenging goals.”), self-motivation (3 items, i.e., “I think of past success to increase my motivation.”), reflection (4 items, i.e., “At the end of the day, I ask myself whether I am satisfied with my performance.”), and volition (4 items, i.e., “I can bring myself in the right mood for studying.”). Planning (3 items, i.e., “While studying, I adhere to a specific time plan.”) was measured using the German Learning Strategies Inventory (LIST; Wild and Schiefele, 1994), which is the German version of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991). We assessed self-efficacy using an adapted version of the Professional Self-efficacy Scale (Schyns and von Collani, 2014) that consists of nine items by rephrasing the items such that they refer to university education (e.g., “When I am confronted with a problem in my studies, I can usually find several solutions.”). We computed an overall self-efficacy score by taking the average of the nine positively coded items. Procrastination was measured using the Procrastination Questionnaire for Students (PFS, Glöckner-Rist et al., 2009). Values on the seven items were averaged to one overall score whereby larger values indicate a higher degree of procrastination. On average, omega (McDonald, 1999) indicated satisfying internal consistencies of the subscales ($\omega = 0.68$ to $\omega = 0.94$, see Table 4) except for goal setting (t1: $\omega = 0.65$, t2: $\omega = 0.57$). Therefore, the subscale on goal setting (trait measure, not state measure) was excluded from further analyses.

2.5.3. Study satisfaction

Students' overall satisfaction with their course of studies was assessed at t1 via a five item scale (adopted from Liborius et al., 2019), e.g., “I am very satisfied with my course of studies” ($\omega = 0.83$).

2.5.4. Grades

At t2, students reported their grades in their written and oral exams to the best of their knowledge up to that point. The average GPA was 2.3 (SD = 0.90), whereby lower grades represent higher performance in the German grading system. Type and number of exams varied to a large degree since students came from very heterogeneous fields of study. Therefore, grades were hardly comparable, since demands and grading of the various exams differed to a great extent. Further, at t2, many students have not yet received their grades which caused a substantial number of missing entries. We obtained at least one grade from 132 out of the 194 students (69%), but due to a lack of comparability of grades across study fields, we refrained from using grades as outcome variable.

2.6. Missing data and data exclusion criteria

The final sample consisted of 194 participants who answered the questionnaires at t1 and t2 as well as filled in at least half of the in daily learning diaries over a period of 36 days. Hence, the maximum number of observations that could be obtained for each of the diary variables was 194 subjects * 36 days = 6,984. Missing data ranged between 7 and 11% ($M = 9.23$, $SD = 0.02$) for the eight diary variables. In multilevel analysis, observed data on level 1 (daily level) are used to define a vector for each person (level 2) based on maximum likelihood estimates of the means and variance-covariance matrices (Raudenbush and Bryk, 2002). Since missing entries are not considered for estimation, we did not impute the missing data for the analyses presented below. Moreover, we excluded diary entries, if students did not set themselves goals in the morning and further indicated that they did not perform any study-related tasks in the evening, i.e., they took a day off. On these days, student neither planned to study nor actually studied but had to respond to the learning diary. Hence, their ratings on SRL strategies and goal achievement do not contain meaningful information. For instance, students reported less ambitious study-related planning on non-study days which, however, does not imply worse self-regulation. According to this criterion, 890 out of 6,984 possible entries (13%) were excluded from further analysis.

2.7. Multilevel analysis

To investigate the effects of feedback on daily self-regulated learning, we conducted multilevel analysis, whereby time points (days, level 1) are clustered within subjects (level 2). Multilevel modelling, also known as hierarchical linear modelling (Raudenbush and Bryk, 2002), takes into account that observations that originate from one person cannot be assumed to be independent of each other. Next to such statistical independency, longitudinal multilevel modelling accounts for the temporal dependency. Observations that are closer to each other with respect to the temporal order of measurement are assumed to be more similar than observations far apart in time, which can bias level 1 variances (Bliese and Ployhart, 2002). Hence, we specified a first-order autoregressive error structure to take into account any possible autocorrelation. We used Stata 15.1 (StataCorp, 2017) for data analysis.

TABLE 4 Reliabilities and correlations among SRL variables (t1) and diary variables measured in the morning or evening questionnaire.

	Variables	<i>M</i> (<i>SD</i>)	ω (t1)	ω (t2)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Person level																	
1	Study satisfaction _{tl}	4.43 (0.44)	0.83	–	–													
2	Planning _{tl}	2.85 (1.25)	0.80	0.83	0.05													
3	Self-Motivation _{tl}	3.94 (1.16)	0.68	0.69	0.06	0.30***												
4	Self-efficacy _{tl}	3.75 (0.92)	0.90	0.90	0.43***	0.10	0.32***											
5	Reflection _{tl}	3.24 (1.01)	0.71	0.73	0.11	0.39***	0.39***	0.23**										
6	Procrastination _{tl}	3.72 (1.35)	0.94	0.94	–0.23**	–0.35***	–0.30***	–0.46***	–0.24***									
7	Volition _{tl}	3.09 (1.04)	0.82	0.80	0.22**	0.26***	0.44***	0.51***	0.23**	–0.46***								
	Daily level																	
8	Goal setting _m	4.76 (0.61)			0.06	0.16*	0.08	0.09	0.08	–0.08	0.06							
9	Planning _m	4.20 (0.99)			0.35***	0.31***	0.19**	0.13	0.20**	–0.30***	0.35***	0.31***						
10	Intrinsic Motivation _m	3.81 (0.90)			0.43***	0.16*	0.16*	0.30***	0.13	–0.20**	0.43***	0.20**	0.47***					
11	Self-efficacy _m	4.22 (0.79)			0.38***	0.25***	0.13	0.30***	0.20**	–0.27***	0.38***	0.27***	0.64***	0.56***				
12	Satisfaction with study day _e	3.87 (0.73)			0.36***	0.23**	0.10	0.35***	0.07	–0.37***	0.36***	0.19**	0.41***	0.53***	0.54***			
13	Adherence to time schedule _e	3.32 (1.32)			0.31***	0.26***	0.18*	0.11	0.17*	–0.30***	0.31***	0.24***	0.73***	0.38***	0.39***	0.58***		
14	Procrastination _e	2.99 (0.87)			–0.27***	–0.20**	–0.01	–0.24***	–0.01	0.43***	–0.27***	–0.10	–0.26***	–0.30***	–0.32***	–0.58***	–0.36***	
15	Effort _e	4.38 (0.70)			0.26***	0.22**	0.19**	0.23**	0.10	–0.34***	0.27***	0.46***	0.42***	0.39***	0.51***	0.67***	0.44***	–0.52***

p*<0.05, *p*<0.01, ****p*<0.001 (two-tailed). _{tl} Scale assessed in the pre-questionnaire at t1. _m Item assessed in the morning questionnaire. _e Item assessed in the evening questionnaire.

A step-wise procedure was used to specify each multilevel model (Bliese and Ployhart, 2002; Raudenbush and Bryk, 2002). First, the unconditional means model was computed that included only the dependent variables. Second, we analyzed whether the experimental manipulation (feedback) had an effect on daily SRL. Following recommendations for the evaluation of daily interventions (Lischetzke et al., 2015), we specified multilevel models using group (1 = LDF, 0 = LD) as a between person predictor of daily SRL while controlling for baseline levels of the respective trait variable at t1. Further, random time slopes (σ^2) account for within subject variability over time. A significant, positive effect of the feedback variable would indicate a main effect, i.e., a higher overall value of the respective dependent variable in group LDF compared to group LD. Hence, we examined mean-level changes in the dependent variables to evaluate the general effectiveness of the feedback intervention (Lischetzke et al., 2015).

3. Results

3.1. Effects of individual feedback on daily self-regulated learning

According to our research goal, we investigated whether feedback affects daily SRL. We hypothesized that feedback will have a positive effect on the overall use of SRL strategies over the course of the study.

Table 5 shows the average persons' mean level across the observation period and provides estimates of the variability on level 1 (within subjects) and level 2 (between subjects). The interclass coefficient (ICC) represents the percentage of variance that lies between subjects, indicating that approximately 17 to 47% of the variance in the dependent variables was between subjects, while 53 to 83% of variance was within subjects. The within subject variability over time was higher than the between subject variance for all variables.

Table 6 provides an overview of the results of the multilevel analyses. Figure 3 graphically shows the average development of the dependent variables over time separately for group LD and group LDF. Note that feedback has been provided throughout the whole survey period, already beginning on day 1. As can be seen in the

plots, the experimental group LDF showed higher values in every dependent variable over almost the entire period of the study.

In line with our hypothesis, we found significant main effects of feedback in most of the dependent variables. The process data in group LDF showed on average more ambitious goal setting ($b=0.19$, H1), better planning ($b=0.24$, H2), self-efficacy ($b=0.24$, H3), satisfaction with the study day ($b=0.20$, H5), and adherence to self-set time schedule ($b=0.40$, H6) (all p -values below 0.05; see Table 6) than group LD. Intrinsic motivation (H4), effort (H7), and procrastination (H8) were not affected by feedback. Following the convention by Funder and Ozer (2019), effect sizes of $b=0.10$ can be labeled as *small*, $b=0.20$ as *medium*, and $b=0.30$ as *large*.

3.2. Explorative analyses of effects of confirmative, informative and transformative feedback on next day's self-regulated learning

The analysis above investigated the effects of the feedback intervention on average self-reported SRL strategies across the whole survey period. However, in order to provide further insights on how feedback on a given day affects SRL on the subsequent day, we conducted exploratory follow-up analyses.

We tested whether presenting confirmative, informative, or transformative feedback regarding planning and motivation (reported in the morning) as well as satisfaction with the study day, adherence to time schedule, procrastination, and effort (reported in the evening) affected next day's response in this particular SRL variable. For this purpose, we created dummy variables indicating which type of feedback (confirmative, informative, or transformative) has been shown, and built an interaction term between type of feedback and experimental condition (LD vs. LDF). For instance, to test the effect of presenting positive feedback regarding effort on day t on next day's effort ($t+1$), we only analyzed those observations in group LDF and LD, in which students responded that they invested high effort ("5" or "6" on six-point scale). Hence, we compared subjects in group LDF who received confirmative feedback regarding effort with those observations in group LD who would have received confirmative feedback if they would have been assigned to the feedback condition.

TABLE 5 Unconditional means models for dependent variables.

	Mean	Variance between (τ)	Variance within (σ^2)	ICC	Number of observations
Dependent variables (morning)					
Goal setting	4.73	0.61	0.83	0.42	5,868
Planning	4.19	0.91	1.07	0.46	5,868
Self-efficacy	4.55	0.60	0.67	0.47	5,868
Intrinsic motivation	3.77	0.71	0.96	0.42	5,868
Dependent variables (evening)					
Satisfaction	3.81	0.34	1.64	0.17	5,562
Adherence to time schedule	3.34	1.52	2.82	0.35	5,562
Procrastination	3.01	0.70	2.18	0.24	5,562
Effort	4.37	0.53	1.50	0.26	5,562

$N=194$. The mean represents an average person's mean value across the 36 points of measurement. The ICC represents the proportion of variance between persons.

TABLE 6 Random intercept models with feedback condition (0=LD, 1=LDF) and outcome at baseline (t1) as predictors of daily SRL.

Dependent variables (morning)												
	Goal setting			Planning			Self-efficacy			Intrinsic motivation		
	Estimate	SE	R ²	Estimate	SE	R ²	Estimate	SE	R ²	Estimate	SE	R ²
Fixed effects												
Level 2 (Between)			0.08			0.19			0.08			0.07
Intercept	3.98***	0.20		3.36***	0.17		3.51***	0.23		3.14***	0.23	
Feedback	0.19*	0.08		0.24*	0.11		0.24*	0.11		0.09	0.12	
Outcome at baseline (t1)	0.15**	0.05		0.26***	0.05		0.24***	0.06		0.15**	0.05	
Random parameters												
Residual variance (τ)	0.53	0.07		0.72	0.09		0.52	0.06		0.64	0.08	
Level 1 (Within)												
Residual variance (σ^2)	0.85	0.02		1.05	0.02		0.68	0.01		0.98	0.02	
Autocorrelation	0.16	0.02		0.16	0.02		0.13	0.02		0.12	0.02	

Dependent variables (evening)												
	Satisfaction with study day			Adherence to time schedule			Procrastination			Effort		
	Estimate	SE	R ²	Estimate	SE	R ²	Estimate	SE	R ²	Estimate	SE	R ²
Fixed effects												
Level 2 (Between)			0.09			0.32			0.22			0.07
Intercept	2.65***	0.19		2.28***	0.23		2.05***	0.17		3.76***	0.16	
Feedback	0.20*	0.09		0.40*	0.17		-0.17	0.11		0.18	0.05	
Outcome at baseline (t1)	0.24***	0.04		0.30***	0.07		0.28***	0.04		0.09***	0.09	
Random parameters												
Residual variance (τ)	0.25	0.05		1.20	0.17		0.48	0.09		0.46	0.07	
Level 1 (Within)												
Residual variance (σ^2)	1.66	0.03		2.86	0.06		2.21	0.05		1.52	0.03	
Autocorrelation	0.07	0.02		0.13	0.02		0.12	0.02		0.10	0.02	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

This allowed us to compute the main effect of receiving confirmative feedback regarding effort on next day's effort while controlling for previous effort. Note that the design no longer constitutes a purely randomized controlled trial since the assignment to a criterion group depends not only on the experimental design but also on the occurrence of certain responses in the learning diary. Results of the multilevel analyses including the number of valid observations in group LD and group LDF used for the respective analysis are presented in Table 7.

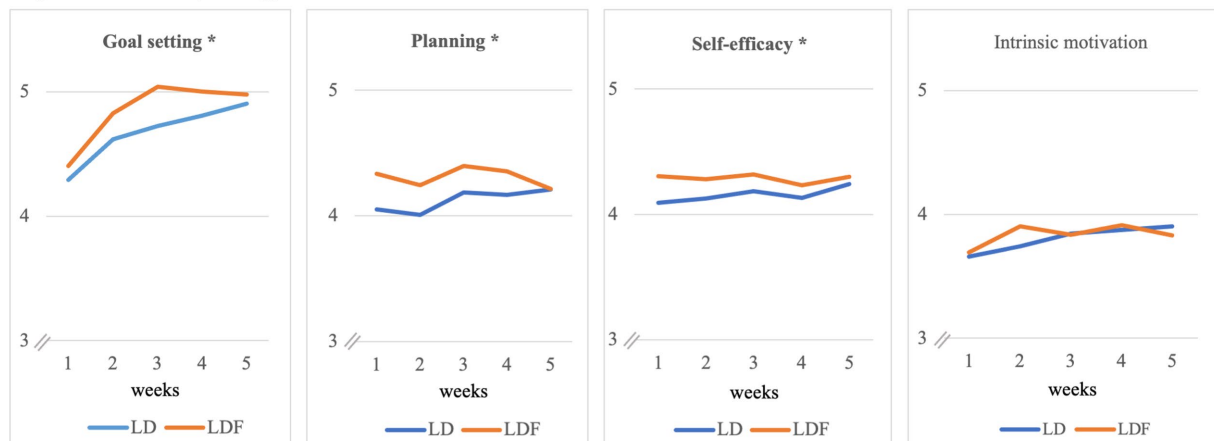
Students who received transformative feedback regarding their planning in the morning reported having more concrete plans on the subsequent day compared to students in group LD who did not receive feedback. Transformative motivational feedback did not predict higher motivation on the next day. Regarding feedback on satisfaction with the study day, students reported higher satisfaction after receiving either confirmative or transformative feedback compared to no feedback. Informative feedback did not affect next day's satisfaction. With respect to feedback on the adherence to the self-set time schedule, confirmative feedback, transformative feedback, and feedback after no time schedule has been made showed significant

positive effects on next day's adherence to time schedule compared to no feedback. Informative feedback did not significantly affect next days' adherence to time schedule. Regarding procrastination, only confirmative feedback had significantly predicted next day's procrastination, which means that procrastination further decreased after confirmative feedback compared to no feedback. None of the other feedback types significantly affected next day's procrastination. As already visible in Table 6, students did not report changes in self-reported effort due to the provision of feedback.

3.3. Effects of individual feedback on trait self-regulated learning

To test whether feedback has an effect on the SRL trait measures, a repeated multivariate analysis of variance (MANOVA) with time as a repeated within-subject measure (t1, t2) and feedback as between-subject factor (1=LDF, 0=LD) was conducted. As dependent variables, we included all SRL subscales, except for goal setting which was excluded due to insufficient internal consistency. The results

Dependent variables (morning)



Dependent variables (evening)

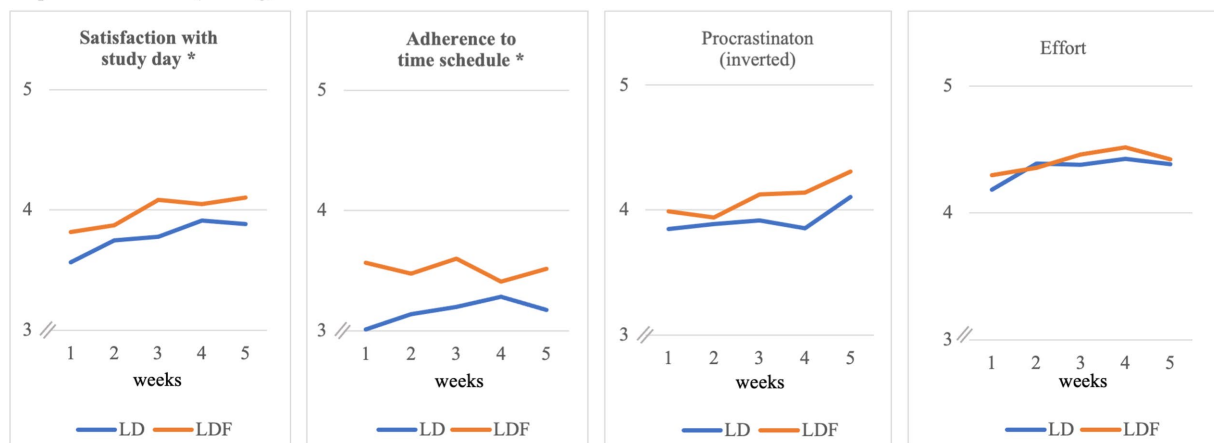


FIGURE 3

Development of SRL variables over the course of the study in group with (LDF) and without (LD) additional feedback. Feedback was provided throughout the whole survey period starting at day 1. Bold headings indicate that average group difference (LD vs. LDF) is significant (* $p < 0.05$).

yielded a significant main effect of time [$F(7, 186) = 10.97, p < 0.001, \eta^2 = 0.29$]. Following the convention by Funder and Ozer (2019) this can be referred to as a very large effect. Irrespective of the feedback condition, all students reported more planning, and reflection activity, and more self-motivation, volition, and higher self-efficacy, and reduced procrastination at t2 compared to t1 (see Table 8). However, contrary to our hypothesis, no interaction effect of feedback condition and time was reflected in the SRL questionnaire data [$F(7, 186) = 1.04, p = 0.41, \eta^2 = 0.04$]. Both groups (LD and LDF) reported a similar change in SRL, self-efficacy and procrastination over time.

4. Discussion

In the present study, we investigated the effects of automatically generated, adaptive feedback on SRL in an experimental field study using daily learning diaries. Almost 200 students in two experimental conditions (with or without additional feedback) reported their application of SRL strategies in the morning and in the evening over the course of 36 days, which allowed us to investigate SRL processes using a rich, longitudinal dataset. Data acquisition took place in the natural learning environment and during the critical examination

phase at the end of semester, which ensures high ecological validity of the daily diary data.

According to our research aim, we investigated the effects of process feedback on SRL using multiple data sources: diary data and pre- and post-questionnaires. Analysis of the daily diary data revealed medium-sized effects of feedback on process data about goal setting, planning, self-efficacy, satisfaction with the study day, and a large effect on adherence to self-set time schedule. Moreover, exploratory analysis of specific feedback sentences showed differential effects depending on the type of feedback. In short, transformative feedback including *feed forward* and confirmative feedback predicted better SRL on the subsequent day compared to no feedback, whereas informative feedback did not predict next day's SRL. Pre-post comparisons of students' self-reported general use of SRL strategies did not show any effects of feedback on trait SRL.

4.1. Does feedback improve self-regulated learning?

According to theoretical models of SRL (Butler and Winne, 1995; Zimmerman, 2002), we hypothesized that learning diaries with

TABLE 7 Main effects of receiving confirmative, informative or transformative feedback on next day's goal setting, planning, satisfaction with study day, adherence to time schedule, procrastination and effort.

	Number of observations				
	LD	LDF	Coefficient	SE	<i>p</i>
Dependent variable (morning): Planning _{t+1}					
Transformative feedback _t	1,668	1,736	0.26**	0.09	0.003
Dependent variable (morning): Motivation _{t+1}					
Transformative feedback _t	1,473	1,444	0.10	0.07	0.152
Dependent variable (evening): Satisfaction with study day _{t+1}					
Confirmative feedback _t	964	1,190	0.30**	0.09	0.001
Informative feedback _t	1,288	1,152	0.05	0.09	0.590
Transformative feedback _t	396	223	1.53**	0.49	0.002
Dependent variable (evening): Adherence to time schedule _{t+1}					
Confirmative feedback _t	1,041	1,223	0.32*	0.13	0.016
Informative feedback _t	865	845	0.12	0.09	0.191
Transformative feedback _t	552	572	0.20*	0.10	0.045
Transformative feedback _t (no time schedule)	507	412	0.59***	0.11	< 0.001
Dependent variable (evening): Procrastination _{t+1}					
Confirmative feedback _t	1,237	1,348	−0.23**	0.06	0.002
Informative feedback _t	915	897	−0.01	0.07	0.981
Transformative feedback _t	524	507	−0.04	0.22	0.883
Dependent variable (evening): Effort _{t+1}					
Confirmative feedback _t	1,463	1,470	0.08	0.06	0.157
Informative feedback _t	972	1,055	0.04	0.07	0.521
Transformative feedback _t	151	314	−0.11	0.09	0.216

Confirmative feedback was given if students indicated “5” or “6” on six-point Likert scale. Informative feedback was given if students indicated “3” or “4” on six-point Likert scale.

Transformative feedback was given if students indicated “1” or “2” on six-point Likert scale. In case of adherence to time schedule, students also received transformative feedback if they reported that they did not make a time schedule. In the morning, transformative feedback was provided adaptively if students indicated low planning or low motivation (values below “5” on six-point Likert scale).

p* < 0.05, *p* < 0.01 ****p* < 0.001.

TABLE 8 Multivariate analysis of variances (MANOVA).

		t1	t2	Time	η^2	Feedback		Feedback × Time	
		<i>M</i> (SD)	<i>M</i> (SD)	<i>F</i> (1, 192)		<i>F</i> (1, 192)	η^2	<i>F</i> (1, 192)	η^2
Planning	LD	2.79 (1.27)	3.05 (1.33)	17.53**	0.08	1.58	0.01	1.28	0.01
	LDF	2.90 (1.24)	3.35 (1.23)						
Self-motivation	LD	4.05 (1.20)	4.58 (0.99)	20.99**	0.20	2.34	0.01	0.01	< 0.01
	LDF	3.83 (1.11)	4.38 (1.12)						
Self-efficacy	LD	3.77 (0.95)	4.02 (0.91)	14.49**	0.07	0.64	< 0.01	1.10	0.01
	LDF	3.73 (0.89)	3.87 (0.88)						
Volition	LD	3.16 (1.05)	3.37 (1.06)	25.41**	0.12	0.11	< 0.01	2.53	< 0.01
	LDF	3.03 (1.03)	3.42 (0.95)						
Reflection	LD	3.32 (0.93)	3.42 (0.99)	5.80*	0.03	0.57	< 0.01	0.98	0.01
	LDF	3.17 (1.08)	3.43 (0.98)						
Procrastination	LD	3.73 (1.34)	3.41 (1.27)	35.66**	0.16	0.85	< 0.01	0.15	< 0.01
	LDF	3.71 (1.36)	3.35 (1.32)						

LD = Learning diary without feedback (*n* = 96). LDF = Learning diary with feedback (*n* = 98).

p* < 0.05, *p* < 0.01.

individual process feedback can help students reflecting on their study behavior and improve SRL. The multimodal assessment applied in this study yielded different results regarding the effectiveness of feedback.

The results of the pre-post comparison showed that students in both groups reported significantly better general planning, self-motivation, self-efficacy, volition, and reflection from t1 to t2 and reduced their self-reported general procrastination over time. The overall time effect was large, especially for general self-motivation, procrastination, and volition (Cohen, 1992). One explanation is that the learning diary constituted an effective intervention itself, irrespective of feedback provision. This would be in line with the idea that learning diaries promote SRL by stimulating monitoring and reflection on the own study process (Schmitz and Perels, 2011), but in contrast to previous research, which did not find effects of learning diaries on SRL (Fabriz et al., 2014; Bellhäuser et al., 2016; Dörrenbächer and Perels, 2016; Bellhäuser et al., 2022). However, since we did not include a control group without learning diary, we do not know how SRL would have developed over time without the use of learning diaries. The study took place before and during the examination phase at the end of semester. Hence, the increase in SRL strategies and especially the decrease in procrastination might also be caused by the fact that students could no longer postpone their studying due to important deadlines (Theobald et al., 2018). In contrast to our hypothesis, the pre-post comparison of the trait SRL measures indicated neither a main effect of feedback on SRL, nor an interaction of feedback and time. It might be that the huge overall time effect covered the (probably rather small) effect of feedback on SRL.

By contrast, the analysis of the process data were in line with our assumption, indicating a significant positive main effects of feedback on daily-reported goal setting, planning, self-efficacy, satisfaction with the study day, and adherence to self-set time schedule. Thus, students in the feedback condition set more ambitious goals, reported to make better plans in the morning, and indicated higher self-efficacy in their own competences to achieve those plans. In the evening, careful planning paid off and students were more likely to report successful adherence to their time schedule, which might also explain an increased satisfaction with the study day (Liborius et al., 2019). This is in line with the results of Wäschle et al. (2014), who found positive effects of visual feedback on time management skills.

We did not find process feedback to affect intrinsic motivation, effort, nor procrastination. All of these SRL components belong to the motivational and volitional part of SRL. Apart from the possibility that this finding is only a random finding, one explanation might be that the feedback intervention did not sufficiently target these motivational SRL components, but rather metacognitive components since the diary focused on planning. It could also be the case that motivation and volition are more difficult to tackle by means of interventions compared to metacognitive strategies (e.g., planning). Consistent with this, Theobald and Bellhäuser (2022) also found a positive effect of a feedback intervention on metacognition but not on motivation. Dignath and Büttner (2008) also found that older students especially benefitted from SRL interventions that targeted metacognitive strategies and reflection. Besides that, self-reported effort was on average quite high over the course of the study. In this study, students usually indicated that they invested a lot of effort, which could also be an indication of ceiling effects or overconfidence (Dunlosky and Rawson, 2012).

Taken together, the results from our multimodal assessment (SRL as state vs. trait measure) provide conflicting results to the question

whether process feedback improves SRL. While the SRL questionnaire that was used in the pre-and posttest gives an indication on how students estimate their general use of SRL strategies (SRL as trait), the process data from the learning diary indicates how students estimate their situative use of SRL strategies (state). Hence, we argue that individual and daily feedback has the potential to foster situative SRL and adds to the exclusive use of learning diaries.

Furthermore, these results contribute to the question on how to assess SRL in a valid way. Clearly, a questionnaire that assesses SRL strategy use generally as a trait and a learning diary that assesses SRL states in a situative way, measure SRL in two different ways. Trait-like self-report questionnaires are frequently criticized since they lack situation specificity and do not necessarily reflect student's actual study behavior in a given situation (Winne et al., 2002; Roth et al., 2016; Panadero et al., 2016b). In contrast, daily learning diaries (although still based on self-report) offer a more context sensitive measure of the SRL process, which complies with the dynamic nature of SRL (Schmitz and Wiese, 2006). Thus, learning diaries offer high ecological validity, since learners complete the diaries in their natural learning environment (Klug et al., 2011). As the feedback has been very specific for each single day of the intervention, it seems likely that learning diaries captured the small adaptations in daily SRL better than general SRL questionnaires that assess SRL as a trait and might be less sensitive to the treatment.

One more explanation for the lack of feedback effect on the trait measures might be the design of our study: Longer interventions have been shown to have larger effects (Dignath and Büttner, 2008), so the 4 weeks of our study may have been too short. Also, changes in SRL traits might show only after a certain delay (Cousins et al., 2022) and without a follow-up measurement we might have missed this effect. Further, the effect of the feedback diary might be larger when combined with a training intervention (Bellhäuser et al., 2022).

Researchers should further investigate how state and trait measures of SRL are associated, and how we can assess SRL more precisely. As we showed in Table 4, daily state measures of SRL are correlated with their respective trait measures, but these correlations are far from perfect—leaving room for many other sources of influence (e.g., biased self-perception in the trait questionnaire). Multimodal assessment is a first step into disentangling the existing assessment methods in the field of SRL research.

4.2. What kind of feedback is most effective?

In the present study, we chose the level of process feedback (Hattie and Timperley, 2007) as our target because it can be produced without detailed context knowledge (unlike outcome feedback that is heavily dependent on the specific task). Contrary to internal self-regulation feedback (which by definition is created internally by the learner), it is possible to manipulate process feedback experimentally. Finally, in contrast to the self level of feedback (which can be detrimental for learning outcomes), process feedback has been shown to foster self-regulated learning (Schunk, 2012).

With respect to the specific type of feedback (confirmative, informative, transformative), our exploratory analyses showed that feedback which confirmed students in their study approach or which included *feed forward* (transformative feedback) showed larger effects

than informative feedback. These results have to be interpreted cautiously due to the fact that they are not based on a purely randomized experimental design. Whether students received confirmative, informative, or transformative feedback depended foremost on what they reported in their diary about their learning behavior. However, only students in the experimental group received such feedback. Also, we compared the impact of feedback only to those days, on which students in the control group would have received the same feedback, given they had been assigned to the other experimental condition. Therefore, we believe that the following results can be interpreted as initial evidence that needs confirmation in future research:

Regarding feedback on satisfaction with the study day, confirmative and transformative feedback resulted in higher satisfaction on the subsequent day compared to no feedback. When students received transformative feedback, they simultaneously received a recommendation on how to *feed forward*. They were advised to set themselves goals for tomorrow, which revealed to be highly effective. For students, who had a good study day, generating positive internal feedback and external confirmative feedback reinforced them in their learning approach. In contrast, the system reported back to students with average satisfaction that there is room for improvement (informative feedback). This feedback did not offer enough guidance on how to *feed forward*.

The same reasoning holds for feedback on adherence to self-set time schedule and the transformative feedback regarding planning provided in the morning. Confirmative feedback reassured students that they are on the right track and might even contributed to increased self-efficacy in their own capabilities. The transformative feedback was combined with the provision of a concrete strategy on how to proceed in order to enhance time management (i.e., reflecting on which tasks took longer than expected or making a To-Do list the next day). The informative feedback only provided a non-directive reflective prompt (When did you deviate from your timetable and why?). Reflective prompts can be helpful if students are willing to engage in deeper reflective processes and already know adequate learning strategies to adapt their study behavior accordingly (Wirth, 2009). Otherwise, reflective prompts are too unspecific to guide students on how to *feed forward*.

Regarding procrastination, only confirmative feedback significantly decreased next day's procrastination compared to no feedback. Neither informative nor transformative feedback showed an effect, although both feedback sentences encompassed a strategy on how to *feed forward*. One explanation might be that these strategy recommendations (rewarding oneself or dividing goals into smaller sub goals) did not help reducing procrastination, or students did not apply the strategies. Moreover, while reasons for poor satisfaction with self-set goals and time schedules are rather straightforward, reasons for procrastination are manifold (Steel, 2007) and can originate from low self-efficacy (Wäschle et al., 2014), poor time management (Grunschel et al., 2013), or more stable personal characteristics, e.g., low conscientiousness (Theobald et al., 2018). Therefore, providing appropriate strategy recommendations would require a more detailed assessment of the specific reasons for current procrastination. This might also explain why feedback did not affect effort. According to the missing overall effect of feedback on effort, there was no effect of specific feedback sentences on next day's effort compared to no feedback. As already known from previous literature, effort praise is

only effective when it leads to a change in students understanding of the role of effort for successful learning (Schunk, 2012). Otherwise, effort praise provides little guidance on how to *feed forward*, which makes it largely ineffective (Hattie and Timperley, 2007).

To sum up, confirmative and transformative feedback seems to support students' monitoring and evaluation and might help them to draw conclusions for the next learning process in terms of a feedback loop (see Zimmerman, 2002). Confirmative feedback seems to encourage students that they are studying the right way and may lead to increased confidence and self-efficacy to do well. Further, confirmative feedback might guide students' attention towards behavior that they already implemented but maybe did not notice consciously, thereby helping them to maintain this behavior. Transformative feedback has the potential to support students if it is combined with effective strategy recommendations on how to *feed forward*. Effort praise alone did not affect SRL.

4.3. How should we feed forward?—study limitations and ideas for future research

Although the present study offers important insights on how feedback shapes daily SRL, future studies should address some research limitations.

First, we did not include a control condition without learning diaries, since we did not intend to investigate the effectiveness of learning diaries. Unexpectedly, pre-post comparisons showed that self-reported SRL significantly increased from t1 to t2. We do not know whether SRL improved due to the diary in terms of an intervention, or whether SRL increased because of the approaching examination phase, or whether the increase is a measurement artifact due to participants' habituation to the questionnaire items. Future studies should therefore explore how self-reported SRL develops over the course of a semester, and especially during the examination phase, as well as whether participants' self-reported SRL increases during second testing without any intervention.

Second, we were not able to validate students' self-report measures from the pre-and posttest as well as from the learning diary by means of objective learning outcomes (e.g., exam grades). Since our sample was very heterogeneous regarding study subject and semester, exam grades were hardly comparable across students. Future studies could sample within one specific class in order to be able to compare objective learning outcomes between students with higher and lower self-reported SRL and to investigate the effect of feedback and SRL on achievement.

Third, this study has been designed to investigate the overall effects of the feedback intervention on various components of SRL. By this means, we implicitly assumed that feedback affects every learner to the same extent. However, one instructional method is rarely best for all learners (Cronbach and Snow, 1977). Hence, considering interindividual differences in the effect of feedback on daily SRL constitutes a promising direction for further research. On which days and for whom is feedback especially helpful? A within subject variation of *feed back* and *feed forward* over time would provide a first step to answer this question. Further, this would allow disentangling the effect of feedback valence and the provision of *feed forward* since, in this study, strategy suggestions were only presented if students reported low self-regulation. In the same vein, it would be interesting

to investigate possible moderators of the effectiveness of daily feedback interventions as dropout analysis yielded a small trend that more self-efficacious students were more likely to cancel participation in the study. It might be that students who reported higher self-efficacy perceived daily learning diaries and feedback to be less helpful.

Fourth, based on our findings, a revision of the specific feedback sentences seems reasonable. Feedback should always include a concrete strategy recommendation in order to help students to *feed forward*. Moreover, some students reported in the qualitative evaluation at the end of the study that the feedback became boring over the course of the five-week intervention period, because formulations were similar. This might have caused some students to be less attentive or even skip the feedback. Future studies should therefore use a broad variety of feedback formulations even for one and the same construct (e.g., more than one confirmative feedback for procrastination). This might increase the subjective feeling that the feedback was really provided by a human being (as opposed to computer-generated) and that it was indeed specifically formulated for oneself.

Moreover, a drawback of the diary method is that it can be perceived as stressful for the participants to fill in a daily diary over an extended period of time, leading to increased dropout rates in empirical studies which makes it necessary to compensate the participants for their time investment (Bellhäuser et al., 2021).

Finally, although learning diaries are more proximate to the real learning behavior than trait questionnaires, one still has to keep in mind that they are a self-report measurement instruments that is not free from biases and distortions (Veenman, 2011). Thus, feedback in the present study has been generated based on self-reported study behavior and therefore relied on students' monitoring accuracy (Nelson, 1990). Since feedback can only be effective if the learner is willing and able to actually use the feedback (Timmers and Veldkamp, 2011; van der Kleij et al., 2012), the question on how to encourage students to consider the feedback seriously constitutes another avenue for further research. Nonetheless, the present study provides a novel approach to integrate automatized, adaptive *feed back* and *feed forward* strategies in students' daily life using a simple, parsimonious intervention.

4.4. Practical implication and conclusion

The results of the present study showed that automatic, individual process feedback carries the potential to foster daily SRL in an economic and cost-effective way. Process feedback that draws the learners' attention towards the relationship between the use of a specific learning strategy and their performance helped students to improve their daily SRL.

SRL constitutes a key competence at university, but not every student knows how to self-regulate studying most effectively. In light of an increasing number of students who decide to enroll at university, offering face-to-face SRL trainings and providing individual, timely feedback to every student is hardly possible. Therefore, online learning diaries and automatic feedback offer one solution to reach a large number of students. Further, university teachers could try to implement automatized online feedback into their courses. However, irrespective of the way feedback is transmitted (orally or written, online or face-to-face), teachers should design feedback that includes

all three components: *feed up*, *feed back*, and *feed forward* (Hattie and Timperley, 2007). Results showed that information on how to *feed forward* is crucial especially for students who are not satisfied with their learning outcomes. The design of effective feedback that fits situational demands and individual prerequisites of the learner constitutes a challenge for further research.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

HB originated the concept for the study and provided funding and refined the final version of the manuscript. MT and HB designed the interventions and conceptualized the study design. MT organized the data collection, performed the statistical analyses, and wrote the first draft of the manuscript. HB and CD provided feedback. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The role of emotions in educational processes: the conceptions of teacher educators

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The research shows that a very important part of initial teacher education is to reformulate the beliefs that student teachers bring with them from their school experience. These beliefs, which are intuitive in nature, deal with different educational topics and one area that is currently of great importance, due to the emotional turn that the educational system is experiencing, are the beliefs that student teachers hold about the role of emotions in educational processes. In a world full of views that portray emotions as discrete states that are separate from cognitive processes, it is a priority for initial teacher development to train future teachers to hold conceptions that consider the deep emotional-cognitive integration that exists in the human brain. At the same time, this process requires teacher educators (hereafter referred to as TEs) who hold conceptions on this topic that are aligned with the most current scientific knowledge on the subject. However, we do not know how the conceptions that TEs maintain on this topic are, since, until now, research on conceptions has focused on other types of educational topics. Considering the foregoing, this study aimed to evaluate the conceptions that TEs have on this topic, using a questionnaire of dilemmas that was applied to 68 TEs from different universities. The results obtained show that the TEs maintain perspectives on the role of emotions in the teaching and learning processes that oscillate between dualism and emotional-cognitive integration. In addition, it was found that TEs' perspectives tend to be more integrative when considering attitudinal learning than when considering verbal learning. Finally, the study shows that maintaining integrative perspectives is more difficult when educational situations involve emotions of positive valence that may constitute an obstacle for teaching and learning. The results are discussed, and a series of reflections are elaborated in order to analyze to what extent the beliefs held by TEs are adequate as a cognitive basis for reformulating the conceptions held by student teachers on this issue.

KEYWORDS

learning, beliefs, conceptions, teacher educators, initial teacher training, teaching, emotions, student teachers

Justification

Teacher training begins, informally, when future teachers enter the school system as students (Alliaud, 2007). This is what Lortie (1975) called “the apprenticeship of observation,” namely, the problem of having had a series of observational learning about teaching over a long period of time. According to Darling-Hammond (2006), this problem is one of the three main dilemmas that arise during the process of learning to teach. Because of this experience, a long and sustained

process of building up beliefs or conceptions¹ about education begins, which can be considered as an important part of the process of becoming a teacher. As educational research has shown, these beliefs play a role in the construction of teacher identity (García and Sebastián, 2011; Zembylas, 2018) and are closely related to the pedagogical practices that future teachers will develop (Ho et al., 2001; Bueh and Beck, 2015). For these reasons, the study of beliefs constitutes a prominent field of educational research that has achieved great development in recent years (Fortoul Olivier, 2008; Cárcamo and Castro, 2015; Fives and Gill, 2015). What are the beliefs about learning? (Pozo et al., 2006); how teachers conceive the intelligence of students? (Dweck, 1999); and what do they think about the role of emotions in educational processes? (Bächler Silva and Pozo, 2020). These are just a few examples of the wide range of topics addressed from the conceptual and methodological umbrella constituted by the study of teaching beliefs.

Implicit conceptions and initial teacher training

We are talking about conceptions that are acquired in a nonconscious way, this is the reason why some people refer to them as “implicit conceptions” (Pozo, 2008). On the other hand, as these conceptions do not have a symbolic or linguistic character and are distinguished, rather by their strong corporal nature, they are called “embodied representations” (Gibbs, 2006). These are sensations and images that have been stored in the procedural memory of student teachers, mainly because of their experience as students in the school system. In that place, observing the behavior of their teachers (and experiencing sometimes its negative consequences), they acquire a set of implicit beliefs about educational processes, beliefs that will later take part in the formal process of becoming teachers. In this way, once they are officially incorporated into the initial teacher training (hereafter referred to as ITT), future teachers will bring with them these conceptions, which will interact with the learning contents and educational processes that are developed there. This process will occur regardless of whether a particular training institution considers or not an explicit and specific design for this interaction, since it finally depends on the intrinsic characteristics of learning, a process that is always the result of this relation between the old and the new (Rodrigo et al., 1993, p.245; Catalán, 2011). Therefore, it is not correct to affirm that ITT starts from zero at the university, because, the prior educational background of student teachers shapes, for better and for worse, a part of the beliefs they will hold about education. Subsequently, once they are part of the professional environment, these beliefs will be triggered when they encounter educational scenarios that are familiar to them, playing a role in the pedagogical decision-making and taking part in the political process of social reproduction of education (Ginsburg and Newman, 1985). This process can be described as a sort of “endogamy” that hampers educational system change (Bachler, 2017). Especially in situations of uncertainty, when the complexity of the classroom does not allow for technically planned practices, these representations or beliefs will play

a predominant role in their practicing for even inexperienced teachers. Considering the above and the fact that the classroom is a place of permanent uncertainty and dynamism (Doyle, 1983; Torres, 1998) these representations can be understood as a key factor for the success of educational processes. Beliefs may be considered even more important than conveying expert knowledge (Tillema, 2000).

Despite the relevance of these beliefs, they are not often considered as a specific topic of work during ITT and therefore, they do not change during this process (Wideen et al., 1998). Richardson (2003) points out that the process of making held beliefs explicit is critical. On the contrary, it seems to be tacitly assumed that the process of becoming a teacher is one of an exclusively explicit nature that consists of “filling” student teachers with new knowledge as if they were empty jars, devoid of previous educational background. It is a perspective that recalls behaviorism and its conception of the mind as a clean slate since it comprehends teacher training as an additive process, which overlooks the person, his or her history and the relation he or she has with the environment (Feiman-Nemser and Buchmann, 1989). However, it would be desirable for ITT to consider an analysis and reworking of the meanings associated with the school experience of prospective teachers with the object of “releasing” them from the conditioning of their prior educational background. The first step for this change is to make explicit the educational conceptions that student teachers bring with them to ITT. Otherwise, the preservice teachers will incline in favor to their conceptions over the new knowledge (Egloff and Souvignier, 2020). Subsequently, there will be an interaction between these conceptions and the learning contents that shape the professional training. As Britzman (1991) points out, it is through a dialog between past and present voices that future teachers will be able to find their own voice as educators. In the words of Pozo (2008), this process consists of representatively rewriting these beliefs, thus constructing new meanings about education. The aim will be to bring to consciousness these experiential and intuitive representations, to give them an explicit and symbolic format by passing them through the sieve of the most updated knowledge on each educational topic particularly. When this happens, the representations will be decoupled from the educational situation that gave rise to them, thus transforming them into real theoretical knowledge, which can be applicable to different types of pedagogical contexts (Pozo, 2008). However, the process of changing the conceptions that student teachers bring to training is an arduous one and, contrary to the common sense associated with this topic, it does not consist solely and primarily of presenting logical arguments (Richardson, 2003). On the contrary, the presentation of logical arguments as the only strategy of intervention for changing conceptions may occasionally result in a sense of threat to the personal identity of students, a threat from which they will seek to defend themselves by weakening the strength of the arguments. In the words of Frijda and Mesquita (2001), “beliefs renders evidence powerless” (p. 45). Probably, this situation stems from the most fundamental fact that the ontology of implicit beliefs is ultimately emotional and not exclusively symbolic. Consequently, as stated Egloff and Souvignier (2020), changing beliefs during the ITT is a process in which emotions play a key role. Considering all the above, it can be understood that the process of changing the conceptions held by student teachers during the ITT involves a delicate balance between fostering affective states that are consistent with the proposed goals of change and, on the other side, accompanying the process through reflections that

¹ In this study we use the terms “conception” and “belief” as synonyms.

guide in a certain direction, also giving greater depth and control to the changes that are achieved (Smith, 2005). This requires that TEs have emotional and cognitive skills that can be brought into play during the process of teaching and learning. Among the emotional skills, it is desirable, for example, to be able to propitiate an environment of trust that is non-threatening to students in order to facilitate the expression of their points of views as freely as possible, given the significance that this has for learning (Coll et al., 2001). In the same vein, it seems convenient that teachers are able to read the non-verbal language of their students during the training process so as to modulate their own behavior according to this information. On the other hand, from a cognitive view, it is necessary that TEs develop explanations that make sense in the light of the perspectives held by the learners or, in other words, that they are able to build bridges between the new and the old and therefore avoid a “collision” between the two domains that would mean a rejection of the new information by the learners. Otherwise, in case of no adequate mediation of this process, student teachers are likely to remain tied to their earlier school experience and pedagogical action becomes, outdated due to its attachment to past experiences that lead it to lose the freshness and spontaneity of a conscious practice connected with the present (Naranjo, 2016).

The conceptions and the role of teacher educators

Of course, the process of change we are aiming to occur, requires TEs who are aligned with the knowledge and skills to be achieved during ITT. Among the most important factors that influence the quality of higher education are the conceptions that teachers have about teaching. These conceptions influence teaching action and have a direct impact on students’ own academic performance and learning outcomes (Grácio et al., 2023). This is a difficult point to achieve, since among the professionals in the teams that train future teachers there are people with different specialties and experiences, which presuppose the existence of different types of educational conceptions (Alvarado, 2006). On the other side, we are talking not only about the need for the TEs to know the topics on which it is sought to train future teachers, but also to believe in them in an implicit, emotional, and deeper sense. Only when this happens is it feasible for TEs to implement pedagogical practices in their own educational space that are coherent with this focus and thus impact on the conceptions of their student teachers (Thomson and Palermo, 2014, p. 59). Otherwise, even if they are “updated” with the most current theories and techniques on a particular educational subject, their own practice as trainers is likely to “betray” them and lead them to implicitly communicate messages that are contradictory to what is explicitly and verbally stated (Riquelme, 2000; Watzlawick et al., 2002; Ng et al., 2010; Kelchtermans and Deketelaere, 2016). We do not have to forget that every educational process, even those at a higher level such as doctoral studies, always and inevitably involves implicit aspects that are not officially acknowledged in the curriculum (Beard et al., 2007; López-Goñi and Goñi-Zabala, 2012; Cotterall, 2013). Among these aspects, the non-verbal communication that teachers express during their pedagogical practice constitutes a central element of the educational process since it participates, most of the time involuntarily and unconsciously, in the shaping of the meaning attributed to what

is expressed. This is due to the emotional character of that part of the communication, which acts as a kind of comment or meta-communication with respect to what is said verbally (Konar and Chakraborty, 2015) thus implicitly suggesting the way in which the message should be understood (Dimberg et al., 2000).

The emotional education of student teachers

As we have affirmed, the topics examined in the previous section correspond to aspects that can occur in any teaching and learning process, regardless of the level of education involved. In school education as well as in undergraduate and postgraduate professional training processes, the non-verbal and emotional language associated with teachers’ implicit beliefs will always be a central dimension of everything that happens in the classroom. Certainly, the same happens during initial teacher training and, especially, when the content to be taught refers precisely to the role that emotions play in educational processes. We refer to a topic which is beginning to be considered with increasing depth within the ITT (Kelchtermans and Deketelaere, 2016; Bächler et al., 2020; Dernikos et al., 2020; Masse-Lamarche et al., 2022) due to the emotional turn that education is experiencing worldwide (Anzelin et al., 2020; Costa Rodriguez et al., 2021). In addition, because of the greater awareness of the role of emotions in educational processes after the pandemic generated by COVID-19 (Granda Granda and Granda Carrión, 2021) it seems more important than ever to promote among future teachers a renewed view on this topic that is aligned with current scientific knowledge on emotions. In this respect, an element that seems essential to consider is the recognition of the close interweaving of cognitive and affective processes (Gu et al., 2012; Bächler et al., 2018; Dejene, 2020; Bächler and Salas, 2021) and, therefore, the immanent presence of emotions in every educational process. If we want to develop an education that recovers its social and human character by abandoning the Taylorist, technicist, and standardizing visions that have caused so much damage to our education, we need a new generation of teachers who believe that emotions are at the core of every teaching and learning process and who develop pedagogical practices that break with the endemic emotional-cognitive dualism in our society and school systems (Searle, 1996; Claxton, 2005). This change implies promoting the idea that emotions are not only relevant when considering learning attitudes or learning about how to develop harmonious social relations at school, as seems to be the predominant point of view among our educators according to some studies (Hargreaves, 1998). On the contrary, it is a matter of understanding that even learning with a high symbolic content, such as mathematics, is based on the characteristics of our bodily and sensory structure, and therefore has an affective dimension associated with it (Gill and Hardin, 2015). On the other hand, a very important aspect of this paradigm shift implies that future teachers modify that idea so anchored in the common sense of our society that divides affection into positive and negative, understanding that this corresponds to an ontology lacking scientific support (Cabanas Díaz and González-Lamas, 2021) that has been encouraged by economic and political ideologies that conveniently seek to promote only one type of affectivity (Davies, 2016). This conceptual change also requires an awareness of the fact that educational culture is colonized

by the emotional intelligence (Ciarrochi et al., 2000; Penalva, 2009), which has become the hegemonic paradigm when it comes to analyzing the role of affections in educational processes (Menéndez, 2018). Almost 30 years after the introduction of this model in our schools, this approach has ended up being an epistemological obstacle that makes it difficult to appreciate other ways of understanding the role of emotions in educational processes, reducing the role of affectivity in teaching, and learning to a problem consisting of learning how to control emotions. This is an ideology that is encouraged by another pseudo-science, the positive psychology, which confuses the subjective phenomenology of affective states with their adaptive nature, resulting in the idea that it is only possible to teach and learn from pleasant emotional states (of positive valence). The resulting coupling of these two viewpoints constitutes a perfect storm that distorts not only our ideas about emotions but also, more seriously, impacts on our conceptions of learning, reinforcing the idea that knowing is a representational and objective process where the subject and the object of the process are irretrievably separated (Atkinson and Claxton, 2010).

Teacher educators are the ones who possess the key to bring about this epistemological change, given the privileged position they have to intervene in the beliefs of future teachers, as it has been analyzed. Nevertheless, as we have exposed, for this to happen, it is first required that they themselves hold beliefs, about the role of emotions in educational processes, that are aligned with the most updated scientific knowledge on this area. In this context, knowing the conceptions or beliefs that they hold about this topic is the starting point for the whole process of change that we have been describing in the previous sections of this paper. However, paradoxically, since the labor of TEs is a recognized fact in education, the empirical research about professional living conditions of TEs has not had a substantial development. As mentioned by Vanassche and Kelchtermans (2014) “empirical research focusing directly on the professional lives and needs of teacher educators—those who teach teachers—remains scarce” (p. 117). Furthermore, in this general context of lack of studies on TEs’ characteristics, research on the conceptions that they hold has not mostly touched on emotional issues. On the contrary, these have focused preferably on cognitive aspects, such as the conceptions about teaching and learning process (Pozo et al., 2006; Grácio et al., 2023), the conceptions about the assessment of educational processes (Monteiro et al., 2021) or the conceptions about the intelligence of the students (Dweck, 1999) among others.

However, in recent years, the specialized literature has begun to highlight the need to address emotions in the study of conceptions:

We can no longer allow ourselves to ignore emotion when discussing teachers’ beliefs about learning [...]; therefore, we suggest that research on teaching include an examination of the teachers’ emotions, alongside their beliefs, instead of separating these two fields of research, as is currently done in educational research (Gill and Hardin, 2015, p. 240).

To make progress in this knowledge, we need a model that enables us to identify different points of view on this field and, ideally, to be able to make comparisons with the perspectives held by other educational agents, such as student teachers and teachers in the school system. We discuss this issue in the next section.

Conceptions of the role of emotions in educational processes

During the last decade, we have been engaged in the task of finding out what conceptions or beliefs teachers hold about the role of emotions in teaching and learning processes. This is not a study of conceptions about emotions (Tamir et al., 2007) or beliefs about learning as a cognitive process (Pozo et al., 2006). Our aim during this time has been to understand the conceptions that educators maintain over the way in which emotions participate in teaching and learning, on the understanding that, in the brain and the human mind, there is a close interweaving between emotional and cognitive processes (Duncan and Barrett, 2007; Pessoa, 2013). With this in mind, we started by identifying the viewpoints that might exist among teachers regarding this theme through a qualitative study (Bächler and Pozo, 2016). This research allowed us to identify different beliefs that teachers hold about the role of emotions in educational processes, which were named “behavioral reductionism” (hereafter referred to as BR); “influence of emotions on cognition” (hereafter referred to as IEC) and “emotional-cognitive integration” (hereafter referred to as ECI).² Regarding the first conception, BR, this is a view that does not differentiate between emotions as subjective and private mental states and their associated behaviors. For this reason, when teachers who hold this perspective refer to affections, they use behavioral terms, pointing out, for example, that to be sad is to cry, as well as to be happy is to laugh. The second conception, IEC, refers to an approach, which assumes that all learning processes, including those that involve subjects with a high symbolic level dimension such as mathematics or history, are influenced by emotional states that students experience when they learn. This influence, however, is conceived in a simplified way based on the valence of emotions. From this approach, it is assumed without further hesitation that any emotion, of a pleasant nature or positive valence, is always a context that facilitates learning and, on the contrary, any unpleasant or negative affective state is, unequivocally, conceived as an obstacle to learning. This point of view is supported by an understanding of learning as a strictly cognitive process in the representational sense of the term (Fodor, 2001) and, therefore, it does not involve the participation of emotional aspects. Finally, the third conception, ECI, corresponds to a point of view, which, unlike all the previous ones, considers learning as an intrinsically emotional process. In this case, it is a perspective that understands that learning starts from an experience in the affective sense of the term. In this way, knowledge is conceived as the result of a reformatting process of sensations, emotions, and other affective and qualitative states, which constitute the starting point of knowing (Bachler, 2019). From this point of view, there is no ontological separation between emotional and cognitive states, in a line that is consistent with some neuroscientific perspectives that refer to a deep intertwining between these two types of phenomena in the brain (Damasio, 2001; Duncan and Barrett, 2007; Pessoa, 2013). On the other hand, given in this point of view that emotions are a central element of learning, the

² The study identified four different perspectives; however, one of them was excluded later, for being considered that it could be understood as a specific scenery in new studies.

valence of affections is not a determining aspect of this process, because it is considered that both, pleasant emotions (of positive valence) as well as unpleasant states (of negative valence), can be a starting point to learn. Once the main viewpoints held by educational agents on the role of emotions in educational processes were identified and described, we carried out a second study aimed at finding out how these conceptions were distributed among a large and diverse sample of primary school teachers, from different universities, and with different sociodemographic characteristics (Bächler and Salas, 2021). To achieve this goal, we designed a questionnaire of dilemmas, a type of instrument that had already been used successfully in previous studies on conceptions. This research showed us that the influence of emotions on cognition (IEC) was the most widely accepted viewpoint among teachers, at the same time, there was a strong rejection of behavioral reductionism (BR), and a relatively neutral position toward emotional-cognitive integration (ECI). Subsequently, through a more limited study at a university, we investigated how these conceptions were reflected by first-year students of primary education (Bächler and Salas, 2021). In contrast to the case of practicing teachers, this time we found that the preferred conception by students was BR, followed by IEC, accompanied by a significant rejection of ECI.

Even though the two studies are independent from each other, the differences in the distribution of the conceptions give the opportunity to reflect on how teacher education could be a variable that substantially modifies these conceptions. Additionally, as we have previously discussed, it is also likely that the actions of TEs become a key factor in this change. For this reason, among others, the following study was designed with the aim of finding out what conceptions about the role of emotions in teaching and learning processes prevail in teacher educators.

Materials and methods

The aim of this study was to assess the conceptions of teacher educators about the role of emotions in the teaching and learning process. The study uses an exploratory and quantitative approach with a descriptive cross-sectional design (Johnson et al., 2007) in order to characterize the conceptions of teachers and identify the profiles of teachers' conceptions on the role of emotions in initial teacher training.

Specific objectives

1. To determine which conceptions are preferred and which are rejected by TE.
2. To analyze and describe the differences between the conceptions held by teachers according to the type of learning content (verbal or attitudinal) to which emotions are associated.
3. To identify and describe conceptions profiles about the relations between emotions and the teaching-learning process.
4. To analyze and describe differences between the identified profiles according to the type of response they express toward emotions of negative and positive valence.

Participants

The design of the sample was non-probabilistic by convenience, and it comprised 68 teachers who are teacher educators of primary education pedagogy from four universities in Chile, with an average age of 50 years and an average professional experience as TEs of 15.9 years. The inclusion criteria considered were:

- Teachers with an academic career in primary education.
- Teachers from universities belonging to the Council of Rectors of Chilean Universities.
- Classroom teachers.
- Teachers with at least half-time teaching experience in universities.

At the same time, teachers who hold head positions in teaching careers were considered as an exclusion criterion.

Table 1 presents some other characteristics of the sample.

Instrument

To assess conceptions, the study used a questionnaire of dilemmas, a type of instrument that had already been successfully applied in different conception studies (Vilanova et al., 2007; López et al., 2010). In this case, given that what was assessed were conceptions about the role of emotions in teaching and learning processes, we used an instrument that had already been considered for these purposes with a sample of primary school teachers (Bächler Silva and Pozo, 2020) and another with student teachers (Bächler and Salas, 2021). The questionnaire consists of 12 dilemmas that present educational situations where emotions are involved. For each dilemma, three response options are offered, each associated with one of the following conceptions about the connections between emotions and the teaching-learning processes previously analyzed: behavioral reductionism (BR), Influence of emotions on cognition (IEC), and Emotional-cognitive integration (ECI). Each participant was asked to choose the option they liked the most and the option they liked the least. This ranking allowed the responses to be tabulated by assigning a score of +1 for the preferred option and −1 for the rejected option; the option left blank was scored as zero. On the other side, the instrument included two evaluation scales that enabled us to assess the existence of differences in conceptions according to the learning content in question. The first, consisting of four dilemmas, was called “students’ emotions and their relation to learning attitudes.” The second, consisting of eight dilemmas, was called “students’ emotions and their relation to the

TABLE 1 Sample characteristics.

Initial training	Disciplinary subjects	Pedagogical developments subjects	
Number of teachers	32	36	
Postgraduate training	Post title	Master	Doctorate
Number of teachers	9	40	19
Gender	Female	Male	
Number of teachers	35	33	

learning of verbal contents.” Each scale consisted of an equal number of dilemmas with emotions of positive and negative valence, which made it possible to compare if there were differences in conceptions according to the phenomenological “tone” of the emotions involved. In addition, to gain a deeper understanding of some features of the conception ECI when learning verbal content, two different types of items with emotions of positive valence were considered in the second scale. The first one proposed a situation under which such emotions could become an obstacle to learning, which implied that the teacher adopting an ECI conception should help the learner to realize the “risks” involved in feeling good in this scenario. Since, in this case, the option associated with the ECI conception involved decreasing the intensity of an emotion of positive valence; the maneuver was called “emotional inhibition for knowledge.” The following item is an example of this type of situation with the ECI response option highlighted in bold.

Maria is a student who is on risk of not achieving the minimum mark to pass English, because of not studying hard enough. However, in the assessment of this week, Maria has improved her grade slightly, so she is now happy and confident about her chances of passing the subject. In view of this situation, the teacher in charge:

Response option ECI (Emotional inhibition for learning): Increase the level of demand on Maria to help her realize that her confidence can play tricks on her.

The response option associated with the conception ECI consists, in this case, of an action carried out by the teacher that aims to modify the affection of the student. The idea is to “take” the student from a state of high intensity of positive valence to a state of lower intensity or even unpleasantness. The purpose is to facilitate an awareness of the “cognitive risks” associated with confidence along the same line of some authors who warn about a loss of attention to details when experiencing high intensity of pleasant emotions (Stein and Jewett, 1986; Anaya-Durand and Anaya-Huertas, 2010).

The other type of item with emotions of positive valence, that was included in the second scale of the questionnaire, considered situations in which teachers who adopted a conception of emotional-cognitive integration should take advantage of the pleasant affective state of students as a platform to deepen their learning. This modality could be implemented by increasing the level of complexity of the content or by extending its domain to other associated aspects. In both cases, it was a matter of using positive affect as a “trigger” to make the process more complex. Due to the above, in this case we call the response option associated with the conception of ECI “Deepening learning through emotions”. The following item is an example of this context:

The students are in science class working in the laboratory. During the session, the teacher notices that some students are restless due to their enthusiasm for experimenting with chemical transformations of matter. In response to this situation, the teacher decides:

Response option ECI (Deepening learning through emotions): Use the enthusiasm to deal with some aspects of science experimentation despite taking some extra time from other content development.

Data analysis procedures

The work considered different analysis procedures. Previously, it was carried out an analysis using Kolmogorov–Smirnov Z-test to assess whether the variables considered in the study were normally distributed or not and, consequently, to determine the most appropriate type of statistic (parametric or non-parametric) for each analysis. Then, the following steps were taken.

To obtain an overall view of the acceptance or rejection of the conceptions expressed by the participants, the average responses to the entire questionnaire were calculated. Subsequently, we used a Wilcoxon test to determine if the differences between the obtained averages for each conception were significant or not. Secondly, to find out if the degrees of acceptance or rejection for each conception varied according to the different learning contents, the procedure described above was repeated, this time comparing the averages expressed for each conception on each of the two scales considered by the instrument using U Mann–Whitney test. Thirdly, we applied a multivariate technique, particularly, non-hierarchical cluster analysis, to identify the existence of groups of participants with differentiated responses that could be interpreted as conception profiles. Finally, seeking a deeper understanding of the differences between the more and less complex profiles, two specific analyses were carried out. The first was a comparison of responses between profiles according to the valence (positive or negative) of the emotions involved in the dilemmas. The second was a contrast of the degrees of acceptance or rejection expressed for each of the two specific maneuvers described above in the case of the ECI conception (deepening learning through emotions or emotional inhibition for learning). In the last two cases, the statistical test used was U Mann–Whitney.

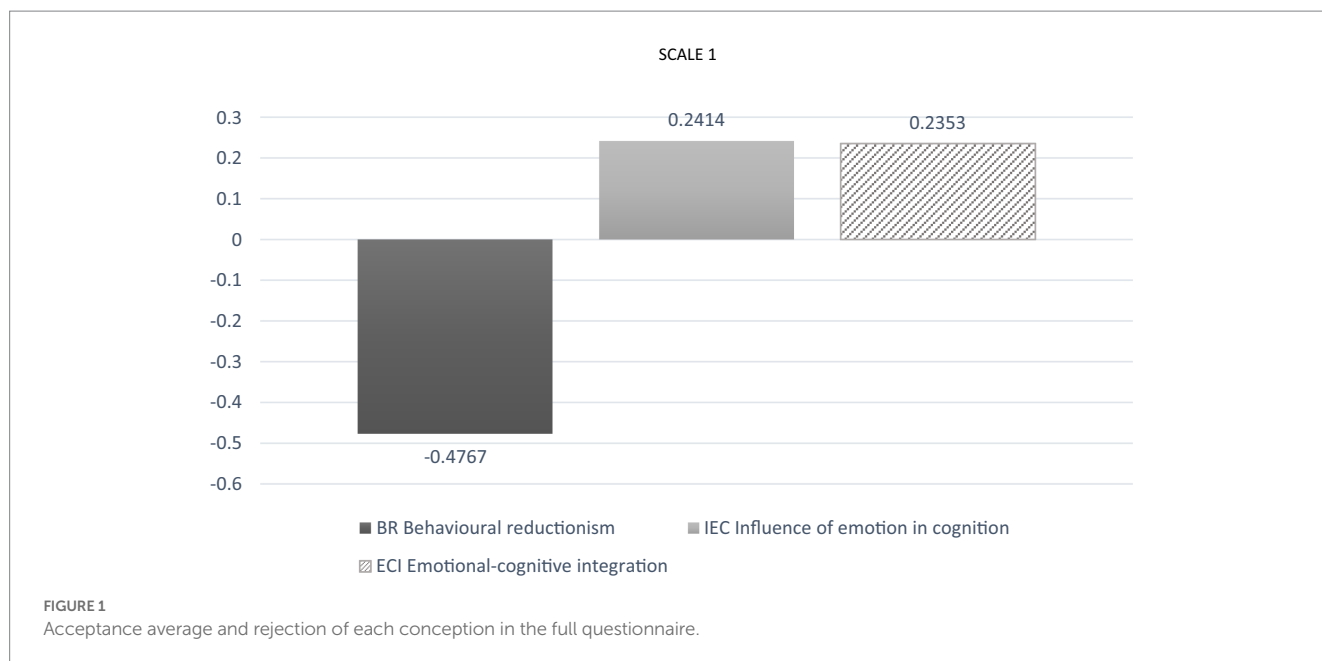
Results

The analysis using Kolmogorov–Smirnov Z-test shows an atypical behavior in the sample ($p > 0.05$). For this reason, most of the results presented below were obtained using non-parametric statistics. At the same time, we applied multivariate statistics.

Results associated with specific objective 1: which conceptions teachers prefer and which they reject

The results of this analysis are presented in Figure 1.

When considering the overall results obtained from the implementation of the questionnaire, without separating the responses per scale, the comparison shows that the average number of responses in relation to the BR conception is different from the average number expressed for IEC and for ECI ($p = 0.001$). However, no differences are



detected for the comparison between IEC and ECI. The above allows us to affirm, firstly, the “behavioral reductionism” conception is the most rejected of all those evaluated. However, the conceptions “influence of emotions on cognition” and “emotional-cognitive integration” share the first place of preferences among the participants in the study ($p=0.001$).

In the following subsection, we will go deeper into the analysis of the previous trends through the results referring to the preferred and rejected options by the participants, this time, in the different scales of the questionnaire.

Results associated to the specific objective 2: analysis of conceptions according to the type of learning content (verbal or attitudinal) to which emotions are related

The results of this analysis are presented in [Figure 2](#).

The analysis of the data shows a greater rejection of the behavioral reductionism conception when considering the learning of attitudes vs the learning of verbal content ($p=0.000$).

In contrast, when considering the learning of verbal contents, there is a significantly higher acceptance for the IEC position, influence of emotions on cognition, compared to the level of acceptance reached for this option when considering the learning of attitudinal contents ($p=0.001$). The above data show a tendency to consider emotions like a context of learning when it comes to learning verbal contents, a situation that is not appreciated when it comes to learning attitudinal contents.

At the same time, there are significant differences between the averages obtained for the ECI option, emotional-cognitive integration, when comparing the responses that are produced taking into account the learning of attitudinal contents vs. the learning of verbal contents. In the first case, there is a tendency toward acceptance of this option, while in the second case, the tendency is toward rejection ($p=0.000$).

The participants tend to consider an integration of emotions and cognition when learning attitudes, a conception that is rejected when considering the learning of verbal contents.

In summary, there is a tendency to acknowledge the role of emotions as the center of the learning process, (ECI conception, “emotional-cognitive integration”), when considering the learning of attitudes, rejecting the possibility of reducing affect to its associated behaviors (BR conception). On the other hand, when considering the learning of verbal content, the tendency is toward the consideration of emotions as the context of this process, their role being valued in terms of the valence of the affections (IEC conception, “Influence of emotions on cognition”).

Results associated to the specific objective 3: identification of conception profiles

As previously indicated, the third objective of this study was to explore if all the information gathered in the preceding phases, was somehow organized into different profiles of conceptions about the role of emotions in learning processes.

In response to this point, multivariate statistics were accomplished, specifically, a series of cluster analyses using K means based on the results obtained for Scale 2, “Emotions of students and their relationship with the learning of verbal content.” The analysis of this scale was carried out understanding that this scale, being related to verbal learning, best represented the main goals and the most common type of activities in the school system, over and above any qualms that might be made about these aspects.

Regarding the results, different possibilities were considered in view of the number of clusters to be proposed, finally opting for a classification into three groups, which were interpreted in terms of conception profiles. The decision of considering three clusters was due to the fact that this number not only coincided with the conceptions addressed in the study, but also allowed for a better

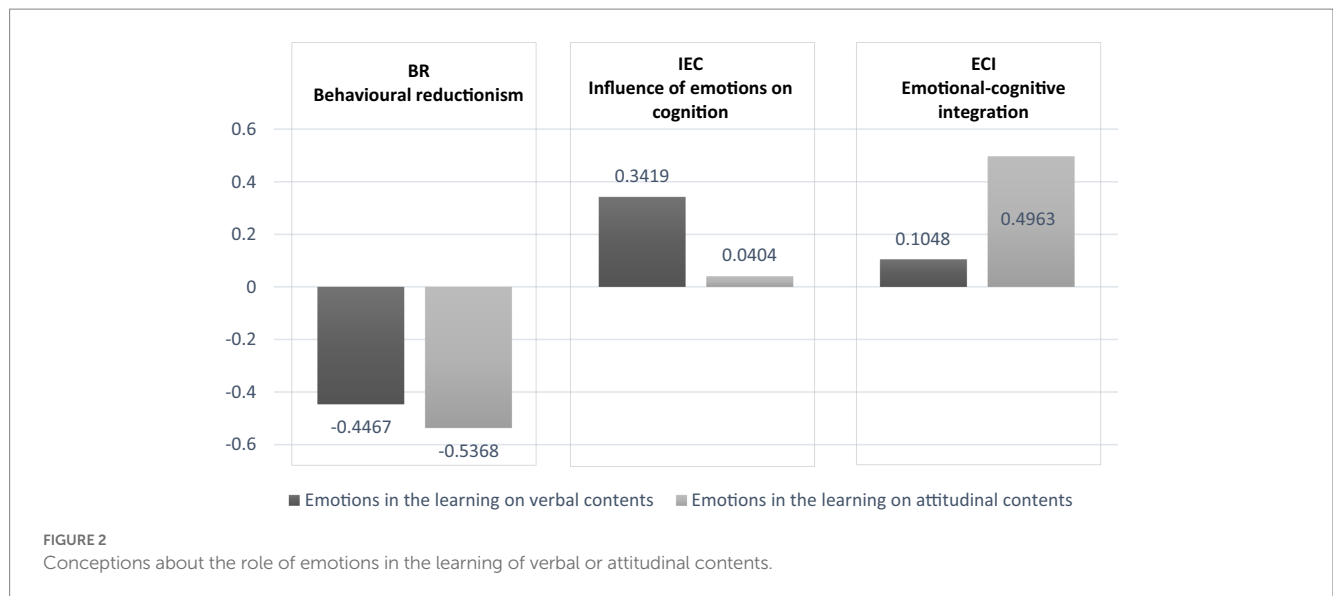


TABLE 2 Clusters resulting from the classification with the responses on Scale 2.

	Cluster 1 (16 cases, 23.52%)	Cluster 2 (21 cases, 30.88%)	Cluster 3 (31 cases, 45.59%)
Behavioral reductionism average	−0.06	−0.56	−0.57
Influence of emotions on cognition average	0.36	0.52	0.21
Emotional-cognitive integration average	−0.30	0.04	0.35
First-choice tendency			
Second-choice tendency			

examination of differences regarding the degrees of rejection and preference for the conceptions. Apart from this, once the clusters to be considered had been determined and the general characteristics of each one had been described, a new analysis was carried out to compare, in a specific way, the two largest and most complex of them. For this purpose, first, the modes of response of each cluster toward the dilemmas of negative valence were analyzed. Subsequently, it was made an examination of the way of dealing with the two kinds of response associated to the ECI conception in items of positive valence emotions (emotional inhibition for learning and deepening learning through emotions).

Details of the results obtained for each of the analyses mentioned above are presented below.

K-means cluster analysis considering three groups

The K-means clustering process allowed the grouping of participants within three clearly differentiated profiles, as can be seen in Table 2, with the first-choice tendency highlighted in darker gray, and the second one in a softer tone.

The main characteristics of each cluster, interpreted as conception profiles, are presented below.

- Profile 1: “Influence of emotions on educational processes: Emotions as a context for learning processes” (16 cases).

It corresponds to a profile that mostly follows the conception “influence of emotions on cognition” with a neutral attitude toward “behavioral reductionism” and shows a clear rejection of “emotional-cognitive integration.” This is the most basic conglomerate emerged from the analysis and corresponds to a profile that tends, on some occasions, to ignore the mental status of emotions by reducing affect to its associated behaviors (BR conception). However, the position, that is most frequently adopted by participants who adhere to this profile, would be to consider emotions as the context of learning processes (IEC conception), although this implies a recognition of the role of affections on cognitive processes, it is a perspective that is grounded in a cognitive-emotional dualism. Furthermore, from this point of view, the role of the valence of emotions on learning processes is considered in a simple way, since it is assumed that any pleasant emotion is favorable for learning, while, on the contrary, unpleasant “tone” affects are unequivocally conceived as obstacles to this process.

- Profile 2: “Transition toward emotional-cognitive integration” (21 cases).

This is a profile that shares with the previous one, a major preference for the “Influence of emotions on cognition” conception. However, in this case, unlike the first one, there is a position of firm rejection of “behavioral reductionism” accompanied, moreover, by a neutral position toward “emotional-cognitive integration.” The above implies that, in some situations, teachers who adhere to the second profile consider learning as an affective process, without making

ontological distinctions between emotion and cognition (ECI conception) and they also value the role of affections in the learning processes beyond their valence. Given the above characteristics, this profile can be considered as a stage of probable transition toward the more complex profile described below.

- c. Profile 3: “Emotional-cognitive integration: emotions as the core of learning processes” (31 cases).

The third profile exhibits a strong preference for the most complex conception of all those considered in this study (ECI conception), followed by an appreciation of emotions as a context of learning processes (IEC conception) and a clear rejection of the BR conception. The foregoing information can be interpreted as affirming that TEs adhering to this profile maintain a perspective on learning as an emotional process, thus diluting the cognitive-emotional dualism that features the previous profiles. From this point of view, it is understood that to feel is to learn and, therefore, the role of the valence of emotions involved in cognitive processes leaves the scene, giving rise to the idea that any emotional state, regardless of its subjective phenomenology, can be the beginning of a learning process.

A characteristic that the different profiles identified have in common is that they all present, on one hand, a main point of view or tendency to value the role of emotions on learning processes, accompanied, on the other hand, by a secondary perspective. This means that the first profile is predominantly under the IEC conception, but secondarily under the BR conception, while the second profile is predominantly under the IEC conception, but with a preference for the ECI conception in some cases. And the third profile reverses the trend of the previous profile with a stronger preference for the ECI perspective followed by a less robust appreciation of the IEC conception. This characteristic of the profiles is interesting, especially if we assume the conceptions studied as a progression from simpler to more complex positions, as actually proposed in different studies (Pozo et al., 2006; Scheuer et al., 2010; Bächler and Pozo, 2016). With this logic in mind, it is possible that the differences between the profiles can be explained by some of the characteristics of the educational situations, which were part of the dilemmas in the evaluation questionnaire. In other words, it is possible that certain features of the dilemmas make it easier or more difficult for the participants in the study to adopt more complex perspectives to assess the role of affections in learning processes. In relation to this point, it seems especially relevant to know what kind of characteristics of the dilemmatic situations could indicate the turning point that facilitates a shift from preferring IEC followed by ECI (profile 2), toward one in which this relationship is reversed, transforming the conception of emotional-cognitive integration into the predominant point of view (profile 3). In the following section, two possible characteristics of dilemmatic situations that could be related to this point are analyzed.

Analysis of the differences of response between profile 1 and profile 2 toward ECI conception

Considering the methodological design of our study and the characteristics of the instrument used, there are two aspects that can be considered to examine the issue described above. The first consists

of an investigation of the possible differences in response to the ECI conception that might exist between profiles 2 and 3 according to the type of valence of the emotions involved in each dilemmatic situation. The second corresponds to an evaluation of possible differences with respect to the way of weighting the more complex conception (ECI) when the dilemma offers two different response alternatives associated with this conception, namely, emotional inhibition for learning and deepening learning through emotions.

Regarding the first, when comparing response tendencies to the ECI preference in items with emotions of negative valence, vs. those consisting of situations where emotions of positive valence are involved, we observe that for both profiles it is more difficult to adopt the ECI conception when the dilemmas contain emotions of positive valence ($p=0.002$). Nevertheless, when comparing the average number of ECI responses on the positive valence items for each profile, it is observed that profile 3 expresses a less intense rejection of the ECI position compared to the degree of rejection that profile 2 expresses on these items ($p=0.001$). For this reason, we decided to “focus” on these items in order to find out which of the two specific types considered in this study for the ECI option, deepening learning through emotions or emotional inhibition for learning, represented a greater problem when choosing this option in each profile. The results of the analysis show that, for both profiles, there is a lower probability of choosing the ECI conception when the ECI response option is emotional inhibition for learning ($p=0.001$). However, when comparing the degrees of rejection of this option in each profile, we find that it is higher in profile 2. In other words, those who adhere to profile 3 have less difficulty in accepting the maneuver called “emotional inhibition for learning” when choosing the ECI conception.

Discussion and conclusion

In the following, some of the reflections that emerge from all the work carried out are presented. This section has been organized into three parts. The first refers to general questions linked to the importance of the topic studied and the possibilities for the development of the line of research proposed by the study. The second part presents reflections directly related to the results obtained in order to facilitate their interpretation. Finally, it is offered an appreciation of the limitations that the work carried out presents.

General reflections

As analyzed in the foundations of this study, the previous literature about conceptions of TEs is scarce, therefore, it can be stated that this study contributes to the comprehension of a topic that despite its relevance, has not been examined in sufficient detail. This situation is further enhanced by the fact that it deals with conceptions of the role of emotions in educational processes, a topic that is becoming increasingly significant in education. Simultaneously, it is necessary to highlight the importance of having studied the conceptions that TEs have about emotions and their role in educational processes based on a perspective that is different from the one promoted by the educational establishment of emotional intelligence and positive psychology (Menéndez, 2018), given the dualistic and reductionist characteristics that these approaches

propitiate as we explained. In the same way as occurs with the change in educational systems, which in part involves a modification of the conceptions of the different educational agents, it seems pertinent to reflect on the perspectives held by researchers and how these can contribute to strengthening the status quo of education. Current studies on the evolution of scientific knowledge over the last decades point out that science is, in general, becoming increasingly disruptive (Park et al., 2023), a situation to which educational research does not seem to be oblivious. In this context, although we are currently experiencing an emotional turn in education (Dernikos et al., 2020), a trend that, *a priori*, can be assessed as positive, since it breaks the historical denial of emotions in our culture, no less true, as analyzed, is the fact that this turn is colonized by approaches lacking the necessary scientific substantiation required by educational practices based on evidence. In this scenario, if we wish to move in a new direction, we need research that, along similar lines, addresses the emotional dimension of teaching and learning processes without the biases of emotional intelligence and positive psychology.

On the other hand, along with highlighting the importance of the study carried out, it is also necessary to point out that further research on the characteristics of TEs in general is required, beyond the study of the conceptions they hold about the role of emotions in educational processes. How is it possible that a large amount of research is carried out with practicing teachers in the school education system and no equal or greater attention is devoted to understanding the characteristics of those who train these educational agents? Substantial improvement in the quality of future teachers may not be possible if we do not begin by first understanding, which aspects should be part of TEs training. In relation to this point, there are some studies that identify subjects that should be compulsory topics in training (Goodwin and Kosnik, 2013), but there are also others that affirm that there are no essential topics in this regard (Ping et al., 2018). The study of educational conceptions held by TEs is probably a good starting point for moving toward greater consensus on this issue.

Finally, it seems evident that a step forward in the development of the line of research that this paper proposes is the analysis of the eventual relationships between the conceptions held by TEs and the pedagogical practices that they implement in their classrooms. On this point, it is pertinent to wonder whether there is any association between the profiles of conceptions found and different affective skills in the TEs. Since the literature reviewed shows that logical argumentation is not sufficient to change the conceptions of student teachers, it is desirable that those TEs who hold more complex conceptions about the role of emotions in educational processes accompany their perspectives with emotional skills that allow for a greater formative impact among their students. Future studies should undertake research in this area.

Reflections about the results

Overall response trends

The work carried out has allowed us to obtain, first, an overall assessment of the conceptions preferred and rejected by TEs that participated in this study. On this point, it is strikingly positive that the trends found reflect, in first place, a clear rejection of the

most basic of all the conceptions considered in the study, “behavioral reductionism,” as well as similar degrees of adherence to the more complex conceptions “influence of emotions on cognition” and “emotional-cognitive integration.” These results are heartening since, if we assume that the TEs are mainly responsible for eventual epistemological changes in future teachers, then it is necessary that they hold more complex positions than those brought by student teachers who, according to the only study done so far, show a significant adherence to behavioral reductionism for this group (Bächler and Salas, 2021). In this context, a minimum requirement for fostering changes is, perhaps, the recognition of emotions as private, subjective mental states that are distinct from behavior, as can be seen from the strong rejection of behavioral reductionism expressed by the sample of participants in this study. But, in addition, the adherence that the TEs expressed to the conception called “influence of emotions on cognition” shows that they conceive the emotions as states that play a role in learning processes and that, in some cases, given the assessment expressed about ECI, the TEs even consider learning as an emotional process. With regard to the latter, however, this is a fact that is more pronounced when attitudinal learning is taken into account. What are the reasons why it is assumed that, when learning attitudes, unlike what would happen when learning mathematics or history, emotions are considered to play a central role in this process? We elaborate some reflections on this issue in the following concluding section.

Variation in conceptions when considering different types of learning

As was the case when we assessed this point with practicing primary school teachers (Bächler Silva and Pozo, 2020), TEs tend to adopt a more complex perspective on the role of emotions when thinking about attitudinal learning compared to the view that they hold when considering verbal learning. It seems to be assumed that learning attitudes, unlike learning about language or chemistry, is an intrinsically emotional process. This means that when thinking about changing attitudes, it is understood that this process is not solely accompanied or influenced by emotions, as seems to be the most popular understanding of learning verbal content. On the contrary, in the case of attitudes, the very process of learning would consist of doing something with that which is felt or experienced. Moreover, when TEs think about attitude learning, they consider that the valence of the emotions involved does not determine the quality of the outcome as it does, at least in some cases, when TEs consider verbal content learning. It is likely that behind these differences lies a remnant of the idea that learning verbal content is a strictly cognitive process in the most basic representational sense of the term. We refer to the conception of learning as reflection or copying, a belief that is affirmed in a naive realism, which holds that human beings have direct and objective access to reality (López-Goñi and Goñi-Zabala, 2012). New studies that consider the relationships between conceptions about learning and beliefs about the role that emotions play in this process should enhance our understanding of this issue. However, this is a perspective that would not be in the majority among TE, as shown by the results of the cluster analysis discussed below.

Possibility of interpreting the identified clusters as a progression of viewpoints

As previously analyzed, the TE, unlike other educational agents such as student teachers or practicing teachers, show a higher degree of adherence to the more sophisticated conception considered in this study called “emotional-cognitive integration” (ECI). This characteristic is observed in the general response trends, but also in the fact that the largest cluster of all those identified in this study corresponds to one that has as a distinctive feature its preference for the ECI conception. Then, if clusters are assumed as part of a continuous progression from more dichotomous and dualistic positions to the adoption of more integrative views, it is relevant to know what would be the turning point that would allow reaching the more complex position. The question refers to the identification of barriers for the transition from one profile that is closer to the predominant emotional status quo in our culture to one that is more complex and aligned with current knowledge about the role of emotions in cognitive processes. The results obtained on this topic show that this point would be found within the consideration of positive valence emotions, especially when the necessary actions to be taken by teachers to progress in the learning process consist of a questioning of the positive mood that a student may have at a given moment. It is about recognizing those moments in which positive emotions can become an obstacle to learning, generally because they hamper a slow and reflective analysis of the learning content (Anaya-Durand and Anaya-Huertas, 2010). In this context, a maneuver that facilitates students’ awareness of the “risks” of feeling good becomes an action that expands learning possibilities. However, it seems that this kind of action implies a frontal clash with the prevailing emotional culture that claims that feeling good should be always privileged. On the other hand, we also know that our school system is burdened with a heavy history of suffering among students (Polizzi and Frick, 2023), which restricts the maneuvering possibilities of current teachers. Within this scenario, it may be the case that TEs avoid any action that could assimilate them to the figure of a vindictive or punitive teacher, just as some studies show that there is a relationship between their own experiences of suffering as a student in the school system and the conceptions they hold about the role of emotions in educational processes as a future teacher (Bächler and Salas, 2021). This is a dimension dependent on the characteristics of the education system that reinforces an emotionally limited way of acting. And this way of seeing things is also reinforced by the very psychological configuration of the human mind, which naturally tends toward the pursuit of pleasure and happiness as a healthier and more adaptive mode of functioning than which is associated with suffering and pain. Nevertheless, as it occurs with some people with regard to developmental processes, who over the years tend to relativise the value of positive emotions (López-Pérez et al., 2023), building conceptions about joy that are more focused on eudaimonic well-being and not so much on hedonic pleasure (López-Pérez et al., 2016) deeper degrees of wisdom that lead them to also question the idea of displeasure as an intrinsically negative state of mind, we should ask ourselves, what to do to move in that direction. This fact becomes even more relevant if we assume teaching as an intuitive process (Atkinson and Claxton, 2010), in other words, a type of practice that is not exclusively rational in the explicit sense of the

term. We refer to the fact that pedagogical decision-making often depends on bodily signals or somatic markers (Damasio, 2001) that teachers experience during the process. If this is so, how to deny a whole range of experiences of negative valence that can be profoundly informative of what happens in the classroom. Similarly, thinking now about learning as an emotional process, it is worth wondering what is lost when we compulsively seek pleasure in learning in a superficial sense of the term. To what extent do we restrict the possibilities of knowledge acquisition when we discredit, for example, the discomfort caused by a point of view that is contrary to our own ideas? How much is lost when we deny the uneasiness involved in learning about an intrinsically sad process such as illness or deterioration?

It seems reasonable to ask teacher educators to go one step beyond this culturally established common sense, thus “opening” the minds of their students and future teachers to interrupt the educational endogamy that characterizes our school systems. As we have pointed out, the first step is to encourage the recognition of existing conceptions about the role of emotions in the learning processes, an aspect to which we have sought to contribute with this work. However, much more than that is required; in particular, it seems convenient to analyze how the conceptions held by TEs are related to different types of pedagogical practices during the training of future teachers. In this context, the first point to consider, refers to the ability of TEs to facilitate the process of making explicit the conceptions that student teachers hold. As was examined, given the implicit and emotional nature of these conceptions, making them explicit is a complex process since it requires the use of skills that are not only cognitive. In the same line, future studies should also investigate the existing relationships between the conceptions held by TEs and different ways of persuading students to change their conceptions, considering that changing them does not only or mainly involve the presentation of logical arguments. In relation to the above, it is important to investigate the educational processes and micro-processes that take place in teaching careers and that have the greatest impact on the change of students’ conceptions. We are referring to both strategies that have been designed to produce these changes, as well as to other types of processes that occur fortuitously or implicitly and that nevertheless play a role in modifying the beliefs that student teachers bring to the course. Future research will have to assume this task.

Limitations of the study

Finally, to warn about a limitation that we observed in our study. We refer to the fact that, with the obtained data, we are not in a position to determine accurately what is, exactly, the emotional background from which the alternative responses to dilemmas are chosen. This situation is a problem if we assume, as we have done in this paper that the ultimate meaning of any communicative process results from the interaction between symbolic aspects associated with verbal language and emotional components linked to non-verbal language. This aspect is of crucial importance in the case of the response alternative associated with the concept of “emotional-cognitive integration,” which we have called “emotional inhibition for learning.” As we have stated, this is an option that would aim at

facilitating an awareness in learners of possible “risks” that feeling good may imply for learning. It can be assumed that those who choose this alternative focus on possible improvements in the learning process of their students. However, as we well know with respect to the educational system, there are not many cases of teachers who carry out similar maneuvers, in the sense of modifying the pleasant mood of their students, for different and not always positive purposes. In this context, we cannot exclude that among the cases of teachers that we have included in profile 3 of our study, some teachers of this type have “slipped in.” For this reason, it seems important to carry out further qualitative studies in the future to investigate the emotional background of the different profiles.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Comité de bioética de la Universidad de Playa Ancha. The patients/participants provided their written informed consent to participate in this study.

Author contributions

RB contributed to the design, planning, and data collection process of the study. RB and PS-L contributed to the data analysis phase, discussion of results, drafting and writing of the final manuscript, as well as its final approval. CP contributed to the data collection process and operational aspects as a researcher in training. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Cognitive emotion regulation and life satisfaction among students from Mainland China in Malaysian universities

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This study investigates the relationship between cognitive emotion regulation and life satisfaction among students from Mainland China in Malaysian universities. It aims to determine the level of life satisfaction, the frequency of using cognitive emotion regulation, the correlation between the two variables, and the predictive factors of life satisfaction. Four hundred and ninety (490) participants were selected from 12 universities in Malaysia through random sampling; 102 for a pilot study and 388 for the final study. A quantitative research design was developed to conduct the investigation using two questionnaires; the Multidimensional Students' Life Satisfaction Scale (MSLSS) and a Cognitive Emotion Regulation Questionnaire (CERQ). Data were analyzed using the statistical tools SPSS 26 and Smart PLS (SEM) 3.0. The findings showed that a high proportion of participants (72.4%) demonstrated a high level of life satisfaction among students from Mainland China in Malaysian universities and 48.7% of these students always used cognitive emotion regulation. 12.6% of students from Mainland China displayed a low level of life satisfaction and 13.4% rarely used cognitive emotion regulation. In conclusion, there was a significant relationship between cognitive emotion regulation and life satisfaction, in which positive reappraisal, positive refocusing, and refocusing on planning of cognitive emotion regulation had significant predictive powers for life satisfaction among students from Mainland China in Malaysian universities.

KEYWORDS

cognitive emotion regulation, life satisfaction, Mainland China students, quantitative study, Smart PLS

1. Introduction

For most high school graduates, university life is a key moment in their lives before they begin their careers (Christie et al., 2005). This study focuses on the university students who fail to feel life satisfaction and meaningfulness upon their graduation. These students are likely to suffer feelings of dissatisfaction, overwhelmedness, and homesickness during their university studies for a variety of reasons, including the intervening changes (Lydster and Murray, 2019). Hence, addressing these issues and improving university students' life satisfaction levels is of great significance to help them enjoy a better university life and accomplish greater academic achievement. Meanwhile, the existing literature has shown emotional sentiments to be indicators of both students' academic performance and drop out rates at universities (Respondek et al., 2017).

1.1. Problem statement

Lewis et al. (2011) showed that Chinese university students have an unusually high prevalence of psychological discomfort, indicating that they are a high at-risk population group. This is due to the ignorance of the psychology education system, which has caused them to have low levels of life satisfaction. This indicates that life satisfaction is very crucial for international university students studying in another country. This means that a common phenomenon of a low level of life satisfaction exists among Chinese students; this is the first gap in this study.

Smith and Khawaja (2011) found that emotional repression may be used more frequently by Asian students as a way of emotion regulation, and depression is frequently regarded as one of the feelings in a person. For instance, when a student from Mainland China studies in a foreign country, they have no choice but to deal with the various mental discomforts, which can raise their risk of being depressed (Suri et al., 2013). This indicates that many of them do not use cognitive emotion regulation, causing emotion repression and depression issues in them. In short, the second research gap is that students from Mainland China rely more heavily on emotional suppression as a method of cognitive emotion regulation.

Suri et al. (2013) argued that there is a need to focus on the relationship between cognitive emotion regulation and life satisfaction, especially for students from Mainland China in Malaysia, due to insufficient research and literature. Even though Berking and Lukas (2015) provided evidence showing that cognitive coping methods are a potential strategy for treating psychopathology symptoms, no research has been conducted to see if the association between certain cognitive emotion regulation strategies and psychopathology is coherent across nations. For instance, it is noted that many university students experience obstacles as they adjust to social and academic demands. This causes depression, especially in Asian students. Moreover, Steger et al. (2006) found that emotion regulation has an impact on life satisfaction. This means that emotion regulation is crucial to life satisfaction. This study is conducted to support the relationship between cognitive emotion regulation and life satisfaction.

1.2. Conceptual framework

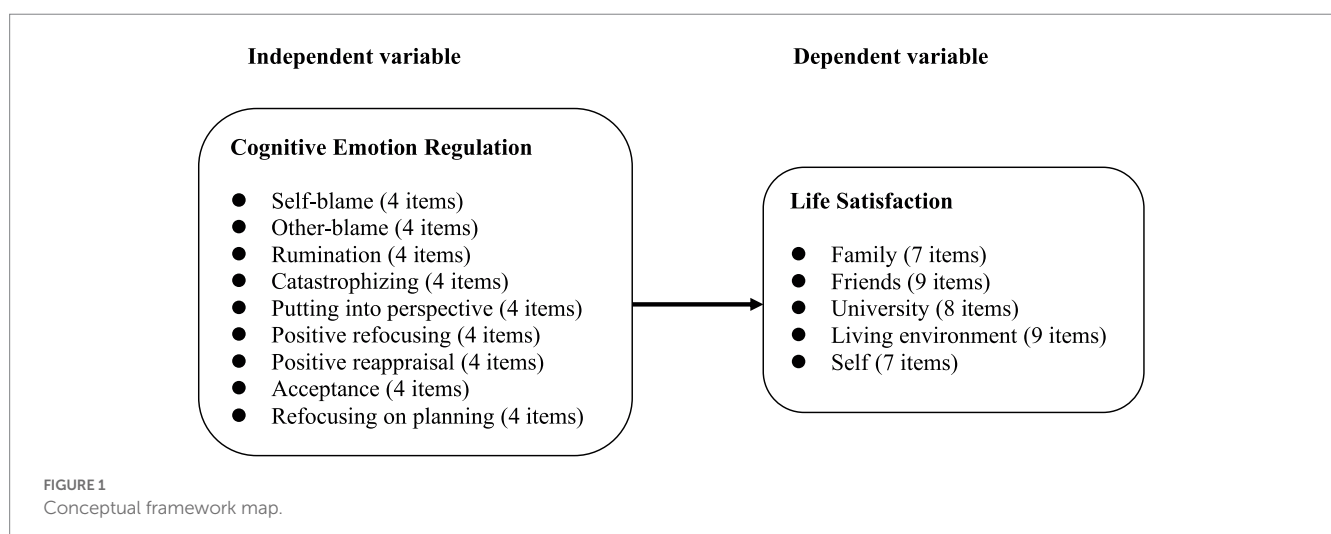
A conceptual framework is a versatile analytical tool that may be used in a variety of situations. It may be used in a variety of fields where an overall image is required. It is used to arrange concepts and create conceptual distinctions. Strong conceptual frameworks capture something in an easy-to-remember and apply manner (Ager and Strang, 2008). This study aimed to investigate the relationship of two variables, namely, cognitive emotion regulation and life satisfaction, where the former influences the latter among Mainland China students in Malaysian universities. Figure 1 shows the conceptual framework that guided this study.

This conceptual framework is based on cognitive emotion regulation influencing life satisfaction. Cognitive emotion regulation is an independent variable with nine dimensions, as depicted in the conceptual map below: self-blame, other-blame, rumination, catastrophizing, putting into perspective, positive refocusing, positive reappraisal, acceptance, and refocus on planning. The dependent variable is defined as life satisfaction, consisting of five dimensions: family, friends, university, living environment, and self. The conceptual framework, as explained in Figure 2, provides nine dimensions of cognitive emotion regulation influencing life satisfaction.

Bastian et al. found that positive emotion regulation is strongly related to life satisfaction. This theory highlights the significance of the relationship between cognitive emotion regulation and life satisfaction, and the predictive power of cognitive emotion regulation strategies contributing to life satisfaction, such as positive reappraisal, refocus on planning, and acceptance (Garnefski et al., 2002; Omran, 2011; Suri et al., 2013). So this conceptual framework is applied in this study to Mainland China students who are studying in Malaysian universities.

1.3. Significance of the study

The findings of this research are of great significance both theoretically and practically in terms of cognitive emotion regulation and life satisfaction.



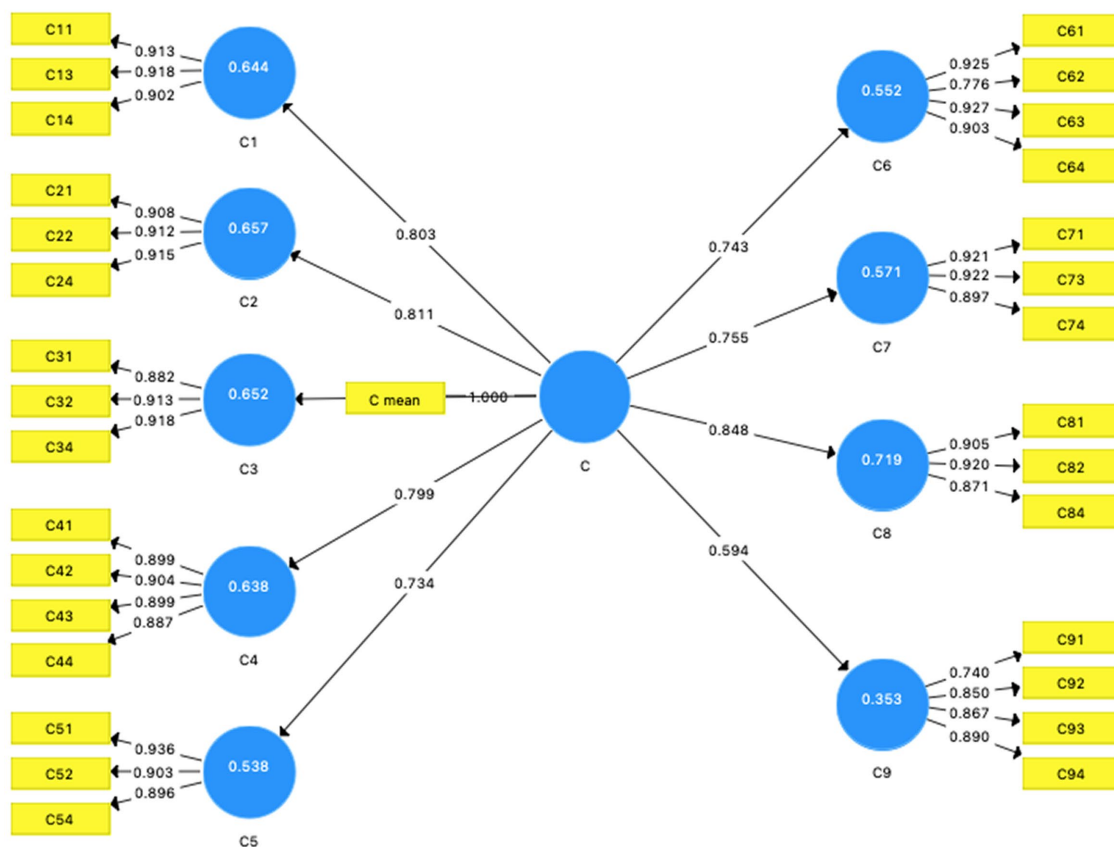


FIGURE 2
Reliability and validity of cognitive emotion regulation questionnaire (CERQ).

Specially, the findings of the present study add to the existing body of knowledge on cognitive emotion regulation and life satisfaction theories by analyzing the correlation between cognitive emotion regulation and life satisfaction. According to the gaps and research objectives of this study, the findings provide specific information about the level of life satisfaction and usage frequency of cognitive emotion regulation among Mainland China students in Malaysian universities.

Furthermore, this study revealed the cognitive emotion regulation strategies that are crucial for international university students to achieve life satisfaction. Therefore, the data gathered can provide excellent suggestions to Mainland China students Malaysian universities on how to apply cognitive emotion regulation in improving life satisfaction levels. Finally, based on the results of this study, we hope to assist university teachers in guiding international students on how to use cognitive emotion regulation strategies to achieve life satisfaction and to guarantee that students successfully achieve their academic objectives.

2. Research methods

2.1. Population and sample

According to Datuk Seri Dr. Noraini Ahmad (Minister of Higher Education Malaysia; MOHE, 2021), there are approximately 20,000 registered Chinese students studying in Malaysia's public and private higher education institutions as of June 2021. In this study, public as

well as private Malaysian universities were selected for data collection to avoid bias caused by the nature of the university.

This research sample consisted of 388 multiple grade university Chinese students (218 males and 172 females) in Malaysia who were selected using a simple random sampling method. The simple random sampling, in which each and every member of the population has an equal chance of being selected, is the best way to present the population (Etikan et al., 2016). Because the researchers could approach the various groups of Chinese students in public and private universities, a total of 12 universities joined the present study; eight universities were public and four private, out of the 12 universities in Malaysia, irrespective of their age and field of study.

All participants are Mainland China students who are studying in different faculties in public and private Malaysian universities. The survey was voluntary and participants were informed of their willingness to take part or withdraw from this study. Signing the consent form implied their willingness to be part of the study. To guarantee that the participants in this study were minimally influenced and to ensure the stability of students' emotion, the questionnaires were sent to students who were attending classes as normal.

2.2. Instruments

Two sets of questionnaires were used as research instruments in this study: a cognitive emotion regulation questionnaire (CERQ) and

TABLE 1 Summary of the dimensions.

Dimensions	IV/DV	Instrument
Self-blame	IV	Cognitive emotion regulation questionnaire
Acceptance	IV	Cognitive emotion regulation questionnaire
Rumination	IV	Cognitive emotion regulation questionnaire
Positive reappraisal	IV	Cognitive emotion regulation questionnaire
Putting into perspective	IV	Cognitive emotion regulation questionnaire
Catastrophizing	IV	Cognitive emotion regulation questionnaire
Other-blame	IV	Cognitive emotion regulation questionnaire
Positive refocusing	IV	Cognitive emotion regulation questionnaire
Refocus on planning	IV	Cognitive emotion regulation questionnaire
Family	DV	Multidimensional students' life satisfaction scale
Friends	DV	Multidimensional students' life satisfaction scale
University	DV	Multidimensional students' life satisfaction scale
Living environment	DV	Multidimensional students' life satisfaction scale
Self	DV	Multidimensional students' life satisfaction scale

TABLE 2 Reliability and validity of CERQ.

CERQ	Cronbach's alpha	Rho-A	Composite reliability	Average variance extracted
C1-Self-blame	0.897	0.898	0.936	0.830
C2-Acceptance	0.898	0.899	0.936	0.831
C3-Rumination	0.888	0.891	0.931	0.818
C4-Positive reappraisal	0.919	0.920	0.943	0.805
C5-Putting into perspective	0.898	0.899	0.937	0.831
C6-Catastrophizing	0.907	0.921	0.935	0.783
C7-Other-blame	0.901	0.906	0.938	0.835
C8-Positive refocusing	0.881	0.884	0.927	0.808
C9-Refocus on planning	0.859	0.879	0.904	0.704

the multidimensional students' life satisfaction scale (MSLSS). The questionnaire was designed by Gross (2016) and the scale by Schnettler et al. (2015).

Cognitive emotion regulation was used to identify specific cognitive emotion control methods that participants utilized in response to exciting or stressful life experiences (Ochsner and Gross, 2008). It is also used for different populations such as adolescents, adults, elderly people, and students (Garnefski et al., 2002). The CERQ is a 36-item self-report questionnaire that is simple to administer (Garnefski et al., 2002). The questionnaire examines 9 distinct cognitive coping mechanisms and was developed using both theoretical and empirical data. Individual cognitive coping mechanisms may be identified using the CERQ, which can then be compared to norm scores from other populations.

The original MSLSS was designed for children and adolescents, as a literature review reflected that a number of previous research studies utilized the MSLSS in university students (Huebner et al., 1998; Gilman et al., 2000; Huebner and Gilman, 2012; Schnettler et al., 2015; Tian et al., 2015). Parts referring to school were replaced with university-based questions and then the reliability and validity were tested. To validate the surveys and to eliminate any misunderstandings among the participants, a reverse translation approach was used. To preserve accuracy, the original surveys were translated to Chinese and then translated back to English. Table 1 provides a summary of the variables, specifying which variable was used for each research question, whether

the variable is independent or dependent, and from which instrument the data were obtained. These two instruments are elaborated upon in detail in the following section.

2.3. Reliability and validity

A pilot study was conducted to see if the research methods performed effectively with the research objectives and research questions used in this study. The obtained data from the questionnaires were assessed to ensure that the instruments' reliability and validity were met. A total of 102 participants joined the pilot study using two questionnaires which were sent to the participants via WeChat.

To test the reliability and validity of the formal study, a measurement model was established via the statistical tool Smart PLS. The first procedure of the measurement model testing was to check the values of the factor loadings. The second procedure was to determine the reliability, and validity of the instruments, Cronbach's alpha value, composite reliability, and average variance extracted value. Lastly, the the variance inflation factor (VIF) values of the two instruments were tested and presented.

As demonstrated in Table 2 and Figure 2, the Cronbach's alpha values ranged from 0.859 to 0.919, suggesting a high level of reliability. Additionally, the composite reliability value minimum should be more

TABLE 3 Variance inflation factor (VIF) of CERQ.

CERQ	VIF
C11	2.827
C13	2.936
C14	2.551
C21	2.690
C22	2.713
C24	2.918
C31	2.258
C32	2.850
C34	2.839
C41	3.084
C42	3.262
C43	3.114
C44	2.890
C51	3.594
C52	2.793
C54	2.506
C61	3.901
C62	1.779
C63	3.937
C64	3.205
C71	2.877
C73	3.055
C74	2.624
C81	2.659
C82	2.910
C84	2.124
C91	1.647
C92	2.256
C93	2.382
C94	2.596

than 0.70 and the maximum less than 0.95 (Hair et al., 2019). The result in this study reached a high level of more than 0.9 and less than 0.95, indicating the consistency of the research instruments. AVE values should be higher than 0.5 to ensure convergent validity; the results showed that all figures were higher than 0.8, suggesting that convergent validity was confirmed.

The VIF is often used to evaluate the collinearity of the formative indicators. VIF values of 5 or above indicate critical collinearity issues among the indicators of formatively measured constructs. However, collinearity issues can also occur at VIF values lower than 5; ideally, the VIF values should be close to 3 or slightly lower (Hair et al., 2019). Table 3 shows that all the items' VIF values are less than 5, with most items close to 3 or slightly below, indicating that collinearity is not an issue in this study.

As presented in Table 4 and Figure 3, the Cronbach's alpha values ranged from 0.839 to 0.926, suggesting a high level of reliability.

Additionally, the composite reliability reached a high level of more than 0.8, indicating the consistency of the research instruments. AVE results showed that one figure was over 0.7 and that other figures were higher than 0.8, suggesting that convergent validity was confirmed.

Table 5 showed that all items VIF values are less than 5, and that all items are lower than 3. In summary, the results showed that the two instruments used in this study reached a high level of reliability and validity, indicating the consistency of the research instruments. Moreover, their convergent validity was strongly confirmed. The variance inflation factor values were close to and lower than 3, indicating that collinearity is not an issue in this study. Therefore, we can proceed with further data analysis to answer our four research questions.

3. Findings and discussion

A 7-point Likert Scale was used in this study, consisting of scores of 1 (strongly disagree), 2 (disagree), 3 (slightly disagree), 4 (neither agree nor disagree), 5 (slightly agree), 6 (agree), and 7 (strongly agree; Joshi et al., 2015). The 7-point Likert Scale performs better and provides more varieties of options which in turn increase the probability of meeting a person's objective reality. The interpretation of these responses was calculated by using the formula: Interval = (the highest score – the lowest score) / the number of the interval (Widodo and Chandrawaty, 2021); for this study, interval = (7 – 1) / 7 = 0.86. Subsequently, the level of mean scores was divided into three categories: low, moderate, and high (Widodo and Chandrawaty, 2021). The low level ranges from 1 to 2.73, the moderate from 2.74 to 5.31, and the high from 5.32 to 7. Level 1 accounted for 12.6% of participants, level 2 for 15%, and level 3 for 72.4%; therefore, 12.6% students experience a low, 15% a moderate, and 72.4% a high level of life satisfaction. This means that most Chinese university students are very well satisfied in their lives; however, a small number still experience moderate and low levels of life satisfaction (Table 6).

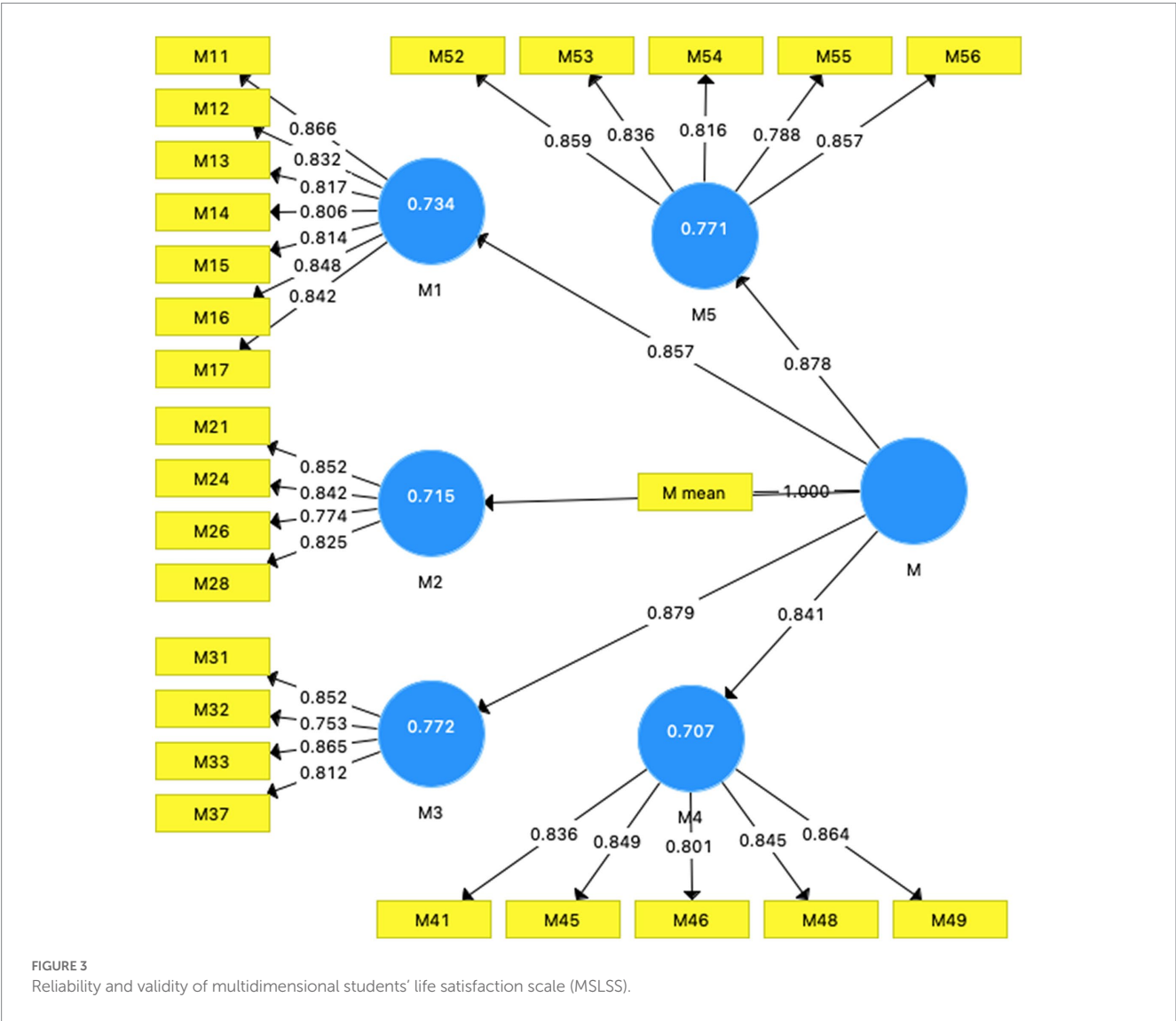
The findings of the first research objective are consistent with those of Lin and Zheng (2007), who found that Chinese university students have a high level of life satisfaction. However, the findings are contradictory to Eisenberg et al. (2007) and Tsitsas et al. (2019), conducted in western samples, who discovered that the majority of university students have a low level of life satisfaction, with no gender differences observed.

Pavot and Diener (2008) also showed that when the original information related to life satisfaction changes, the reported level of life satisfaction changes as well. Furthermore, Paschali and Tsitsas (2010) showed that students who have a low level of anxiety have a high level of life satisfaction. Therefore, we assume that students from Mainland China in Malaysian universities have less anxiety and different cultural backgrounds compared to western countries.

This finding can be attributed to the following factors: one primary factor can be the lower anxiety of modern university students studying in Malaysia. Another potential factor may be that different cultures and environments lead to different levels of life satisfaction, such as in the majority of university students having a low level of life satisfaction with no gender differences observed in Western samples.

TABLE 4 Reliability and validity of multidimensional students' life satisfaction scale (MSLSS).

MSLSS	Cronbach's alpha	Rho-A	Composite reliability	Average variance extracted
M1-Family	0.926	0.928	0.940	0.693
M2-Friends	0.844	0.860	0.894	0.679
M3-University	0.839	0.849	0.892	0.675
M4-Living environment	0.895	0.898	0.923	0.705
M5-Self	0.888	0.892	0.918	0.692



(Eisenberg et al., 2007; Tsitsas et al., 2019). Furthermore, life satisfaction has a positive link with self-esteem, familiar relationships, attributional styles, hopefulness, interpersonal relationships, and self-efficacy (Rezaei and Khosroshahi, 2018). Tsitsas et al. (2019) also showed that when students have strong assertiveness ratings, they are more likely to have high life satisfaction scores; therefore, students from Mainland China in Malaysian universities have a high level of life satisfaction because they have more confidence.

Moreover, when compared to urban university students, rural university students experience a greater degree of worry and stress (Bayram and Bilgel, 2008); therefore, urban university students are more satisfied with their life. Previous studies showed that life satisfaction in western countries is not optimistic and that in the United States, mental health problems are estimated to account for over half of the entire burden of disease among young adults (Eisenberg et al., 2007). In a 2005 national survey of university

counselling center directors, 86% reported an increase in severe psychological problems among students (Eisenberg et al., 2007). Thus, different cultures and environments lead to different levels of life satisfaction.

To explore other factors that affect life satisfaction in university students, some aspects, such as anxiety, stress, and emotion regulation, which have a detrimental influence on life satisfaction, are discussed. Many studies have reported that high anxiety is linked to decreased levels of life satisfaction (Headey et al., 1993; Cook et al., 2000; Tsitsas et al., 2019). Researchers (Extremiera et al., 2009; Schiffrin and Nelson, 2010; Tsitsas et al., 2019) have also related stress with life satisfaction among university and college students. Academic competence, academic culture shock, academic resources, intercultural communication, and pressure were also identified as important

stresses for Mainland Chinese university students (Meng et al., 2018). Finally, emotion regulation can also predict academic achievement and dropout intentions in students (Respondek et al., 2017). As discussed above, some factors such as anxiety, stress, living environment, and emotion regulation all influence university students' life satisfaction; therefore, less anxiety and stress and better utilization of emotion regulation strategies predict higher life satisfaction levels.

The mean values were divided into three levels (Widodo and Chandrawaty, 2021); level 1 ranged from 1 to 2.73, indicating that the respondents rarely used cognitive emotion regulation, level 2 (2.74–5.31) indicates that the respondents sometimes use cognitive emotion regulation, and level 3 (5.32 to 7) indicates the most frequent usage of the strategy. Table 7 shows that level 1 corresponded to 13.4% of participants, 2 to 37.9%, and 3 to 48.7%, which means that 13.4% of students rarely use cognitive emotion regulation, 37.9% use it sometimes, and 48.7% use it often. The data showed that out of a total of 380 participants, 51 Chinese university students rarely use cognitive emotion regulation strategies, 144 sometimes use them, and 185 students always use them. Therefore, almost half of Chinese university students in Malaysia always use cognitive emotion regulation strategies.

This finding is supported by Cheng and Suri et al. (2013), who also found that students from Mainland China adopted emotion regulation strategies when studying in universities. The Cheng study showed that participants from Mainland China used a wide range of emotion regulation strategies; furthermore, Suri et al. (2013) suggested that international university students use adaptive cognitive emotion regulation strategies to adequately achieve life satisfaction. These findings are consistent with the findings of the present study. Webster and Hadwin (2015) also explained that cognitive emotion regulation is significant to university students, indicating that successful students proactively and strategically regulate their cognition, motivational states, and behaviors. This finding was contradictory to Smith and Khawaja (2011), conducted in Asian students, who found that they rarely use cognitive emotion regulation.

According to Miyamoto and Xiaoming (2011), different cultural backgrounds lead to different usage frequencies of cognitive emotion regulation. It was found that positive emotion regulation is more prevalent in Westerners than in Asians. Secondly, as well as the negligence of cognitive emotion regulation education in Chinese and family education, one study believed that the control of emotions has been a neglected issue in educational study (Pekrun and Linnenbrink-Garcia, 2012). The Chinese education system and family education place a high value on basic subject performance, causing all educational participants, whether teachers, students, or their parents, to regard subject performance as the most important aspect of their studies. As a result, emotion regulation strategies and courses on fundamental understanding for Chinese students should be explored for inclusion in the education system.

TABLE 5 Variance inflation factor (VIF) of MSLSS.

VIF	
M11	2.900
M12	2.595
M13	2.445
M14	2.214
M15	2.316
M16	2.676
M17	2.550
M21	2.200
M24	2.257
M26	2.085
M28	2.161
M31	2.118
M32	1.631
M33	2.127
M37	1.764
M41	2.359
M45	2.639
M46	2.410
M48	2.587
M49	2.607
M52	2.897
M53	2.572
M54	2.778
M55	2.559
M56	2.415

TABLE 6 The level of LS.

Level	Frequency	Percent	Meaning of level of LS	Level values
low	48	12.6	1 = low level of life satisfaction	Low [1–2.73]
moderate	57	15.0	2 = moderate level of life satisfaction	Moderate [2.74–5.31]
high	275	72.4	3 = high level of life satisfaction	High [5.32–7]
Total	380	100		

TABLE 7 The Usage Frequency of CER.

Level	Frequency	Percent	Meaning of level of CER	Level values
Rarely	51	13.4	1 = rarely use CER	Rarely [1–2.73]
Sometimes	144	37.9	2 = sometimes use CER	Sometimes [2.74–5.31]
Always	185	48.7	3 = always use CER	Always [5.32–7]
Total	380	100		

TABLE 8 The results of path coefficients between CER and LS.

Path coefficients	Original sample	Sample mean	Standard deviation	T statistics	p Values
CER->LS	0.729	0.730	0.038	19.375	0.000

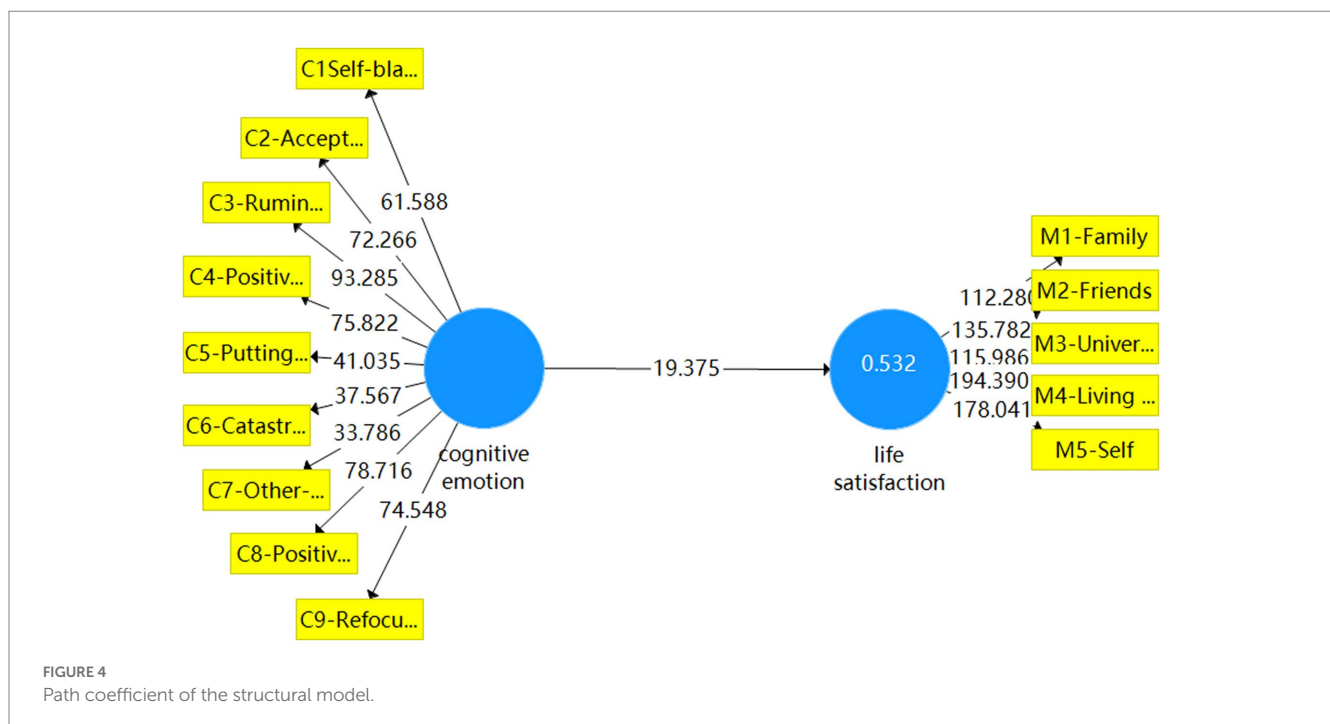


Table 8 and Figure 4, show the results of path coefficients between CER and LS, which indicated that the relationship between them is significant. In this case, the T statistic is 19.375, which is greater than 1.96, and the p value is 0.000, which is smaller than 0.05. Therefore, according to these values, the effect on cognitive emotion regulation and life satisfaction is significant. Based on the path coefficient of the structural model, R squared is 0.532, which means that 53.2% of cognitive emotion regulation contributes to life satisfaction.

This finding indicates a positive correlation between cognitive emotion regulation and life satisfaction, which is consistent with Schutte et al. (2009), whose findings confirmed a strong connection between the two variables. Schutte et al., also discovered a substantial relationship between life satisfaction and various emotion regulation strategies. Suri et al. (2013) and Haga et al. (2009) have also found that there is a relationship between different emotion regulation strategies and life satisfaction. Szczygiel and Mikolajczak (2017) claimed that perception, expression, understanding, and management of emotions all play a part in fostering life satisfaction. The findings are similar to

other research that discovered that men and women manage their emotions in various ways to achieve life satisfaction (Suri et al., 2013; Yigit et al., 2014). Other research also supported that there is a considerable link between life satisfaction and various emotion regulation strategies (Haga et al., 2009; Schutte et al., 2009). It was also discovered that life satisfaction, positive emotion, negative emotion, and depression had significant relationships (Durak et al., 2010), despite the fact that managing emotions is a prerequisite to achieve life satisfaction (Yigit et al., 2014). A similar result reported in another study indicated that positive emotions, rather than negative emotions, appear to play a larger role in the relationship between emotion regulation and life satisfaction (Szczygiel and Mikolajczak, 2017).

The findings of the third research objective can be attributed to the following factors. Emotion regulation, in particular, promotes the incidence of happy feelings, while reducing the frequency with which unpleasant feelings occur, resulting in a stronger sense of life satisfaction, indicating that trait emotion regulation plays a unique

TABLE 9 Results of path coefficients between variables of CER and LS.

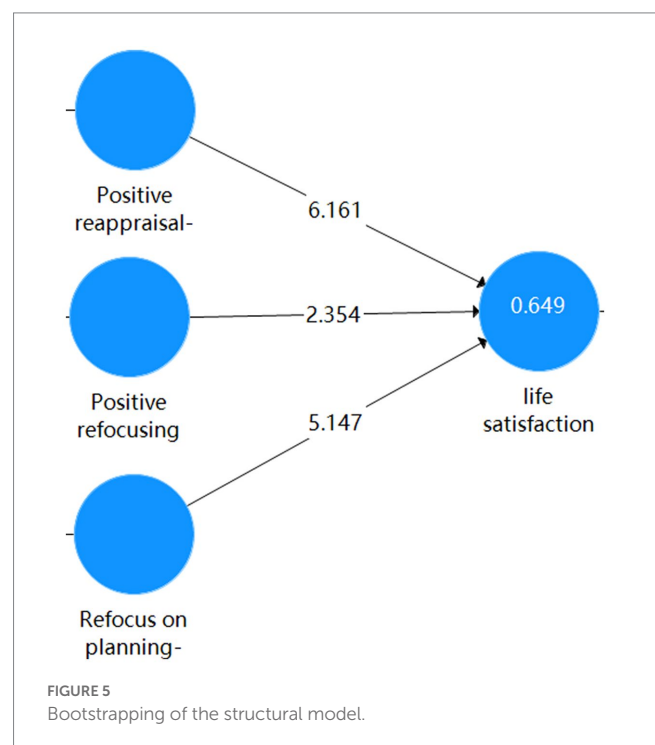
Path coefficients	Original samples	Sample mean	Standard deviation	T statistics	p Values
Self-blame- > LS	0.035	0.029	0.066	0.523	0.601
Acceptance- > LS	-0.067	-0.068	0.088	0.760	0.447
Rumination- > LS	-0.014	-0.013	0.066	0.207	0.836
Positive reappraisal- > LS	0.427	0.428	0.073	6.161	0.000
Putting into perspective- > LS	-0.019	-0.025	0.062	0.307	0.759
Catastrophizing- > LS	-0.006	-0.003	0.067	0.093	0.926
Other-blame- > LS	-0.039	-0.035	0.065	0.602	0.547
Positive refocusing- > LS	0.17	0.174	0.059	2.354	0.004
Refocus on planning- > LS	0.337	0.337	0.070	5.147	0.000

role in explaining people's perceptions of life quality (Szczygieł and Mikolajczak, 2017). Thus, using various cognitive emotion regulation strategies, students can strive to alleviate psychological suffering. These findings are beneficial for university students, particularly those who are dealing with depression and academic difficulties.

Another factor may be that emotion regulation is essential for university students to balance their academic stress and university life; for instance, Yiğit et al. (2014) found that among university students, emotion regulation is the most important predictor of life satisfaction. The last potential factor is that emotion regulation plays a significant role in university students' social relationships. One study showed that trait emotion regulation is critical for a variety of facets regarding adaptability that are good for students, from the standpoint of emotional behavior and social relationships (Szczygieł and Mikolajczak, 2017). According to a study conducted in Canada, there is a significant positive link between the quality of new friendships and adjustment to university life; especially for those who are new university students and experience a series of problems that contribute to poor adjustment, including homesickness and missing friends (Buote et al., 2007). In a nutshell, emotion regulation plays a unique role in life satisfaction.

Table 9 and Figure 5 show that the *p* values of positive reappraisal, positive refocusing, and refocus on planning are < 0.05, which indicates that they are significant to life satisfaction. The positive reappraisal *T* statistic = 6.161, the positive refocusing *T* statistic = 2.354, and the refocus on planning *T* statistic = 5.147, further suggesting that positive reappraisal is one of the main cognitive emotion regulation variables influencing life satisfaction, followed by refocus on planning and positive refocusing. According to Figure 5, the *R*² value is 64.9%, which means that positive reappraisal, positive refocusing, and refocus on planning contribute 64.9% to life satisfaction.

The results related to research objective four are consistent with previous research (Gross and John, 2003; Garnefski et al., 2004; Suri et al., 2013), which found that positive reappraisal, refocus on planning, and positive refocusing are significantly and positively correlated with life satisfaction. Omran (2011) also showed that positive reappraisal is associated with low levels of anxiety and sadness. A similar result of another study suggested that it is adversely connected with depression and anxiety symptoms (Suri et al., 2013). These findings are identical in students from Mainland China in Malaysian universities: positive reappraisal, positive refocusing, and



refocus on planning are strong predictors of cognitive emotion regulation for life satisfaction.

Another study suggested that positive reappraisal is negatively related to depression and psychological illness (Garnefski et al., 2004). This is partly consistent with the finding of our study, in that positive reappraisal of cognitive emotion regulation shows a significant association with life satisfaction. Positive reappraisal is the strongest predictor of life satisfaction in this study; in this aspect, this finding is consistent with other previous research (Gross and John, 2003; Garnefski et al., 2004; Omran, 2011; Suri et al., 2013).

Based on this finding and previous studies, the first potential factor may be that positive reappraisal could increase positive emotions, since people pay more attention to the positive side of life. In terms of the correlations between the dimensions of cognitive emotion regulation and life satisfaction, such as positive reappraisal, it has been discovered that it can promote appropriate actions and happy emotions while reducing negative sentiments

(Gross and John, 2003). We can summarize the second factor as follows: cognitive emotion regulation strategies are mental reactions to stressful experiences that change one's emotional state (Suri et al., 2013). The findings also suggested that those who employed positive reappraisal, positive refocusing, and refocus on planning tended to display a higher level of life satisfaction.

As discussed above, regarding the life satisfaction of university students, many studies have shown that university students are under academic stress, age stress, and so forth. This means that university students should learn some cognitive emotion regulation strategies so that they can deal with stressful situations. Regarding other strategies of cognitive emotion regulation that affect people's life, previous studies have shown that ruminating, self-blame, and catastrophizing are all cognitive emotion regulation strategies that are favorably connected to depression and/or other indicators of mental ill-health, whereas, positive reappraisal is negatively related (Anderson et al., 1994; Garnefski et al., 2004). Many researchers reported that positive reappraisal is significantly and positively correlated with life satisfaction; thus, utilizing positive reappraisal is good for people's mental health and since the findings of the present study are similar to previous research, we encourage university students to apply more cognitive emotion regulation strategies in university life, especially stressed situations.

Other factors were also discussed, for example, people may control their emotional experiences to some extent by adopting various emotion regulation strategies throughout their emotional episodes (Kashdan et al., 2015). The findings also showed that some cognitive emotion regulation strategies have a significant impact on both genders' life satisfaction, whereas others have no impact (Suri et al., 2013). Moreover, positive emotions will lead to better life satisfaction (Boiger et al., 2013). Putting a social significance on happy emotions might help to draw attention to the unpleasant emotion experience as a source of worry, leading to more rumination and, as a result, lower life satisfaction (Nolen-Hoeksema et al., 2008; Mauss et al., 2011). Gross and John (2003) found that the experience of positive emotions is linked to reappraisal. In this way, putting a social value on pleasant emotions may help people feel better by strengthening the link between bad feeling and happiness. Cognitive reappraisal might be used to improve good sentiments and adaptive behavior by reducing negative feelings and increasing positive sensations (Suri et al., 2013). Therefore, focusing too much on positive emotion leads to backfire; it is important to learn to apply adaptive cognitive emotion regulation strategies and to balance positive and negative emotions.

4. Conclusion

The current investigation has significantly contributed to the correlation between cognitive emotion regulation strategies and life satisfaction, as well as the usage of cognitive emotion regulation among students from Mainland China in Malaysian universities. In general, "positive refocusing," "refocus on planning," and "positive reappraisal" of cognitive emotion regulations are related to life satisfaction. They are positive correlations that have also led to the discovery of additional data that were unexpected, necessitating further investigation to evaluate the findings. We suspect that some of these findings, which differ from those of other nations, are due to

cultural differences. Finally, a favorable association was shown between cognitive emotion regulation and life satisfaction among Mainland China students in Malaysian universities. Furthermore, positive reappraisal, positive refocusing, and refocus on planning could be an intervention method applied by university teachers in class.

4.1. Limitations

The following is a summary of the limitations of the present study:

Firstly, owing to the limitations of time and space, we were unable to reach all the Mainland China students in Malaysia. Mainland China students were selected from 12 public and private Malaysian universities to be the sample population. Secondly, this study focused on the general background of Mainland China students in Malaysian universities; there are still many detailed backgrounds or differences that could be further explored, such as culture background or gender differences.

Finally, because the current study only analyzed Mainland China students in Malaysian universities, the results were limited to a single nationality and country. However, this research study could be used to explore more international students from other countries in Malaysian universities since there are still many international students from other countries who come to Malaysia to study in universities.

4.2. Implications

This study indicated that most Mainland China students in Malaysian universities have a high level of life satisfaction, which is consistent with a previous similar study (Lin and Zheng, 2007). It is contradictory to research conducted in western samples (Eisenberg et al., 2007; Tsitsas et al., 2019) and provides more information and discussion about different countries or different multi-cultural backgrounds that lead to different levels of life satisfaction in university students, which may be useful for future studies. Our findings also imply that there is still a small number of university students with a low level of life satisfaction. Therefore, it is recommended that university teachers and students should pay more attention to cognitive emotion regulation strategies to improve life satisfaction, in particular, Mainland China students who have a low level of life satisfaction.

Moreover, we found that cognitive emotion regulation influences life satisfaction among Mainland China students in Malaysian universities; other research also supported this finding that life satisfaction and emotion regulation do, in fact, have a significant relationship (Gross and John, 2003). This implies that cognitive emotion regulation is significant to life satisfaction. As the academic information about the topic of cognitive emotion regulation and life satisfaction among Mainland China students in Malaysian universities is limited, this study adds relevant academic information.

This study focused on cognitive emotion regulation strategies applied by university students to achieve life satisfaction, and we found that positive reappraisal, positive refocusing, and refocusing on planning are three strategies significant to life satisfaction without gender difference, consistent with many previous studies (Gross and

John, 2003; Garnefski et al., 2004; Suri et al., 2013). The study implies that positive reappraisal, positive refocusing, and refocusing on planning are significant for life satisfaction among Mainland China students in Malaysian universities. These findings provide more specific cognitive emotion regulation strategies for university students' to achieve life satisfaction, presenting more specific information on emotion regulation strategies for future studies.

4.3. Suggestions

According to the limitations and implications of this study, it is suggested that various backgrounds or differences could be explored and discussed in-depth in future studies, such as cultural backgrounds and gender differences. Moreover, we showed that positive reappraisal, positive refocusing, and refocus on planning of cognitive emotion regulation are significant for life satisfaction among Mainland China students in Malaysian universities, which means Chinese university students could be encouraged to use cognitive emotion regulation strategies in a targeted manner (e.g., positive reappraisal, positive refocusing, refocus on planning). Furthermore, university teachers could apply these strategies in their class as an intervention method.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Ethics statement

The studies involving human participants were reviewed and approved by Segi University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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