HIGHER EDUCATION DROPOUT AFTER COVID-19: NEW STRATEGIES TO OPTIMIZE SUCCESS

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HIGHER EDUCATION DROPOUT AFTER COVID-19: NEW STRATEGIES TO OPTIMIZE SUCCESS

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EDITORIAL
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Editorial: Higher Education Dropout After COVID-19: New Strategies to Optimize Success

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Editorial on the Research Topic

Higher Education Dropout After COVID-19: New Strategies to Optimize Success

Over the last few years, several challenges have been identified in higher education. On the one hand, a high percentage of students drop out of university in the first year. This problem has been exacerbated in the context of the deregulation of teaching and learning conditions in physical distance due to the COVID-19 pandemic. On the other hand, during the years of the pandemic, educational institutions, under pressure to adapt their teaching procedures, have made significant efforts to increase the integration of technology in teaching and to update the skills of their teachers in the use of virtual teaching resources.

The improvement of teaching and learning processes requires a proactive behavior by lecturers and students. The need for scientific knowledge that supports teaching procedures that involve the intentional promotion of various cognitive-motivational variables that influence learning is clearly visible. In these efforts, it is possible to find support in the persistent appearance of new technological resources that improve communications, access, and availability of knowledge.

Lecturers play a fundamental role by embodying models of behaviors and verbalizations of thoughts during the teaching of their subjects and in the various interactions with their students. In addition, academic performance is related to the adequate use of skills to develop learning processes in university studies. In both aspects, in the last decades, research has provided remarkable developments in the knowledge of cognitive, social, and motivational variables that are at the basis of academic performance.

However, in the context of the pandemic, psychology, and education, lecturers from different academic disciplines have been particularly challenged to answer questions that encompass all multi-causal variables (affective, cognitive, and social) that influence dropout, across different levels of analysis, including: (1) Do we have the necessary measuring instruments for variables involved in teaching and learning processes? What are the relationships between these variables? How adequate are the hypothesized relationship models? (2) What is the degree of impact of the intentional modification programs of these variables? What are their conceptual foundations? What are the measures of their impacts? And (3) if these programs are successful, how to evaluate their application to large numbers of participants?

In order to contribute to answering these questions, this special issue provides interesting systematizations and reflections on innovations, proposed solutions, and experiences obtained by students and teachers in the context of the COVID-19 pandemic. The research presented here is characterized by offering rigorous, clear, replicable views and procedures, which constitute valuable contributions with a general constructive vision in the advancement of scientific knowledge. They can guide study and lecturing practices and offer theoretical foundations for the design of university policies to reduce dropout rates and improve lecturing and learning processes.

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Lessons Learned: Teaching In-Person During the COVID-19 Pandemic

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For the Fall 2020 semester, the University of New Haven (UNewHaven) joined over a third of colleges and universities across the country in offering in-person courses and reopening its campus. Allowing the campus community to safely return was a challenging endeavor, particularly for those at the University's School of Health Sciences, which offers both non-clinical and clinical courses. In order to create learning environments that adhered to continuously-changing guidelines, our team at the School of Health Sciences was forced to develop and implement innovative strategies. In this article, we share our experiences in fulfilling our roles as faculty, staff, and students at a School of Health Sciences offering in-person, non-clinical and clinical courses during the COVID-19 pandemic. We reflect upon our challenges and share the lessons learned, which we hope will serve as guidance for our collective community in higher education, including those working within schools of public health and health sciences. Our lessons learned are presented in following three themes: 1) preparation for in-person classes; 2) the emotional state of faculty, staff, and students; and 3) innovative practices. Should colleges and universities ever find themselves in similar, yet unprecedented times, our lessons and recommendations may serve as a starting point to assist them in navigating through such tumultuous moments.

Keywords: COVID-19, pandemic, health sciences, dental hygiene, clinical, didactic, education

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INTRODUCTION

In August 2020, the University of New Haven (UNewHaven) joined over a third of colleges and universities in the United States (U.S.) in fully reopening its campus (Here's Our List of Colleges' Reopening Models, 2020). Based in West Haven, Connecticut, UNewHaven is a four-year institution that serves nearly 7,000 undergraduate and graduate students and is comprised of five colleges, including the School of Health Sciences (University of New Haven, 2021). The process of reopening during the COVID-19 pandemic included the requirement of "return to campus COVID-19 tests" and ongoing randomized testing for all returning students, faculty, and staff.

Opening college campuses during the pandemic was both a challenging and controversial decision that was met with scrutiny (Sorrell, 2020; Yamey and Walensky, 2020). Critics raised concerns over the health and safety of all individuals working on campuses—from students, to faculty, and staff—as there are no re-opening strategies that are risk-free (Wrighton and Lawrence, 2020). Furthermore, young adults represented a large proportion of new COVID-19 infections between June through August 2020 (Boehmer et al., 2020). However, many colleges and universities opted to reopen in light of financial pressures, demands from students to offer in-person courses, and challenges with offering clinical and lab-based coursework in a virtual format (Higgins-Dunn, 2020; Quintana, 2020; Wrighton and Lawrence, 2020; Yamey and Walensky, 2020).

The task of offering on-ground (aka in-person) courses has been challenging for many institutions, as COVID-19 outbreaks emerged on many campuses (Tracking the Coronavirus at U.S. Colleges and Universities, 2020). According to a survey of 1,900 colleges and universities, the *New York Times* estimated 397,000 cases of COVID-19 and at least 90 deaths have occurred due to possible infections originating on campuses in the U.S. since the beginning of the pandemic (Tracking the Coronavirus at U.S. Colleges and Universities, 2020). Less than a week after opening its campus to students in August 2020, the University of North Carolina at Chapel Hill closed following a spike in COVID-19 cases (Treisman, 2020). Other colleges and universities across the country also experienced similar outbreaks shortly after opening (Nadworny, 2020).

At UNewHaven, university officials, guided by state and federal recommendations, including the Centers for Disease Control and Prevention's (CDC) COVID-19 testing guidance for colleges (Centers for Disease Control and Prevention, 2020; Redden, 2020), implemented a number of COVID-19 directives, including a campus-wide mask mandate. Students enrolled in on-ground courses and their instructors were required to wear protective masks and were situated at least six feet apart. Eating and drinking were prohibited in all classrooms, although students and instructors were allowed to take breaks to snack and consume beverages in designated locations.

A key factor for reopening UNewHaven was to continue its clinic-based courses. The School of Health Sciences offers a number of interdisciplinary undergraduate and graduate programs, including its accredited dental hygiene program, which generally provides students with patient interaction (School of Health Sciences, 2020). **Table 1**. summarizes the demographics of students enrolled in the UNewHaven School of Health Sciences in Fall 2020, including clinical vs. non-clinical students. Reopening college campuses is arguably essential for students in the health professions that involve clinical training, such as medicine, dentistry, and related fields. For healthcare students, studies suggest hands-on and real life experiences are associated with increased preparedness (Burford, Whittle, and Vance, 2014). Acknowledging the high risk of infection, many have called for the continuation of in-person clinical programs as they will ensure that healthcare students will graduate on time, particularly during a period when they are in high-demand (MedEd Collaborative, 2020).

Here we reflect upon our experiences during the Fall 2020 semester at an academic institution, that chose to open and offer in-person, clinical and non-clinical courses during the COVID-19 pandemic. We share our unique perspectives as faculty, staff, and students with hopes that individuals at other academic institutions will learn from our experiences, including our successes and challenges as members of the UNewHaven's School of Health Sciences. We aim to assist others in successfully navigating through this ongoing pandemic, as well as future public health threats, with the lessons we learned based on the following themes: 1) preparation for in-person classes; 2) the emotional state of faculty, staff, and students; and 3) innovative practices.

TABLE 1 | Sample demographics.

Characteristic	Total *N* = 619 (100.0%) *n* (%)
Sex	
Female	491 (79.3)
Male	128 (20.7)
Race/Ethnicity	
Asian or pacific islander	35 (5.6)
Black or African American	99 (16.0)
Hispanic	77 (12.4)
Non-residential alien	61 (9.9)
Other	22 (3.6)
White	325 (52.5)
Grade level	
Graduate	196 (31.7)
Undergraduate	423 (68.3)
Clinical status	
Clinical program[a]	233 (37.6)
Non-clinical program	386 (62.4)

[a]*Includes students enrolled in the dental hygiene or paramedicine undergraduate programs. All other majors are non-clinical programs.*

PREPARATION FOR IN-PERSON CLASSES

With the increasing prevalence of COVID-19 in 2020, many universities were forced to move to online education. Clinical and didactic instruction also changed drastically due to social distancing and safety protocols for in-person classes, including medical training programs that include pre-clerkships and clerkships (Guadix et al., 2020). Adapting to constantly changing recommendations from health and government officials to keep members of our university safe demanded flexibility. Special challenges immediately presented themselves to meet the evolving state and CDC guidelines (Centers for Disease Control and Prevention, 2021) for in-person education.

One challenge for didactic teaching resources was the limited classroom space allowing for socially distanced teaching and learning by providing a six-foot bubble around students and the instruction area. Classrooms were created from non-traditional spaces on campus (e.g., university-affiliated church, athletic studios) in order to allow socially distanced in-person classes. These non-traditional spaces presented challenges as many were only partially outfitted with the technology needed for instruction (e.g., the university-affiliated church was not equipped with adequate desktops needed for clinic-based courses).

Managing clinically-based programs also raised challenges. For example, students in our dental hygiene program must meet specific patient contact hours as part of key accreditation requirements. However, accessing patients, who were generally from the surrounding community, was highly restricted due to concerns of COVID-19 transmission. Additionally, external service learning sites (e.g., community partner clinics) were unable to host students for on-site clinical experiences. Many students were also placed into quarantine due to possible exposure to COVID-19—another factor that reduced their in-person training. To meet patient contact accreditation challenges, the development of online coursework for dental hygiene

students was necessary. Best practices for online clinical coursework included developing detailed student learning outcomes and restructuring rubrics to demonstrate learning with case studies in place of some patient contact hours. High impact practices including group work using Zoom breakout rooms kept students engaged.

We also experienced communication challenges due to the university-wide requirements to wear masks on campus. To meet the six-foot distancing requirement, many classrooms were held in large rooms and lecture halls, which presented communication challenges between faculty and their students. Individuals with hearing loss were also at a disadvantage, as the mask mandate prevented them from being able to read lips and other nonverbal facial cues. However, these mitigation strategies proved successful, as no COVID-19 infection spread was traced back to classrooms or other instructional areas.

From a faculty perspective, lecturing often required shouting or louder talking voices in order to be heard in larger rooms that were not equipped with microphones and other essential technology. This communication barrier presented difficulties in maintaining students' engagement because they often could not hear or understand the lecturer.

Reflecting upon our past challenges, we believe adaptation, flexibility, and planning for future incidents, including pandemics, is essential. In anticipation for other impending public health threats, academic institutions should ensure that non-traditional classrooms (e.g., university-affiliated church, athletic studios) can be easily equipped with essential technology. Clinically-based programs have developed alternative teaching strategies to help students meet accreditation and knowledge milestones. Developing and maintaining a secondary strategy for teaching clinical skills during such emergencies should remain a part of the curriculum. Finally, using classroom integrated microphones or portable microphones may address communication challenges in non-traditional classrooms.

EMOTIONAL STATE OF FACULTY, STAFF, AND STUDENTS

Faculty and Staff

"We cannot help but impute emotions to the behaviors of others, and constantly infer not only what others are feeling but also why they feel that way" (Spunt and Adolphs, 2019). This quote accurately describes the basis of the emotional state of UNewHaven School of Health Sciences faculty while teaching during the pandemic. The emotional state refers to emotions and behaviors which are related to a psychological and physiological state (Kim et al., 2013). The evolution of the pandemic has shocked educators in higher education forcing the reevaluation of best practices in every area of course delivery. One of the common themes among faculty following teaching in-person courses during the pandemic was emotional, mental, and physical exhaustion. Emotional exhaustion is frequently the focus of educational research related to educator burnout (Maslach et al., 2001). Emotional exhaustion, cynicism, and inefficacy are the result of prolonged interpersonal and emotional stressors within education (Chang, 2009; Goetz et al., 2015; Arens and Morin, 2016; Taxer et al., 2019). At the School of Health Sciences, faculty frequently experienced isolation from colleagues, anxiety, and expectations to meet new teaching standards through in-person, hybrid, and online learning modalities. Uncertainty regarding job security, student satisfaction with teaching, and day-to-day changes with teaching recommendations due to the pandemic contributed to burnout. Furthermore, faculty did not receive training to effectively cope and reduce stress. Such concerns around mental health among of members of university and college campuses during the pandemic continue to be documented, with researchers attributing such health consequences to increased workload related to adapting to changes in laboratory and practical activities (Anderton et al., 2021).

Non-teaching staff, who often provide various forms of support to students, also experienced heightened anxiety around job security, as they were among the groups within higher education most affected by furloughs (Bauman, 2020). Additionally, staff became reluctant to express their health and safety concerns, even as they were tasked with additional roles and responsibilities (Anderson, 2020).

Adding to the emotional state, faculty and staff were forced to address COVID-19 induced situations hastily. As schools begin to close, many faculty and staff with children found themselves without adequate childcare and were forced to innovatively juggle work and homelife responsibilities. Additionally, faculty and staff were concerned with students' emotional and mental health, as many were often distracted and lacked focus in class.

Developing strategies to maintain and improve the emotional, mental, and physical health for faculty and staff should not be ignored. Offering virtual services such as medical counseling, mental health counseling, and opportunities to join virtual exercise classes for physical health could help to ward off mental and physical exhaustion (Ruegsegger and Booth, 2018). Training faculty and staff to identify signs of anxiety and depression among individuals will assist in recognizing and meeting the needs of students and colleagues. Additionally, generating positive thinking and feeling for educators associated with work-related demands can help manage exhaustion resulting from increased workload and addressing students' needs (Nordhall et al., 2020).

Students

Concerns over students' emotional and mental health grew as a result of the ongoing pandemic and its resulting public health measures (e.g., stay-at-home orders). Students' motivation, concentration, and social interactions remained crucial factors for their overall success (Son et al., 2020). As a university that offered in-person courses, UNewHaven students were frequently placed into quarantine or isolation for varying periods of time due to COVID-19 exposure. Being placed into quarantine due to possible exposure to COVID-19, or being isolated due to confirmed infection, was tolling on students' emotional, physical, and mental well-being and contributed to burnout. Often referred to as "COVID brain fog," students often found

themselves feeling sluggish, unable to concentrate, and battling with the stigma of needing to stay on top of their course work regardless of their physical or mental health status (Budson, 2021). Many School of Health Sciences students reported feeling defeated, lacking motivation, and anxious as they worry about the pandemic and their own mental fatigue.

Universities should strategize how to promote and maintain students' overall health—physically, mentally, and emotionally—as they return for in-person learning. Possible solutions include the reduction from full-days to half-days in the clinical setting, and hybrid learning opportunities for didactic courses, to maintain students' ability to focus during class. Furthermore, faculty and staff should work closely with on campus resources, including counseling services and student affairs, to identify and remove barriers preventing students from seeking assistance and additional support.

INNOVATIVE PRACTICES

Novel Pandemics and Public Health Threats Course for Student Retention

As part of the School of Health Sciences' student recruitment and retention plan, a faculty member trained in health education developed and taught an eight-week online course focused on the COVID-19 pandemic. All accepted students who had committed to one of the nine undergraduate programs at the School of Health Sciences—from health sciences, exercise science, to dental hygiene—were offered the opportunity to complete the online, synchronous course at no cost and receive college credit upon successful completion. The course, titled Pandemics and Public Health Threats, challenged incoming students to think critically about the novel coronavirus pandemic of 2020 and other public health threats; it also introduced students to the fundamentals of epidemiology, public health practice, and the social determinants of health (Islam, 2019).

Pandemics and Public Health Threats proved to be successful based upon its evaluations and the low number of students who dropped the course (one student dropped due to work obligations). The course offered students an opportunity to interact with a faculty member and their future classmates in an online setting, with hopes that they (recent high school graduates) will transition into on-ground courses in the fall semester successfully. Furthermore, the course served as a key source of information regarding the ongoing COVID-19 pandemic and emerging developments (e.g., number of cases, status of vaccine development) and the safety plans at the School of Health Sciences and UNewHaven (e.g., mask mandates, social distancing, crowd control). This focus on health equity and addressing social determinants sets the foundation for students' anticipated four years at the School of Health Sciences.

Examples of positive student feedback from the course evaluations include:

> I enjoyed learning about topics that I've never known to be an epidemic or that I've never really cared too much to look into.

> I enjoyed speaking about our current pandemic: COVID–19! It's a new topic in which is marked in history. It amazing we are able to learn about it first in college.

Given students' positive feedback, as well as its ability to retain newly accepted students, we recommend institutions that are concerned with student retention and success to consider a similar approach in developing a special topics course. We also saw the course as an opportunity to give students' early exposure to the social determinants of health, including the role of structural racism, in shaping health outcomes and contributing to health disparities.

Online Education for Clinical Lab Courses

To meet accreditation requirements while navigating a time in which students were frequently placed into quarantine or isolation due to the pandemic, the structure of our mandatory clinical lab course for dental hygiene students had to be flexible. We received some latitude from our accrediting agencies regarding competencies as a result of the now highly restricted exposure to the surrounding patient population and partnering community clinics. We compensated for the reduction in patient contact hours by utilizing case study work, which encouraged our students to apply critical thinking skills and collaborate in teams. Additionally, faculty and staff worked diligently to secure PPE as recommended by the CDC. Keeping faculty, staff, students, and community patients safe was the priority of all clinic-based courses. Students placed into quarantine during the semester necessitated additional remote clinic course work completed online *via* Zoom. Despite the reduction of patient contact hours and in-class time, developing our own case studies and associated competencies allowed us to keep our students on track.

DISCUSSION

The ongoing COVID-19 pandemic has presented unprecedented challenges to institutions of higher education—our experiences at UNewHaven's School of Health Sciences were no exception. The charge of offering in-person classes, all while maintaining safety protocols to prevent the spread of COVID-19, proved to be daunting. Despite the many challenges we encountered, there were countless lessons learned, many of which we feel obligated to share with our peers at other academic institutions. Our lessons are also valuable as global leaders continue to discuss emergency preparations for future pandemics and public health threats (WHO, 2020; Robbins, 2021). Academic institutions must be prepared for such challenges. We summarize our lessons learned and recommendations in **Table 2**.

Based upon our experiences, we recommend colleges and universities, particularly health-related institutions (e.g., schools of health sciences) have an emergency learning plan. This plan must be flexible and adaptable to the frequently changing guidelines presented by health and government officials. Upon our return to campus during the fall 2020 semester, we learned many nontraditional spaces on campus were transformed into classrooms to accommodate social

TABLE 2 | Summary of key challenges and recommendations.

Challenges	Recommendations
1. Lack of classroom space to accommodate social distancing measures	Create and maintain non-traditional spaces on campus (e.g., university-affiliated church, athletics facilities) with technology (e.g., microphones, projectors, access to internet) as classrooms
2. Reduction in clinical lab experience and patient contact hours, challenges accessing PPE	Maintain a regular supply of PPE and keep an educational plan up to date to meet alternative clinic lab requirements that adhere to accreditation standards. Consider innovative practices to accommodate the reduction in patient contact hours, such as the development and use of case studies
3. Effective communication	Equip classrooms with essential technology to ensure student and faculty success, such as microphones, cameras, internet access, projectors, computers/laptops, and other equipment
4. Emotional, mental, and physical exhaustion	Offer access to virtual services including medical counseling, mental health counseling and virtual exercise
4b. Feelings of disconnection	Prioritize opportunities for faculty, staff, and students to connect outside of the classroom
5. Student recruitment and retention	Develop innovative, new courses for incoming students to ensure their successful transition into the university; the new course may also be used to educate students on campus-wide pandemic protocols (e.g., mask mandate, social distancing, quarantine and isolation requirements)
6. Unpredictable and sudden changes to state and federal guidance	Work with local colleges, universities, and academic institutions to develop best practices and maintain a regular stream of communication. Such collaboration creates a collective cohort of institutions that can express disagreements and concerns to sudden changes to state and federal guidance

distancing. We believe such measures are viable solutions but they must be equipped with adequate technology (e.g., microphones, projectors, and computers) to ensure effective teaching and learning. School officials should also ensure nontraditional classrooms be prepared to accommodate students who may be placed into quarantine or isolation and require online instruction. Students also come from diverse ability statuses and may require additional support as mask mandates and social distancing measures present challenges in hearing and engaging in classroom-based discussions. Students of lower socioeconomic statuses may also lack the financial or technological resources (e.g., laptops and tablets) to easily pivot to online learning.

The pandemic's toll on the mental health of the global community cannot be ignored. Nor can we ignore the pandemic's effects on the health—from physical, emotional, to mental—of the campus community. We noticed an increased emphasis (and understandably so) placed on protecting our community's physical health, particularly from COVID-19 infection. However, there were clear gaps in promoting and protecting the emotional and mental health of faculty, staff, and students. To ensure that on-campus instruction, including clinical and didactive courses, are achieving desired outcomes and fostering effective learning environments, academic institutions must be intentional in addressing concerns around mental and emotional health. This is a time to maximize on-campus counseling services and develop innovative strategies to cope with the heighten fear and chronic stressors.

As colleges and universities work to mitigate the negative impact of the declining number of prospective students, as well as retaining current ones, they must consider innovative practices for recruitment and retention. We found our innovative course focused on the pandemic and other public health threats helpful in recruiting and retaining students; it also served to ease the transition from high school to college as it was offered virtually at no cost in the summer leading up to fall semester. We recommend developing courses that focus on timely and appealing topics that also set the foundation for students to succeed during the duration of their time in college.

CONCLUSION

Approximately a year after the official declaration of the COVID-19 pandemic, institutions of higher education continue to weigh the options in offering in-person over online courses. Regardless of their decisions, future pandemics and emerging public health threats are inevitable. Therefore, we hope our lessons learned and recommendations as faculty, staff, and students at a university that chose to offer primarily in-person courses serve as guidance to assist others who will find themselves in similar positions.

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

AT conceptualized the manuscript's focus and proposed objectives. AT and RK prepared the draft manuscript and wrote the majority of the sections. SG and SP contributed to the writing of the manuscript and provided critical revisions.

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E-Learning System Use During Emergency: An Empirical Study During the COVID-19 Pandemic

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The pandemic of COVID-19 quickly led to the closure of universities and colleges around the world, hoping that the guidance of social distancing from public health authorities will help flatten the curve of infection and minimize the overall fatalities from the epidemic. The e-learning framework, however, is the best solution to enable students to learn about the quality of education. The aim of this research was to examine variables reflecting the actual use of the e-learning system during the COVID-19 pandemic among university students. The perceived ease of use and perceived usefulness are positively correlated with facilitating condition, perceived control, and self-efficacy, which in turn influences students' attitude toward use, which in turn affects the actual use of the e-learning system during the COVID-19 pandemic. To exam the model on the basis of user data from the e-learning system used collected through an online survey, structural equation modeling (SEM) and path analysis were used. The findings showed that the mindset of students to use had positive effects on the learning of students during the COVID-19 pandemic through the actual use of the e-learning system. In the context of e-learning programs in developing countries, previous studies have seldom explored an integrated model. In addition, this article aims to include a literature review of recently published research on the actual use of the e-learning system during the pandemic of COVID-19.

Keywords: e-learning system, COVID-19 pandemic, TAM, students' learning, higher education

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INTRODUCTION

The corona virus disease 2019 (COVID-19) pandemic has been severely damaging. The World Health Organization, WHO (World Health Organization, 2020), when this article was written, registered almost 95.5 million cases. The COVID-19 pandemic has produced changes in the teaching–learning environment in higher education institutions and has impacted learning between teachers and students. As a result of the pandemic, universities were reduced to performing their operations primarily online with students (Sobaih et al., 2020).The COVID-19 pandemic gradually evolved from its first introduction into a genuinely global phenomenon. While the social dissemination of the virus is of significance for the securitization of face-to-face schooling, the perspective is provided by a brief overview of the growth of the virus. The first reported disease onset date of COVID-19 was December 1, 2019, and the first hospital intake date was December 16, 2019 (Huang et al., 2020). A cluster of patients with pneumonia in Wuhan, China, was reported at the World Health Organization's Beijing office on December 30, 2019 (Guarner, 2020). In clinical presentations, a shared viral pneumonia strain, called COVID-19 or 2019 novel coronavirus, was indicated (Huang et al., 2020). An epidemiological warning was posted by the health authorities the next day (Huang et al., 2020). About a month after the

viral pneumonia cluster was recognized, just under two months after the first symptoms ever caused by the virus (Lai et al., 2020), and on March 11, 2020, the COVID-19 pandemic (WHO coronavirus Disease (COVID-19) dashboard, 2020), the World Health Organization declared a Global Health Emergency of International Importance. The severity of the virus has been very catastrophic; the closing of colleges and schools was one of the effects during the COVID-19 pandemic. There is also an inescapable need to use technology in education for educational purposes during the pandemic; a number of recent reports have raised this issue (Almanthari et al., 2020; Kerres, 2020; Wang et al., 2020). One of the technologies used during COVID-19 is e-learning, a media integration for teaching that uses a consolidated platform to organize communication processes during instructional activities. Innovative networks of technology, such as Edmodo, social media, forum, Coursera, or special higher education platforms, apply computer-managed e-learning to immersive online learning. By the use of the e-learning system (Omar et al., 2011; Al-Rahmi et al., 2020a), students are expected to make meaningful progress in doing their learning activities. Two considerations are frequently used to construct e-learning in higher education, namely, manageable costs and support facilities to promote learning effects (Clark and Mayer, 2016). The purpose of the implementation of the e-learning method in normal circumstances is to promote more flexible, usable, and efficient face-to-face learning (Al-Rahmi et al., 2020b). In the plethora studies (Megahed and Mohammed, 2020; Shi et al., 2020), the use of the e-learning system as a research object was discussed. Some recent studies have also been reported during COVID-19 (Almanthari et al., 2020; Abbasi et al., 2020; Favale et al., 2020; Radha et al., 2020) on e-learning system applications in education. However, research on the adoption of the e-learning system is still limited in developed countries and, in particular, on topic matters. This thesis was therefore conducted to understand variables predicting the eventual use of the e-learning method through path analysis by university students. Universities and school doors were closed to restrict the dissemination of COVID-19. More than 1.7 billion students around the world have been affected by the closure, according to the report, with 160 countries implementing the closure because of the pandemic (UNESCO, 2020). It can be estimated that COVID-19 has affected 91 percent or more of the global student population. The recession has opened up an incentive for both the application of technology and the challenges it faces at about the same time. On the other hand, the role of technology in changing the learning process, fostering sustainable teaching, and facilitating distance learning education for students around the world has produced enormous perspectives (Abbasi et al., 2020). Therefore, this research develops a new model of the e-learning system use during the COVID-19 pandemic.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

This study was developed based on methods of technology adoption "e-learning system" that are used to analyze students' attitude on the application and intent of behavior during the COVID-19 pandemic to influence the use of the e-learning method. Thus, the study developed 12 hypotheses and the results from it developed a new model shown in **Figure 1**. Also, in this research, technology acceptance model (TAM) has been applied as a highly promising way to measure students' attitudes and behaviors toward using computer technology (Vankatesh and Davis, 1996). The perception of ease of use, usefulness, and attitude of students to use by students has been noticed by several researchers (Islam, 2013; Al-Rahmi et al., 2019a). Liaw and Huang (2014) and Al-Rahmi et al. (2018a) found that the attitude of learners to technologies, like the e-learning system, had a major positive influence on the self-efficacy of learners. The current research, followed by a synthesis of the main theories and previous similar studies, starts by evaluating the current literature on technology adoption. A model of the core structures of the practical use of e-learning systems as the result of this study. Moreover, this study filled the research gap to develop a new model through seven main factors shown in sections from *Facilitating Condition* to *Actual Use of the E-Learning System During COVID-19 Pandemic*. To understand the schooling of learners during the COVID-19 pandemic by the use of the e-learning system, an extended technology adoption model is used. Believed that the stimuli experienced in the e-learning system's environment can be called external environment stimuli and are related to the mental reaction provided by learning self-efficacy (Illeris, 2003), and here the internal psychological process is divided into self-efficacy. The research model variables are as follows: independent influences: facilitating condition (FC), perceived control (PC), self-efficacy (SE), and mediator factors are perceived as perceived ease of usage (PEU), perceived usefulness (PU), and attitude of students toward use (AT) during the COVID-19 pandemic, which in turn affects the dependent factors of actual use of the e-learning system (AUE). Refer **Figure 1**.

Facilitating Condition

The facilitating condition is introduced to become the only external variable that accompanies the main TAM-based build. It is described as the degree to which students believe that the use of the COVID-19 pandemic e-learning platform has organizational and technological resources to support it. It is believed that conditioned facilitation is correlated with perceived ease of use and perceived usefulness. Previously, facilitating conditions have been reported to substantially predict perceived ease of use for the implementation of educational technology (Nikou and Economides, 2017; Muhaimin et al., 2019). In addition, it was also stated to have been significantly related to perceived usefulness (Rahimi et al., 2015). Nonetheless, two previous studies (Muhaimin et al., 2019; Teo et al., 2019) have stated that condition facilitating is an irrelevant measure of perceived utility. The following theories were suggested based on the discussion above:

H1: FC is positively associated with PEU.
H2: FC is positively associated with PU.

Perceived Control

Teaching classroom control is also defined as a single dimension that ranges from teacher control to student autonomy and also

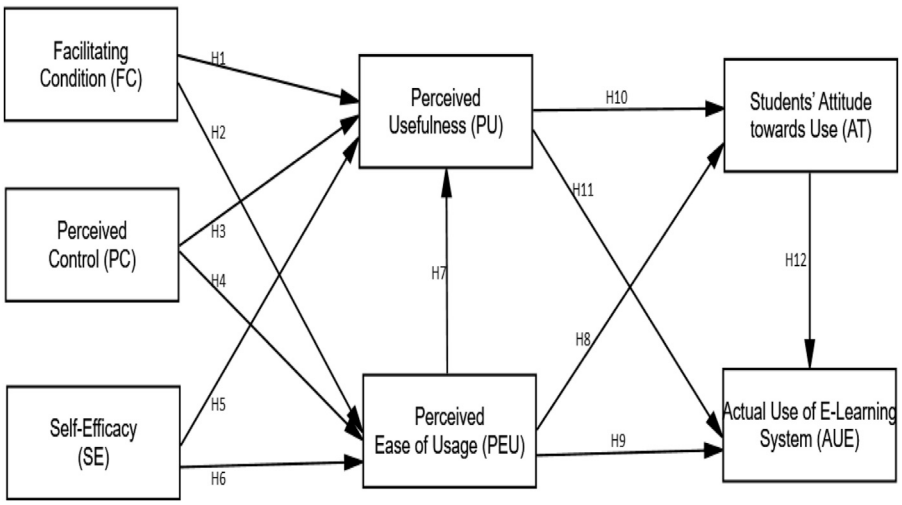

FIGURE 1 | Research model and hypothesis.

teacher and student learning control (DeCharms, 1976). Classroom management depends on the quality and direction of instruction, as managed by instructors, and the opportunities for self-directed learning for the students (Bandura and Wood, 1989). Connell (1985) believes that by providing options for choice and self-directed learning to students, perceived autonomy can be improved. Decades of study has found that perceived influence is correlated with motivation and different measures of satisfaction, such as the relationship between parent and child (Abad and Sheldon, 2008) and friendship (Demir et al., 2013). This description has also been extended to the relationship between teacher and student: the perceived control of students has been shown to increase the internal understanding of learning (Bonneville-Roussy et al., 2013; Simon et al., 2015), suggesting that control is perceived to be affected by the use of the e-learning system during the COVID-19 pandemic. The following theories were suggested based on the discussion above:

H3: PC is positively associated with PEU.
H4: PC is positively associated with PU.

Self-Efficacy

Self-efficacy refers to a learner's trust that he or she can achieve a mission and accomplish a goal (Bandura, 1977; Bandura, 1986). Generative ability in which cognitive, social, and behavioral subskills must be structured into integrated action courses to fulfill the generative capacity of countless reasons to organize cognitive, social, and behavioral subskills into integrated action courses to serve countless purposes. For Liaw and Huang, self-efficacy is a beneficial feature of successful learning (Liaw and Huang, 2013). Therefore, a high degree of perceived self-efficacy leads to improved learning performance and greater behavioral retention in e-learning environment settings (Chu and Chu, 2010; Liaw and Huang, 2013). Therefore, learners' self-efficacy determines their useful learning, attitudes, skills development, choice of activities, and continuing encouragement to learn through the actual use of the e-learning system during the COVID-19 pandemic. The following theories were suggested based on the discussion above:

H5: SE is positively associated with PEU.
H6: SE is positively associated with PU.

Perceived Ease of Use

As one of the main variables of the original TAM, the perceived ease of use is defined as the degree to which learners believe that during COVID-19 it will be easy to use the e-learning system. Perceived ease of use is characterized as the degree to which a person assumes that using a system (Davis, 1989), which is an imminent adoption factor of modern technology–based applications, would be effortless (Venkatesh, 2000). In several previous research studies (Chen and Tseng, 2012; Islam, 2013; Al-rahmi et al., 2015a; Al-Maatouk et al., 2020), the effect of perceived ease of use on the intent to use the e-learning system has been shown. Therefore, the more ambitious the aim of using the e-learning system is, the greater the perceived ease of use of the e-learning system; thus, the greater the likelihood of using it. Moreover, in the sense of the e-learning system, perceived ease of use is often believed to have an indirect effect on the attitude of use perceived by usefulness (Chen and Tseng, 2012). Therefore, the perceived ease of use is also predicted to have an indirect influence on users' perceptions by the perceived usefulness of the use of the e-learning system during the COVID-19 pandemic. Based on the above discussion, following hypotheses were proposed:

H7: PEU is positively associated with PU.
H8: PEU is positively associated with AT.
H9: PEU is positively associated with AUE.

Perceived Usefulness

The perceived usefulness has been accepted as the student level believes that during COVID-19, the use of the e-learning system would increase the performance. A primary determinant of

purpose is perceived usefulness, which stimulates IS consumers to implement more innovative and user-friendly technologies in the 21st century that give them greater freedom (Pikkarainen et al., 2004; Abuhassna et al., 2020). It was found that perceived usefulness had a significant positive effect on the decision to use the e-learning system's resources (Chen and Tseng, 2012; Cheng, 2012; Islam, 2013; Al-Rahmi et al., 2019b). Therefore, the higher the perceived usefulness of the actual e-learning system, the more positive the attitude to use it is; thus, after the COVID-19 pandemic, the greater the probability of using the e-learning system. Based on the above discussion, following hypotheses were proposed:

H10: PU is positively associated with AT.
H11: PU is positively associated with AUE.

Students' Attitude to Use

The attitude in this study is represented as some students' behavior is associated with the use of the e-learning system during COVID-19. The attitude was hypothesized to have a strong correlation with behavioral intent. (Mohammadi (2015) and Al-Rahmi et al. (2020b) found that if the extent of such behavior correlated with the use of technology was higher, the attitude toward using technology would also be more significant. Based on the TAM, behavioral intent, which is described as the attitude of students to use the e-learning framework during COVID-19, was included. It is expected that the behavioral attitude in this analysis would have a statistically significant relationship with the actual use of the e-learning system during COVID-19. Previous experiments have demonstrated that students' behavior and attitudes are closely related to the actual use of technology, in general the e-learning system (Teo, 2009; Ramírez-Correa et al., 2015), hence the attitude of students to use the e-learning system during the COVID-19 pandemic. Based on the above discussion, the following hypothesis was proposed:

H12: AT is positively associated with AUE.

Actual Use of the E-Learning System During COVID-19 Pandemic

The higher education system is currently in a constant transformation phase, with universities having to keep pace with the demands and expectations of students. Accordingly, information technology and e-learning platforms are key factors in the implementation of the activities of universities, which are increasingly investing in online systems and devices (Popovici and Mironov, 2015; Alalwan et al., 2019). One of the key challenges for universities in the technology age, however, is the integration of an advanced e-learning framework to improve and sustain both teaching and learning (Fischer et al., 2014; Al-Rahmi et al., 2018b). The e-learning framework has several features that promote and cultivate the learning–teaching process, providing a broad range of options for exchanging information and uploading documents in various formats. The installation of additional tools is not needed because it is a web-based framework, and once published, the content is accessible to users at any time (Raheem and Khan, 2020; Alamri et al., 2020). The effect of the pandemic on education, universities, teachers, and students has become a topic of great concern to researchers because of the extraordinary situation produced by the COVID-19 pandemic. Examining the opinion of students regarding online learning during the COVID-19 pandemic, Allo found that students had a positive attitude about the use of the e-learning system, finding it beneficial and useful during the time of the pandemic crisis (Allo, 2020).

RESEARCH METHODOLOGY

This research was performed by an online survey from October 2020 to December 2020, when universities were closed from March 2020. A survey instrument to measure factors predicting the use of the e-learning method during COVID-19 among students was developed and validated prior to the main data collection. Of the 371 questionnaire participants, 363 returned responses. However, another nine participants' responses were eliminated from analysis since they were incomplete. Confirmatory factor analysis was used to ensure the model's validity. Partial least square structural equation modeling (PLS-SEM) was employed using SmartPLS 2.0.

Data Collection and Sampling Method

Using the questionnaires as a data collection tool, a quantitative research model was adopted for this research. The primary statistical analysis method was PLS-SEM, with SPSS software used for data analysis; in this research, the sample size for the analysis was determined using Roscoe's rule of thumb (Sekaran and Bougie, 2016).Also, according to Taherdoost (2016), sampling can be used to build a model about a population or to make generalizations based on existing theory. In general, there are two kinds of sampling techniques: probability or normal sampling and non-probability or nonrandom sampling. It is necessary to decide on a large sampling technique before deciding on a particular form of sampling technique. Therefore, the sampling method for this research was probability or random sampling, and it was recommended by Taherdoost, (2016). As a result, multiplying 10 by 25 items provided a sufficient sample size of 250 participants for this study. Thus, 354 participants were imported into the SPSS package software. Postgraduate and undergraduate students at university, who are active users of the e-learning system during the COVID-19 pandemic, were the sample of this research. A sufficient degree of reliability was determined through computing composite reliability. Initially, constructs validity was performed in two steps by calculating first convergent validity and second by assessing discriminant validity. Convergent validity was determined to evaluate the model's fit appropriateness before assessing the hypotheses by three procedures: factor loadings, average variance extracted AVE, and composite reliability. As detailed in section four, discriminant validity was assessed through the criterion test, in accordance with Hair et al. (2019). The structural model was assessed in the second stage.

Instrument Measurement

Regarding the data collection technique, the instrument was adopted from within the extant research and the principal research was used. A five-point Likert scale was adopted for the questionnaire items, with "5" indicating strong agreement and "1" indicating strong disagreement by the respondent. The inaccuracy in the outcomes may result from some exceptional cases, the data analysis to come in accordance with Hair et al. (2019). The questionnaire used in this research was adopted from the previous research facilitating condition that adapted three items from Habibi et al. (2020), perceived control adapted three items from Eshel (1991), self-efficacy adapted four items from Abdullah et al. (2016), perceived ease of use adapted four items from Davis (1989), perceived usefulness adapted four items from Davis (1989), students' attitude towards use adapted four items from Ratna and Mehra, (2015), and actual use of e-learning system during COVID-19 pandemic adapted three items from Peral et al. (2014); Ratna and Mehra, (2015).

RESULTS AND ANALYSIS

Demographic variables were classified according to gender, age, level of education, and specialization. With regard to gender, 195 (55.1%) were male and 159 (44.9%) were female, 209 (59%) were in the 18–21 age group, 76 (21.5%) were in the 22–25 age range, and 69 (19.5%) were in the 26–29 age group. The level of education was 269 (76.0%) undergraduate students and 85 (24.0%) postgraduate students. 101 (28.5%) of respondents were from social science, 77 (21.8%) of respondents were from engineering, and 176 (49.7%) of respondents were from science and technology, in contrast to the demographic variables of specialization. Cronbach's α reliability coefficient value for all constructs (facilitating condition, perceived control, self-efficacy, perceived ease of use, perceived usefulness, students' attitude toward use, and the actual use of the e-learning system use during the COVID-19 pandemic) was 0.827. Discriminant validity (DV) is considered satisfactory when 1) the index of factors is less than 0.80 (Hair et al., 2019), 2) the average extracted variance (AVE) value of each construct is equal to or greater than 0.50, and 3) and the square root value of AVE of each construct is greater than the inter-construct correlations (IC) connected with the factor (Hair et al., 2019). Moreover, crematory factor analysis (CFA) with factor loading (FL) values must be about the minimal acceptable level of 0.70, whereas the values of Cronbach's α (CA) ought to be equal to or above 0.70 (Hair et al., 2019). Durability of composite (CR) was also taken into consideration and it should be equal to 0.70.

Measurement Model Fit and Instrumentation

The first stage needed to confirm the validity of this model is to employ the partial least square structural equation modeling (PLS-SEM) Smart PLS 2.0. Prior to testing the hypotheses, the reliability of this model was confirmed in two steps. The CMN/DF ratio was 2.407, which was below the threshold (5.00). TLI (0.962) and IFI (0.951) are exceptional, GFI (0.927) is a good standard, and CFI (0.955) is outstanding. RMR and RMSEA of 0.33 (0.05) and 0.034 (0.08), respectively, were smaller than the cutoff (Hair et al., 2019), indicating that the model's badness metrics were adequate.

Construct Validity of Measurements

Construct validity is defined as the degree to which a test measures everything it needs to be measuring. Construct validity, content validity, and criterion validity are the three principal types of validate evidence (Hair et al., 2019). Factor analysis showed that factors had high loading and cross-loading of items (**Table 1**).

Convergent Validity of the Measurement Model

The composite reliability scores ranged from 0.932650 to 0.871728. These scores are above the required threshold of 0.70 proving that all constructs can be considered. Furthermore, Cronbach's α values varied from 0.903448 to 0.819590. This also satisfies the condition of being higher than 0.60. At the same time, the average variance extracted (AVE) values ranged from 0.792393 to 0.679315 surpassing the minimal limit of 0.50, while critical element loadings surpassed 0.50 (Hair et al., 2019), see **Table 2**.

Discriminant Validity of the Measurement Model

Discriminant validity is the extent that differentiates a latent variable from other latent variables. Discriminant validity is when a latent variable can explain more variance in the observed variables connected to it than a) measurement error or similar exterior unmeasured effects or b) other constructs within the conceptual framework. Should this be not the case, then the validity of each one of the indicators and of the construct becomes unreliable (Hair et al., 2019), see **Table 3**.

Structural Model Analysis

The path modeling research in the current study was used to construct a model to measure facilitating conditions, perceived control, and self-efficacy with TAM model variables on the actual use of the e-learning system during the pandemic of COVID-19. The effects are shown and compared in the hypothesis testing discussion, according to the model. Subsequently, factor analysis (CFA) was conducted on SEM to evaluate the suggested hypotheses as seen in the path model results in **Figure 2** and hypotheses testing in **Figure 3** for the second step.

Figure 2 and **Figure 3** above indicate that the findings of this research have accepted all hypotheses via path model results and hypotheses testing. In addition, **Table 4** below indicates that the key model statistics were fit, demonstrating model validity and hypotheses by showing the values of standard errors and then unstandardized coefficients of structural model testing coefficients.

TABLE 1 | Factor analysis and cross-loading values.

Factor	Item	At	PC	FC	SE	PEU	PU	EU
Attitude to use	AT1	0.86	0.39	0.46	0.47	0.43	0.44	0.46
	AT2	0.87	0.35	0.38	0.43	0.42	0.43	0.45
	AT3	0.74	0.34	0.31	0.42	0.42	0.42	0.34
	AT4	0.85	0.36	0.38	0.46	0.50	0.52	0.50
Perceived control	PC1	0.39	0.82	0.54	0.39	0.36	0.34	0.38
	PC2	0.37	0.87	0.46	0.34	0.37	0.31	0.36
	PC3	0.31	0.81	0.39	0.30	0.33	0.28	0.33
Facilitating condition	FC1	0.40	0.51	0.88	0.35	0.37	0.33	0.39
	FC2	0.40	0.48	0.91	0.35	0.37	0.36	0.40
	FC3	0.43	0.51	0.89	0.37	0.38	0.35	0.40
Self-efficacy	SE1	0.47	0.35	0.35	0.83	0.47	0.43	0.47
	SE2	0.41	0.30	0.28	0.83	0.39	0.36	0.40
	SE3	0.40	0.35	0.35	0.83	0.42	0.40	0.41
	SE4	0.48	0.36	0.33	0.82	0.48	0.45	0.48
Perceived ease of use	PEU1	0.48	0.35	0.33	0.44	0.82	0.67	0.47
	PEU2	0.38	0.32	0.31	0.40	0.80	0.54	0.45
	PEU3	0.44	0.37	0.36	0.46	0.84	0.58	0.50
	PEU4	0.44	0.36	0.38	0.46	0.84	0.61	0.46
Perceived usefulness	PU1	0.50	0.36	0.38	0.43	0.65	0.89	0.49
	PU2	0.47	0.32	0.34	0.44	0.65	0.91	0.51
	PU3	0.49	0.34	0.36	0.46	0.64	0.89	0.48
	PU4	0.45	0.29	0.28	0.42	0.63	0.83	0.46
E-learning system use during COVID-19	EU1	0.42	0.33	0.34	0.46	0.46	0.46	0.85
	EU2	0.48	0.37	0.38	0.48	0.50	0.49	0.88
	EU3	0.47	0.41	0.41	0.42	0.51	0.46	0.84

TABLE 2 | Crematory factor analysis of the measurement model.

Factor	Item	Factor loading	AVE	Composite reliability	R square	Cronbach's alpha
Attitude to use	AT1	0.86	0.693861	0.900314	0.333603	0.851917
	AT2	0.87				
	AT3	0.74				
	AT4	0.85				
Perceived control	PC1	0.82	0.693998	0.871728	0.000000	0.879409
	PC2	0.87				
	PC3	0.81				
Facilitating condition	FC1	0.88	0.792393	0.919668	0.000000	0.868,910
	FC2	0.91				
	FC3	0.89				
Self-efficacy	SE1	0.83	0.687028	0.897756	0.000000	0.848607
	SE2	0.83				
	SE3	0.83				
	SE4	0.82				
Perceived ease of use	PEU1	0.82	0.679315	0.894398	0.446654	0.842692
	PEU2	0.80				
	PEU3	0.84				
	PEU4	0.84				
Perceived usefulness	PU1	0.89	0.776058	0.932650	0.593006	0.903448
	PU2	0.91				
	PU3	0.89				
	PU4	0.83				
E-learning system use during COVID-19	EU1	0.85	0.735211	0.892764	0.420562	0.819590
	EU2	0.88				
	EU3	0.84				

As shown in **Table 4**, all hypotheses were accepted as all the seven factors were found to be statistically significant. There is a relationship between facilitating condition and perceived ease of use (H1) (β = 0.054809 and t = 2.505118): the result of this research confirmed that hypothesis is positively supported by the facilitating condition that makes the e-learning system ease of use.

TABLE 3 | Discriminant validity of the measurement model.

Factor	Item	At	EU	FC	PC	PEU	PU	SE
Attitude toward use	AT	1.00						
E-learning system during COVID-19	EU	0.53	1.00					
Facilitating condition	FC	0.46	0.44	1.00				
Perceived control	PC	0.43	0.43	0.56	1.00			
Perceived ease of use	PEU	0.53	0.57	0.42	0.42	1.00		
Perceived usefulness	PU	0.54	0.55	0.39	0.37	0.73	1.00	
Self-efficacy	SE	0.53	0.53	0.40	0.41	0.53	0.50	1.00

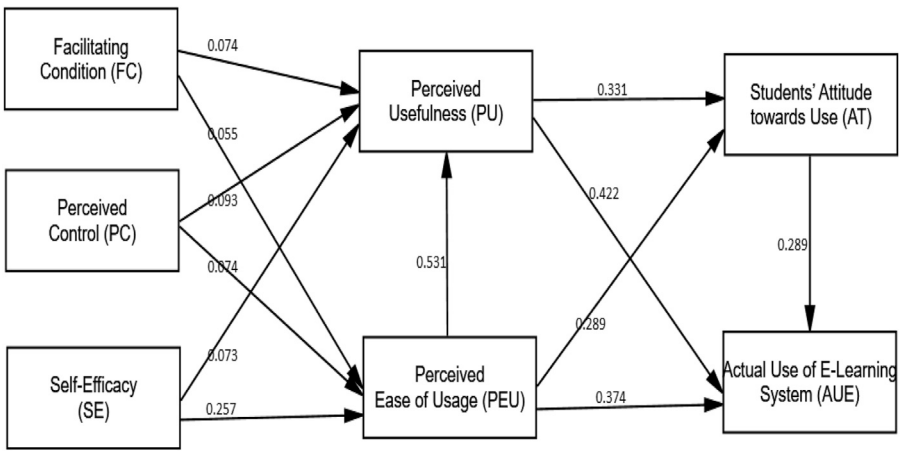

FIGURE 2 | Path coefficients results.

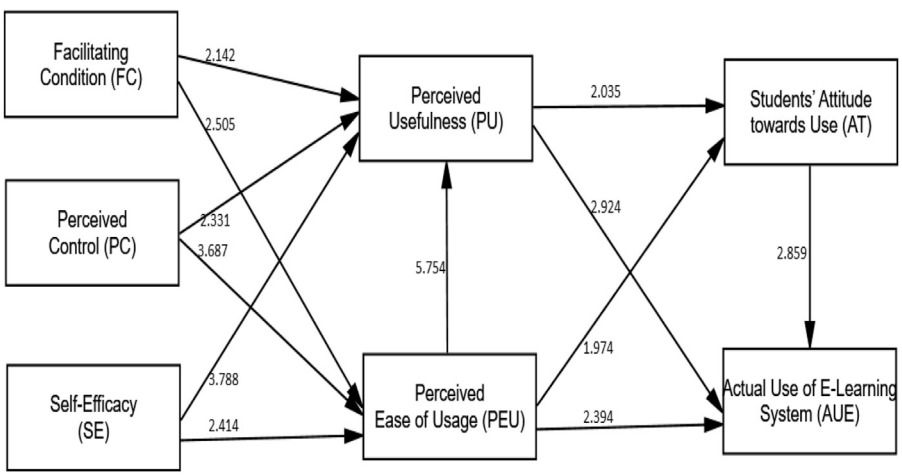

FIGURE 3 | Hypothesis testing.

Similarly, there is a relationship between facilitating condition and perceived usefulness (H2) ($\beta = 0.074292$ and $t = 2.142176$): the result of this research confirmed that the hypothesis is positively supported by the facilitating condition that makes the e-learning system useful. Second, there is a relationship between perceived control and perceived ease of use (H3) ($\beta = 0.074433$ and $t = 3.687396$): the result of this research confirmed that the hypothesis is positively supported by perceived control that makes the e-learning system ease of use, and also there is a relationship between perceived control and perceived usefulness (H4) ($\beta = 0.093211$ and $t = 2.331149$): the result of this research confirmed that the hypothesis is positively supported through

TABLE 4 | Hypotheses testing.

Hypothesis relationship	Path coefficient	Standard deviation	Standard error	T statistics (T.value)	Result
Facilitating condition and perceived ease of use (H1)	0.054809	0.108,507	0.108,507	2.505118	Supported
Facilitating condition and perceived usefulness (H2)	0.074292	0.089911	0.089911	2.142176	Supported
Perceived control and perceived ease of use (H3)	0.074433	0.108283	0.108283	3.687396	Supported
Perceived control and perceived usefulness (H4)	0.093211	0.097270	0.097270	2.331149	Supported
Self-efficacy and perceived ease of use (H5)	0.256649	0.106334	0.106334	2.413613	Supported
Self-efficacy and perceived usefulness (H6)	0.073766	0.093665	0.093665	3.787546	Supported
Perceived ease of use and perceived usefulness (H7)	0.530,577	0.092214	0.092214	5.753757	Supported
Perceived ease of use and attitude toward use (H8)	0.289979	0.146919	0.146919	1.973729	Supported
Perceived ease of use and actual use of e-learning (H9)	0.374401	0.123469	0.092101	2.393632	Supported
Perceived usefulness and attitude toward use (H10)	0.330564	0.162412	0.162412	2.035344	Supported
Perceived usefulness and actual use of e-learning (H11)	0.422371	0.326935	0.083492	2.923845	Supported
Attitude toward use and actual use of e-learning (H12)	0.288759	0.101002	0.101002	2.858943	Supported

perceived control that makes the e-learning system useful. Third, there is a relationship between self-efficacy and perceived ease of use (H5) ($\beta = 0.256649$ and $t = 2.413613$): the result of this research confirmed that the hypothesis is positively supported by self-efficacy that makes the e-learning system ease of use. Likewise, there is a relationship between self-efficacy and perceived usefulness (H6) ($\beta = 0.073766$ and $t = 3.787546$): the result of this research confirmed that the hypothesis is positively supported through self-efficacy that makes the e-learning system useful. Fourth, there is a relationship between perceived ease of use and perceived usefulness (H7) ($\beta = 0.530577$ and $t = 5.753757$): the result of this research confirmed that the hypothesis is positively supported through perceived ease of use that makes the e-learning system useful. And there is a relationship between perceived ease of use and attitude toward use (H8) ($\beta = 0.289979$ and $t = 1.973729$): the result of this research confirmed that the hypothesis is positively supported through perceived ease of use that makes the e-learning system useful and easy thus, students' attitude to use it. Also, there is a relationship between perceived ease of use and actual use e-learning (H9) ($\beta = 0.374401$ and $t = 2.393632$): the result of this research confirmed that the hypothesis is positively supported through perceived ease of use that makes the e-learning system useful and easy; thus, students actually use the e-learning system for learning. Fifth, there is a relationship between perceived usefulness and attitude toward use (H10) ($\beta = 0.330564$ and $t = 2.035344$): the result of this research confirmed that the hypothesis is positively supported through perceived usefulness that makes the e-learning system useful thus, students attitude to use it. And, there is a relationship between perceived usefulness and attitude toward use (H11) ($\beta = 0.422371$ and $t = 2.923845$): the result of this research confirmed that the hypothesis is positively supported through perceived usefulness that makes the e-learning system useful thus, students actually use the e-learning system for learning. Finally, the relationship between attitude toward use and e-learning system during COVID-19 (H12) ($\beta = 0.288759$ and $t = 2.858943$), the result of this research confirmed that hypothesis is positively supported through students' attitude toward the use that affects students' actual use of the e-learning system for learning. This is consistent with previous studies in the same field (Almanthari et al., 2020; Abbasi et al., 2020; Radha et al., 2020; Al-Rahmi et al., 2019b; Al-Rahmi et al., 2018b; Chu and Chu, 2010; Chen and Tseng, 2012; Raheem and Khan, 2020).

DISCUSSIONS AND IMPLEMENTATIONS

This research analyzed college students' understanding of the use, adoption, and acceptance of online learning during stay-at-home orders due to COVID-19. In order to explore variables forecasting the use of the e-learning system during the pandemic, a variant of the extended TAM was successfully used in this study to illustrate the mechanism perceived by university students of implementing the e-learning system during the pandemic. From the results, other researchers who are interested in doing research in the field of technology integration, particularly during pandemics such as COVID-19 and based on virtual-based studies among university students, can analyze and adapt the scale in the future. The tool helps to resolve the important contribution of the structural equation study for developing academic skills. The model is stated to be accurate and reliable through the material validity and measurement model. For the testing of their scale, previous studies used similar measurements (Ramírez-Correa et al., 2015; Al-Rahmi et al., 2018c; Moafa et al., 2018). Through the results of the research, it was revealed that facilitating condition, perceived control, and self-efficacy have a significant relationship with perceived usefulness and perceived ease of use and confirmed all the hypotheses of the current study. In addition, the results of the study showed that the students' attitude toward using the system has a significant relationship with the actual use of the e-learning system during the COVID-19 pandemic. It can be concluded that during the pandemic, the facilitating situation such as adequate facilities, good climate, and easy access to the Internet will make it easier for Saudi students to use the e-learning system. Usage of the e-learning system was also recorded at normal times to significantly predict perceived utility, perceived ease of use, and learning by students (Nikou and Economides, 2017; Muhaimin et al., 2019; Alyoussef et al., 2019). A significant relationship between facilitating condition, perceived control, self-efficacy, and perceived usefulness is positively associated with the perceived ease of use, which in turn affects the attitude of students toward use, which in turn affects the use of the e-learning system during the COVID-19 pandemic. The model was presented to show that the atmosphere and tools for using the e-learning system enhance the beneficial effects perceived by university students of the use of the e-learning system during

the pandemic. The outcome contradicts a previous finding by Muhaimin et al. (2019) that found an insignificant predictive capacity to promote perceived utility for Web 2.0 integration conditions. The finding of this study stated that it substantially predicts perceived utility with regard to perceived ease of use; when the e-learning system is perceived to be user-friendly, respondents enhance their feelings during the COVID-19 pandemic toward the value of the instruments. This result was supported by related studies from previous researchers (Mohammadi, 2015; Ramírez-Correa et al., 2015; Zhang et al., 2008). It is also stated that perceived ease of use has a close association with attitude; a shred of proof that the more students think the e-learning system is easy, the more during the pandemic they act against the use of the e-learning system. Buabeng-Andoh et al. (2019) confirmed this result through their meta-analysis research and Muhaimin et al. (2019) through their observational evidence. Furthermore, it was observed that the association between perceived usefulness and attitude to use was highly important. Other research works in the integration of the e-learning method have indicated that the perceived easy to use and perceived usefulness would be more likely to be improved as respondents consider that technology benefits instructional practices (Zhang et al., 2008; Ramírez-Correa et al., 2015; Nikou and Economides, 2017; Al-Rahmi et al., 2018a; Teo et al., 2019;). In comparison, during the pandemic, the more attitude the participants had about the use of the e-learning method, the better the likelihood for them to learn using the tool. Some previous research has also identified a substantial association between attitudes toward the use of technology in education (Muhaimin et al., 2019; Alhussain et al., 2020). Finally, in forecasting the real use of the e-learning method during COVID-19, which was confirmed by results from Teo (2009); Zhang et al. (2008); Ramírez-Correa et al. (2015); Al-Rahmi et al. (2015b), the attitude to use was stated to be important. They also found that behavioral intent during teaching and learning processes was a primary indicator of the use of the e-learning method. The consistency of teaching materials of the e-learning method influences the learning of the students (Sun et al., 2008), and it is often important to encourage an effort to allow learning of students through the use of technology during pandemics such as COVID-19. In our study, the average level of a student learning through online learning was found to be strong, and during the pandemic, the attitudes of students to use were very optimistic toward online learning. According to our research, the lack of the student learning from both teachers and peers impacted students. In general, students consider the program a beneficial mechanism for online learning during the COVID-19 pandemic as it comes to the mindset of students regarding the application of the e-learning system platform. Our findings indicate that the technology adoption model may be strengthened by taking into account such external influences, such as the technological conditions provided by the universities, the technical conditions of the schools, the teaching style of the teachers, the technical skills of the teachers, and the learning of the students across the network. If the TAM model may explain the attitude of using e-learning systems in the sense in which the framework is used as a supplementary method for the conventional educational method, an updated model version could explain the attitude of using it during pandemics such as COVID-19 in the context of online learning. This article further shows that since the transition to online learning, students have used more platforms and online instructional resources than ever. The use of emergency e-learning system services, as Murphy (Murphy (2020)) stated, increased the awareness of technical resources among students.

Conclusion and Future Research

This analysis interprets university student viewpoints, which showed that during the COVID-19 pandemic, online learning was an influential and successful source of the e-learning system. According to the students, online learning is an engaging and productive source of learning for students that helps with simple administration and accessibility of distant learning along with less use of resources and time. The instructional content can easily be reached by learners regardless of the time limit. The TAM model has been extensively used to investigate the e-learning system in normal circumstances in higher education (Ramírez-Correa et al., 2015; Zhang et al., 2008; Alenazy et al., 2019). This bulk surveys have shown that e-learning programs have been adopted across countries across the globe. For different situations and environments, the assessment of variables influencing the use of the e-learning system during outbreaks such as COVID-19 should be introduced. Most TAM-based relationships were reported to be strongly associated by concentrating on the e-learning system of students during pandemic. Furthermore, this study relates to areas of access where not many students have sufficient technology services that are linked to promoting conditions, especially Internet access. The present study therefore enriches scholarly literature in understanding the state of distance learning during the closing of universities and schools' doors due to pandemics, an important guideline for future research. However, the adoption and use of the e-learning system by students is much more difficult and definitely inevitable than that of usual circumstances due to the closures of colleges and colleges. Therefore, to enhance the learning of students, it is necessary to maximize the investment of the e-learning system in higher education. Future researchers interested in doing related styles of analysis require funding for the findings of the analysis. As a result of an epidemic, stakeholders should brace more for distance learning. While this analysis presents the existence of statistical evidence, there are several drawbacks to this report. Respondents interested in this research are only from one university; thus, future studies need more respondents from different major backgrounds. However, during a pandemic like COVID-19, a few studies explored the use of the e-learning method.

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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Predicting Completion: The Road to Informed Study Decisions in Higher Online Education

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Non-completion is an ongoing concern in higher education, and even more so in higher *online* education. One way to address this problem is to take initiatives prior to student enrollment, enabling informed decision making. In line with this, an institution for open higher *online* education seeks to develop a (non-committal) online self-assessment for prospective students. To identify variables (tests) to be included in this self-assessment, the present study aims at validating variables–previously identified as "predictive of completion in higher education and open to intervention before enrollment"—within the current higher *online* education context. Results of correlational analyses indicate that the following modifiable variables are relevant to include: hours planned to study, employment hours, study intention, discipline, discipline confidence, basic mathematical skills, and social support. Based on a sensitivity cut-off of 95% (to minimize false negatives) about 13% of the actual non-completers could be identified correctly. Implications for future development of the self-assessment are discussed.

Keywords: study decisions, self-assessment, predictors, completion, validation, higher online education

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INTRODUCTION

Higher *online* education is expanding (Seaman et al., 2018). But the openness and flexibility of such online delivery, compared to traditional higher education (e.g., face-to-face education), comes at a price. That is, the number of students not completing a course or program in higher *online* education is impending, despite diverse initiatives taken by educational institutions (Rovai, 2003; Simpson, 2010, 2013; Vossensteyn et al., 2015). It is important for both the student and the educational institution that non-completion is kept to a minimum. For the institution, non-completion amounts to wasted effort (time and money invested), and possibly reputational damage, as completion is often one of the performance criteria presented in catalogues for prospective students' study decisions, and in some countries funding for educational institutions depends on such outcomes as completion rates (Vossensteyn et al., 2015). For the student, non-completion is also an issue in regard to the invested time and money. In addition, (repeatedly) concluding that the chosen study path does not fit one's characteristics (e.g., knowledge, skills and goals) and/or situation (e.g., combining a study with other responsibilities) might have a demotivating effect for future studies. One way to address this problem is to take initiatives (interventions) prior to student enrollment, to help students choosing a study program that optimally suits them, and to ensure that prospective students' expectations with regard to their courses or studies are realistic (Menon, 2004; Oppedisano, 2009; Vossensteyn et al., 2015; Muljana and Luo, 2019). One course of action in the direction of such an improved orientation prior to student enrollment is the development of (non-committal) self-assessments. It has been

assumed that non-selective, but adequate and personalized information will help prospective students to make an informed study decision (McGrath et al., 2014). We define these kinds of self-assessments as *"the active participation of students in making judgments about their own characteristics (i.e., knowledge, skills, and expectations), in order to foster reflection on the extent to which these characteristics fit with studying in a specific context"* (definition adapted from Dochy et al., 1999, p. 334). However, interventions aimed at decreasing non-completion implemented prior to student enrollment are not yet strongly flanked by scientific research (Delnoij et al., 2020). To the extent that interventions prior to student enrollment are systematically researched, these studies largely took place in the context of traditional higher education, typically characterized by a target group of students enrolling right after obtaining their high school degree (Fonteyne and Duyck, 2015).

We aim to design and develop a non-committal online self-assessment (i.e., hereafter referred to as "the self-assessment" or SA) to inform prospective students in open higher *online* education about the match between their characteristics (e.g., knowledge, skills, and expectations), and what is conducive to study in higher *online* education. This SA is aimed at identifying prospective students with lower chances for completion and provide feedback on how they can enhance their chances for completion. It will be non-committal, as prospective students will not be obliged to fulfill this assessment, and students will not be selected based on their self-assessment results as the institute operates according to an open access policy. To determine the relevant variables to be included in such a self-assessment (i.e., to ensure evidence-informed study decision making), we investigated predictors of non-completion in higher education through a review of reviews (Delnoij et al., 2020). As a second step, it is important to verify predictors resulting from that study in the current context for which the SA is being developed. The aim of the present study, therefore, is to validate the use of previously identified predictors for completion in the context of higher *online* education and to examine which of these variables need to be included in the SA as constituent components. Theoretical considerations underpinning the validation process are elaborated in *Theoretical Framework*. The (selection of) possible predictors included in this validation study will be discussed in sections 2.2 and 2.3. The results of this study will be used to develop the SA.

Theoretical Framework

Validation as a Process

Validity can be defined as an *"overall evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment"* (Messick, 1989, p.2). In line with this definition above, as well as modern validity theories, we consider validity to refer to the inferences (interpretations and actions based on assessment scores) rather than the instrument itself, and validation as a process requiring ongoing evaluation of evidence, rather than a "once and for all" conclusion (Royal, 2017). In this respect, the validation process described in this paper must be considered as "first steps" of evidence collection concerning the validity of inferences supported by the self-assessment. The Standards for Educational and Psychological Testing developed by the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education, mention five sources of evidence (Cizek, Bowen, and Church, 2010; Creswell, 2014): evidence based on the test content (e.g., expert opinions), evidence based on response processes (e.g., interviews with test-takers on their experiences with the test), evidence based on the internal structure (e.g., dimensionality and internal consistency), evidence based on relations to other variables (e.g., the predictive value on an expected outcome), and evidence based on the consequences of testing (either intended or not, positive or negative, etc.). The latter type of evidence, according to St-Onge et al. (2016) can be evaluated from both an individual and a societal perspective. In the context of the current self-assessment, the anticipated individual consequence involves the decision to enroll (or not), based on the test scores and feedback. At a societal level, the implicated consequence is a positive impact of the self-assessment on completion rates. **Figure 1** illustrates the various evidence sources and their relevance at various stages of the (design-based) development of the current self-assessment. Currently, this process is still at the stage of Analysis. Following a previous selection of evidence on predictors 'in general' by means of a literature review, this study investigates the relationship of these predictors with completion in the current context. Once this relationship has been established on the predictor level, it will be further investigated at the model level (i.e., the prediction accuracy of the combined predictors). Prior to investigating the predictive value of predictors measured by means of (sub)scales, it is important to secure the internal structure and consistency of these variables in the present context.

In the next stages of the development and validation process, further evidence will be collected in regard to test content (e.g., user experiences) and response processes. Regarding the latter, a general point of concern is that self-assessments, i.e., self-report measures, may be subject to all kinds of measurement errors, due to, for instance, inaccurate self-perceptions (Dunning et al., 2004) or social desirable answering (Viswesvaran and Ones, 1999; Niessen et al., 2017). Furthermore, as explained above, evidence with respect to the consequences of testing from both an individual (e.g., enrollment decision based on test scores and feedback) as well as a societal perspective (e.g., impact on completion rates) is required in the future stages of the validation process.

Predictor Selection Criteria

Taking into account that predictors are to be selected as input for a *non-committal* SA *prior* to student enrollment, several requirements are formulated to select the possible predictors from prior research. First, predictors need to be identified as variables relevant prior to admission, as it would not make sense to obtain information prior to student enrollment on variables that, in nature, can only play a role after enrollment (e.g., academic adjustment). Prior-to-admission variables identified by Rovai (2003) for instance comprise student characteristics

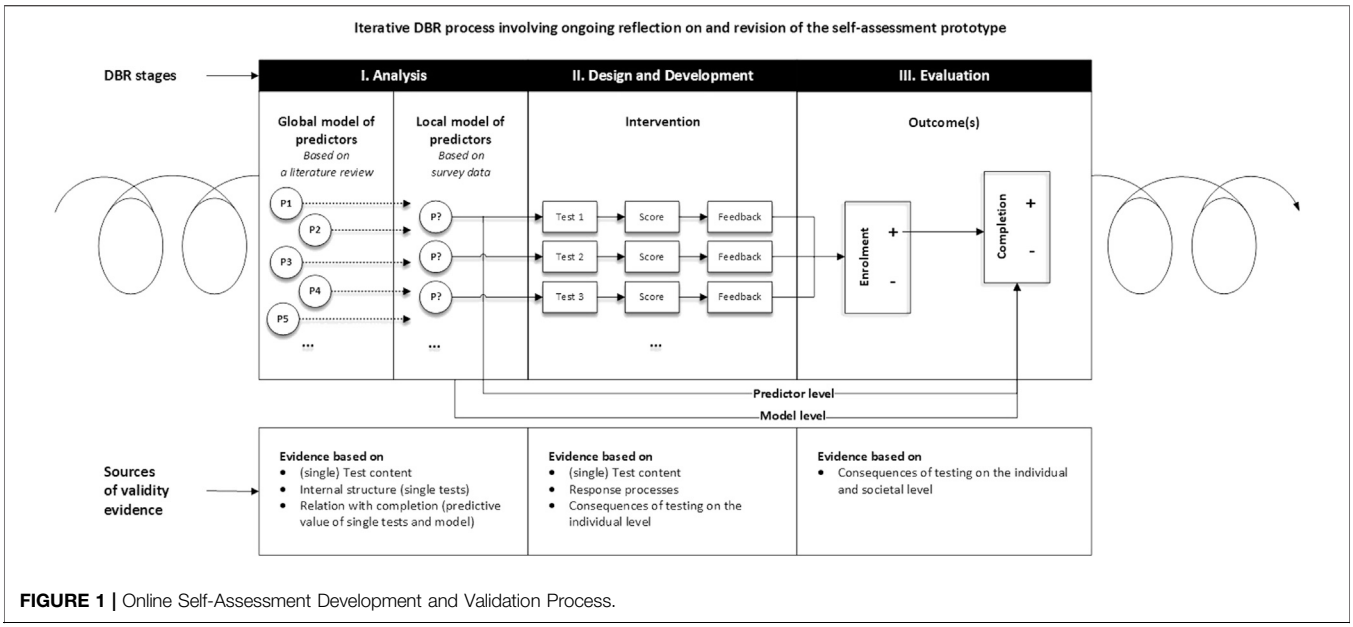

FIGURE 1 | Online Self-Assessment Development and Validation Process.

(e.g., academic preparation) and student skills (e.g., time management). Second, the modifiability of variables is a requirement in the present study. That does not mean that non-modifiable variables cannot explain non-completion, or are irrelevant in this context. However, modifiability is required, as the SA needs to give insight into where there is room for improvement and how prospective students can raise their chances for completion. According to our definition, a variable is modifiable if the variable is changeable or can be advised upon. For instance, self-regulation skills (e.g., learning strategies) are trainable (Patterson et al., 2014), and the number of hours a student plans to study can be advised upon (but not be changed directly). Third, as there has been carried out a lot of research on predictors of non-completion in higher education, consistency of prior results is a requirement we take into account. Previous research in this domain is on specific predictors or carried out in specific study programs. Review studies are merely carried out in the context of *traditional* higher education, and effect sizes are often not reported. This means that conclusions on the predictive value of variables in the context of higher *online* education need to be drawn with caution. We aim to validate predictors from prior research that preferably have been demonstrated consistently (Delnoij et al., 2020). All in all, we aim to include *modifiable* variables, relevant *prior* to student enrollment, which review studies have *consistently* identified as possible predictors of non-completion in higher (*online*) education.

Selected Predictors

Our previous extensive literature review (Delnoij et al., 2020), yielded potential predictors meeting the selection criteria: academic self-efficacy, employment (hours), basic mathematical skills, study intentions, goal orientation, learning strategies, and social support. Therefore, these predictors are included in the current study. In this previous literature review, motivation, as a possible predictor, surprisingly did not meet the consistency criterion. However, in the context of higher *online* education, it has been argued that a related concept–volition–might actually be more re levant than motivation (Deimann and Bastiaens, 2010). Volition has been defined as "the tendency to maintain focus and effort toward goals despite potential distractions" (Corno, 1994, p. 229). In the case of adults combining a study with a job and family or other responsibilities, distractions or obstacles interfere with the study process. According to Deimann and Bastiaens (2010), motivation might not be enough to overcome these distractions or obstacles. It has been argued that whereas motivation is relevant for initiating activity, volition might be more relevant in accomplishing that certain activity (Deimann and Bastiaens, 2010). It seems that volition possibly is a relevant variable in relation to our outcome measure of interest. Therefore, we added volition as a potential predictor to our list.

All in all, the current study focuses on the predictors as listed and defined in **Table 1**. The operationalization and measurement of these variables are further elaborated in the methodology section.

Research Questions

The present study aims to gain insight into whether the predictors selected from prior literature are relevant in explaining completion in higher *online* education. Also, we aim to gain insight into the extent to which actual completers and non-completers can be classified correctly by the predictors of non-completion in the context of the Open University of the Netherlands (OUNL), as we want to minimize the risk of falsely discouraging prospective students. Before we investigate the predictive value of the selected variables and the accuracy of classifying non-completers, it is important to secure the internal structure of predictor operationalization in the current context. Hence, three research questions are subsequently addressed in the current study.

TABLE 1 | Definitions of Variables.

Variable	Definition	Adapted from
Completion (Outcome measure)	The proportion of students enrolling and meeting the requirements for certification, within a specified period of time.	—
Academic self-efficacy	The belief in the ability to succeed in an academic environment.	Bandura (1997); Robbins et al. (2004)
Basic mathematical skills	The ability to solve calculations and quantitative reasoning problems.	Fonteyne et al. (2015)
Employment hours	The amount of hours a prospective student spends on paid employment obligations.	—
Goal orientation	A reflection of the purpose of achievement behaviour in a particular setting (i.e., academic environment), influencing the way a student approaches academic work.	Harackiewicz et al. (2008)
Hours planned to study	The amount of hours a prospective student plans to spend on studying.	—
Learning strategies	Approaches for acquiring, organizing, or transforming information divided in cognitive, metacognitive, and resource management strategies.	Alexander et al. (1998); McKeachie et al. (1990)
Social support	Students' perception of whether social networks support them in their academic career financially, emotionally, and practically.	Robbins et al. (2004)
Study intention	The intention to fulfill an educational component (i.e., intention to obtain a master's degree) or not (i.e., orientation or no specific intention).	—
Volition	The tendency to maintain focus and effort toward goals despite potential distractions.	Corno (1994)

1. To what extent can the internal structure of the instruments used to operationalize the selected predictors be validated in higher *online* education?
2. To what extent is the (relative) predictive value of the selected variables verified by data from a higher *online* educational context?
3. To what extent can prospective students be accurately identified as completers or non-completers by the validated predictors?

MATERIALS AND METHODS

Context and Design

The present study is part of a design-based research process (Van den Akker et al., 2013). As illustrated in **Figure 1**, the results of the analysis phase give input for the design and development of an intervention in a certain context. In the present research, the intervention is the non-committal online SA in the context of the OUNL (i.e., an institute for higher distance education). The OUNL also has to contend with relatively high non-completion rates. For example, approximately 40% of the course participants enrolling in September 2018 did not obtain any study credits within the valid registration period. Education in the OUNL is provisioned mainly online, occasionally combined with face-to-face meetings. Academic courses up to full study programs are provided to obtain a bachelor's or master's degree in the following study directions: law, management sciences, informatics, environmental sciences, cultural sciences, educational sciences, and psychology. The OUNL operates according to an open access policy, which means that for bachelor programs, no prior education is required, and the only requirement is a minimum age of 18 years. Students can choose to study a single course or a combination of courses, up to a full bachelor- or master's program. In general, students have three examination attempts for each course within 14 months after enrollment, after which registration for a course is no longer valid.

The present study can be characterized as a correlational (prediction) design (Creswell, 2014), which means that no conclusions on causality can be drawn from the results. The data is based on two different student surveys, of which the first, most elaborative survey was used to collect data between August 2012 and December 2014 (Neroni et al., 2015). Hereafter, this part of the data is referred to as data collection or dataset 1. As these data did not cover all selected variables, supplementary data collection was executed between September 2017 and February 2019, hereafter referred to as data collection or dataset 2. Data from both data collections were supplemented with data from the student information system on the criterion measure: completion within 14 months after enrollment.

Participants

All (approached) participants were first time enrolling students in the OUNL, as a proxy for the eventual target group of the intervention, prospective students of the OUNL. In **Table 2** an overview of the sample(s) is provided.

Procedure

The data collection procedure for the two data collections was nearly the same. Newly enrolled students received an email explaining the purpose of the study with an invitation to fill out the online questionnaire. Informed consent was obtained online, preceding the actual questionnaire. Full completion of the questionnaire took approximately 45–60 min in data collection 1 and 30 min for the questionnaire used in data collection 2. Respondents were able to pause and return to the questionnaire if they wished so. Response-enhancing measures included sending out email reminders (both data collections) and follow up phone calls (data collection 1). Besides, in data collection 2, the invitation email was signed by the rector of the educational institution to enhance participation.

TABLE 2 | Sample Information.

	I. Participants approached	II. Respondents[a]	III. Full participating respondents[b]	Sex	M_{age} (SD)
				Based on III	
Dataset 1	4,945	2,562	2043	61.7% Female	43.4 (11.2)
Dataset 2	2,996	613	455	52.5% Female	41.2 (11.4)

[a]*Respondents are participants who at least filled in the informed consent and thus, started to fill out the questionnaire.*
[b]*Full participating respondents are respondents who filled out the whole questionnaire. For data collection 1 we made a subset of the original dataset including the variables of interest for the present paper. Full participating respondents in data collection one are thus respondents who filled out all questions up and until the last question of variables of interest for the present paper, extracted from the whole dataset.*

TABLE 3 | Factor Structure per Variable and Reliability per Factor in Prior and Present Research.

Variable (dataset)	Prior research			Present research		
	Factor	K	Reliability (Cronbach's alpha)	Factor	K	Reliability (McDonald's omega)
Academic self-efficacy (d2)	Effort	8	0.760	Confidence in basic study skills	6	0.649
	Comprehension	14	0.790	Discipline confidence	2	0.830
Basic mathematical skills (d2)	Basic mathematical skills	20	0.620	Basic mathematical skills	9	0.722
Goal orientation (d1)	Performance approach	3	0.920–0.960	Performance approach	3	0.880
	Performance avoidance	3	0.820	—	—	—
	Mastery approach	3	0.880	—	—	—
	Mastery avoidance	3	0.840–0.890	—	—	—
	Work avoidance	3	0.900	Work avoidance	3	0.813
Learning strategies (d1)	Rehearsal	4	0.690	Contact with other students	3	0.856
	Elaboration	6	0.750	Discipline	3	0.704
	Organization	4	0.640	Elaboration	3	0.664
	Critical thinking	5	0.800	Organization	3	0.779
	Metacognitive self-regulation	12	0.790	—	—	—
	Time and study environment	8	0.760	—	—	—
	Effort management	4	0.690	—	—	—
	Peer learning	3	0.760	—	—	—
	Help seeking	4	0.520	—	—	—
Volition (d2)	Volitional self-efficacy	8	0.790	—	—	—
	Consequence control	6	0.800	Consequence control	4	0.802
	Metacognition	9	0.710	Metacognition	4	0.630
	Emotion control	6	0.640	—	—	—

Note. *K is the number of items.*

Measures

Scale Measures

An overview of all independent measures' factors, number of items, and reliabilities (expressed in Cronbach's alpha) based on prior research are given in **Table 3**.

Academic self-efficacy was measured by the College Academic Self-Efficacy Scale, adjusted by Fonteyne et al. (2017), which we, in turn, adapted to better fit the context of *adult* and *online* learning (i.e., we changed some terms and added three items). The eventual questionnaire consists of 23 items. Respondents were instructed to rate all items on a scale of 1 (completely unable to) to 5 (completely able to). Fonteyne et al. (2017), reported a 2-factor structure with factors identified as effort (e.g., "*Attending class regularly*"), and comprehension (e.g., "*Understanding most ideas you read in texts*").

Basic mathematical skills were measured by a set of 20 items based on work by Fonteyne et al. (2015, 2017). The test consists of open questions, yes/no questions, and multiple-choice questions. One example item is "*If x/y = 0.25, then y/x = ?*". There was no time limit and respondents were not allowed to use calculators, although we could not control for that as the test was fulfilled online.

Goal orientation was measured by the Achievement Goal Questionnaire developed by Elliot and McGregor (2001), supplemented by the Work Avoidance Scale (Harackiewicz et al., 2008). In total 15 items, equally divided in five categories are measured: mastery approach (e.g., *"I want to learn as much as possible from this class"*), mastery avoidance (e.g., *"I am worried that I will not understand everything in this class as thoroughly as I would want to"*), performance-approach (e.g., *"It is important for me to do well compared to others in this class"*), performance-avoidance (e.g., *"I just want to avoid doing poorly in this class"*), and work avoidance (e.g. *"I want to do as little work as possible in this class"*). In the present study, to fit the *adult* and *online* learning context, the word "class" was replaced by "course". All items are rated on a scale of 1 (totally disagree) to 7 (totally agree).

Learning strategies were measured by part B of the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1993), adapted to the *adult* and *distance* learning context (e.g., replacing "class" by "course"). The original questionnaire consists of 50 items divided in nine factors: rehearsal (e.g., *"When I study for this course, I practice saying the material to myself over and over"*), elaboration (e.g., *"When I study for this course, I pull together information from different sources, such as lectures, readings, and discussions"*), organization (e.g., *"When I study the readings for this course, I outline the material to help me organize my thoughts"*), critical thinking (e.g., *"I often find myself questioning things I hear or read in this course to decide if I find them convincing"*), metacognitive self-regulation (e.g., *"When reading for this course, I make up questions to help focus my reading"*), time and study environment management (*"I usually study in a place where I can concentrate on my course work"*), effort regulation (e.g., *"I work hard to do well in this course even if I don't like what we are doing"*), peer learning (e.g., "*When studying for this course, I often set aside time to discuss course material with a group of students from the course"*), and help seeking (e.g., *"I ask the instructor to clarify concepts I don't understand well"*). Respondents were instructed to consider these items in relation to the way in which they intend to study. All items are rated on a scale of 1 (totally disagree) to 7 (totally agree).

Volition was measured by an adapted version of the Academic Volitional Strategy Inventory (McCann and Turner, 2004; Deimann and Bastiaens, 2010). All items were introduced as follows: *"If at any point I notice that I'm not working in a targeted manner and with little concentration, then..."*. This questionnaire consists of 32 items, divided in four factors: volitional self-efficacy (e.g., "*I think about my strengths in order not to get blocked by my weaknesses"*), consequence control (e.g., "*I think about the negative effects of not finishing my tasks or projects"*), emotion control (e.g., "*I try to think about joyful things"*), and metacognition (e.g., "*I reflect on my planning and adjust the associated goals if necessary"*). All items are rated on a scale of 1 (completely not applicable to me) to 5 (completely applicable to me).

Single Indicator Measures

As single indicator measures do not comprise a full questionnaire, they are taken into account only in relation to research questions two and 3. An overview of "single indicators" (except covariates) is provided in **Supplementary Material S1**.

Employment hours was measured as the number of hours in a paid employment contract. Respondents indicating they were not employed, were given value 0.

Hours planned to study was measured by one open-ended question: *"How many hours do you expect to study on average per week?"*.

Social support is divided into financial, emotional, and practical support and measured by newly developed questions, resulting in three dichotomous variables indicating whether respondents receive support (1) or not (0).

Study intention was measured by one multiple-choice question in which respondents were asked to indicate their achievement intentions. Their answers were coded 0 if they indicated no specific study intention (i.e., no explicit intention to obtain study credits) and one if they indicated the intention to fulfill a course or program (i.e., in other words, to obtain study credits). Details about these questions and answer options can be found in **Supplementary Material S1**.

Covariates taken into account are prior level of education, gender, age, and faculty. These variables were obtained by the student administration office of the educational institution, or inquired by a multiple-choice (e.g., age) or open ended (age) question.

Criterion Measure

Completion data was distracted from the student information system, with a score of one being assigned to those students completing at least one course within 14 months (after which registration is no longer valid), else a score of 0.

Statistical Analyses

Research question 1: To what extent can the internal structure of the instruments used to operationalize the selected predictors be validated in higher online education? To answer the first research question, analyses of descriptives (SPSS Version 24.0), factor analyses, and reliability analyses (Jamovi version 0.9.5.12) were conducted. Prior to factor analyses, items were checked and removed if skewness and kurtosis indicated significant non-normality (Field, 2009; Mayers, 2013; Trochim and Donnelly, 2006). In case no substantial alterations were made to the scale, and sufficiently detailed information was available from prior research, a confirmatory factor analysis (CFA) was carried out. If CFA could not be performed, factor analyses involved several steps. First, the data was randomly split in half, on which exploratory factor analysis (EFA), followed by an EFA in the CFA framework (E-CFA) (Brown, 2015) on one random half of the dataset. Subsequently, the model resulting from the exploratory analyses was cross-validated by means of CFA using the second half of the data. After that, a CFA on the final model was performed in the whole dataset, of which the results are presented in this paper. We applied relatively strict criteria with the aim to reach an optimal (i.e., most parsimonious) solution, as in the eventual self-assessment, we do not want to burden the respondents unnecessarily. The exact process of and cut-off values applied in factor analyses can be found in **Supplementary Material S2**. For reliability, McDonald's omega was chosen over Cronbach's alpha, as Cronbach's alpha depends on the assumption that each item contributes equally to the factor. McDonald's omega allows items to vary in factor loadings and thereby, fits better to our data. In addition, in using omega there is less risk of overestimation or underestimation of reliability as compared to alpha (Zinbarg et al., 2005; Graham, 2006; Revelle and Zinbarg, 2009).

Research question 2: To what extent is the (relative) predictive value of the selected variables verified by data from a higher online educational context? Analyses regarding this research question started with a check for normality and outliers through descriptive statistics (Trochim and Donnelly, 2006; Field, 2009; Mayers, 2013). Next, various analyses were conducted to gain

insight into the relationship between the variables. Pearson correlation coefficients are reported for the relationship between continuous variables. Omega-squared (ω^2) was chosen as the reported effect size for associations between categorical and continuous variables (Analysis of Variance (ANOVA)) because it gives the least biased view on the effect size in analyses in which the assumption(s) of homogeneity of variances and/or normality are not met, which was incidentally the case (Yigit and Mendes, 2018). To decide which categorical variables should be included in the self-assessment, associations between categorical variables (including the outcome measure) are examined using Cramer's V (Cohen, 1988). To decide which continuous variables should be included in the self-assessment, Confidence Interval-Based Estimation of Relevance (CIBER) analyses were conducted in R (Version 3.6.1), based on work by Crutzen and Peters (2019). The CIBER analysis was chosen for several reasons. First, it is recommended to base decisions for selecting predictors on confidence intervals for bivariate associations, combined with the variables' distributions and means. Confidence intervals should be used instead of point estimates (e.g., regression coefficients), as confidence intervals give insight in estimation accuracy as well. For instance, a broad confidence interval means that the point estimate is unreliable and can have a substantially different value in a new sample. In the context of selecting variables for the self-assessment, regression coefficients would provide little information on the relevance of specific predictors, because they are conditional upon the other predictors in the model. In regression analyses, it would be hard to distinguish between the contribution of associated predictors in predicting the outcome measure. Second, CIBER data visualization has two advantages for the selection of predictors in the context of our research:

- It facilitates the comparison of the effects of different variables.
- The relative width of the distribution and variation in estimates is presented, which facilitates a cautious and well-considered decision for variable selection.

Research question 3: To what extent can prospective students be accurately identified as completers or non-completers by the validated predictors? To gain insight into the proportion of explained variance in the outcome measure, the selected variables were included in a multivariate logistic regression together with background variables (i.e., age, sex, faculty, and prior level of education). Given that the SA is constructed to identify those prospective students who have a lower probability for completion, classification accuracy was evaluated in Jamovi (Version 0.9.5.12).

RESULTS

Internal Structure and Reliability of Scale Variables

In **Table 3**, an overview is presented of the results discussed in this section. In **Table 4**, the factor score means, standard deviations, and the minimum and maximum factor scores are presented. For all measurements, the eventual set of items can be found in **Supplementary Material S1**.

Academic self-efficacy. The EFA, E-CFA and CFA procedure resulted in two factors, labeled as *confidence in basic study skills* (6 items, McDonald's omega = 0.649) and *discipline confidence* (2 items, McDonald's omega = 0.830). The correlation between these two factors is 0.178 and significant at the 1% level. This CFA revealed a good fit with SRMR of 0.035, RMSEA of 0.053, TLI of 0.954 and CFI of 0.969 ($\chi2(19) = 49.2$, $p < 0.001$).

Basic mathematical skills. Based on prior research (Fonteyne et al., 2015) a CFA was performed in which we examined the fit of a model with one factor including all items. Though the fit of this model was reasonably good (i.e., four out of five fit indices were within cut-off values), there were indications for modifications, and as we aimed for the most parsimonious test, we decided to perform the EFA, E-CFA and CFA procedure. One factor was found, consisting of nine items (McDonald's omega = 0.772). The CFA on the complete data set revealed a good fit with SRMR of 0.026, RMSEA of 0.008, TLI of 0.998, and CFI of 0.998 ($\chi2(27) = 27.9$, $p = 0.419$).

Goal orientation. Based on prior research, a CFA was performed (Harackiewicz et al., 2008). Here too, we found indications for modifications, despite a reasonably good fit of the model, so we performed the EFA, E-CFA and CFA procedure. Two factors were found, labeled as *work avoidance goals* (3 items, McDonald's omega = 0.813) and *performance-approach goals* (3 items, McDonald's omega = 0.880). The correlation between these two factors was not statistically significant. The CFA on the complete data set revealed a good fit with SRMR of 0.010, RMSEA of 0.019, TLI of 0.998, and CFI of 0.999 ($\chi2(8) = 13.8$, $p = 0.088$).

Learning strategies. CFA based on prior research showed that the original structure did not fit our sample (i.e., two out of five fit indices within cut-off values). The EFA, E-CFA and CFA procedure resulted in four factors, labeled as *contact with other students* (3 items, McDonald's omega = 0.856), *discipline* (3 items, McDonald's omega = 0.704), *elaboration* (3 items, McDonald's omega = 0.664), and *organization* (3 items, McDonald's omega = 0.779). The model fit of the CFA on the complete data set was good with SRMR of 0.031, RMSEA of 0.041, TLI of 0.965, and CFI of 0.975 ($\chi2(48) = 216$, $p < 0.001$). All correlations between these factors were significant at the 1% level.

Volition. CFA could not be performed, as the required information was not available. EFA, E-CFA, and CFA resulted in two factors, labeled as consequence control (4 items, McDonald's omega = 0.802) and metacognition (4 items, McDonald's omega = 0.630). The correlation between these two factors was not statistically significant. The model fit of the CFA on the complete dataset was good with SRMR of 0.039, RMSEA of 0.051, TLI of 0.956, and CFI of 0.970 ($\chi2(19) = 44.2$, $p < 0.001$).

Predictive Analyses

Explorative Analysis

Variable means, standard deviations, minimum and maximum scores are presented in **Table 4**, for the two data collections

TABLE 4 | Descriptive Statistics per Variable, per Dataset.

Variable	Dataset 1		
	***M* (SD)**	**Min and max**	***M* in % of max**
Performance approach goals	7.22 (3.73)	2.53–17.70	40.79
Work avoidance goals	6.23 (2.68)	2.31–16.15	38.58
Contact with other students	6.85 (3.23)	2.45–17.12	40.01
Discipline	8.19 (2.51)	1.76–13.90	58.92
Elaboration	9.62 (1.84)	1.88–13.19	72.93
Organization	11.09 (2.37)	2.09–14.63	75.80
Paid working hours	27.84 (15.08)	0.00–68.00	40.99
Hours planned to study	12.20 (7.08)	1.00–40.00	30.50
Variable	**Count (of respondents)**	**% Of total (respondents)**	
Study intention			
a) Specific intention to fulfill an educational component	2,269	88.60	
b) No specific intention to fulfill an educational component	201	7.80	
Missing	92	3.60	
Social support: Financial			
a) 0 (= no)	1,016	35.75	
b) 1 (= yes)	1,343	47.25	
Missing	483	17.00	
Social support: Emotional			
a) 0 (= no)	71	2.50	
b) 1 (= yes)	2,288	80.50	
Missing	483	17.00	
Social support: Practical			
a) 0 (= no)	730	25.69	
b) 1 (= yes)	1,629	57.31	
Missing	483	17.00	
Faculty/educational program			
(1) Law	569	22.20	
(2) Cultural sciences	261	10.20	
(3) Psychology	903	35.20	
(4) Management sciences	327	12.80	
(5) Informatics	226	8.80	
(6) Educational sciences	113	4.40	
(7) Environmental sciences	102	4.00	
Missing	61	2.40	
Prior level of education			
(1) Elementary school	22	0.90	
(2) Pre vocational education	174	6.80	
(3) Pre higher education	300	11.70	
(4) Vocational education	253	9.90	
(5) Higher education	893	34.90	
University of applied sciences degree			
(6) Higher education	867	33.80	
Scientific university degree			
Missing	53	2.10	
Outcome measure			
(a) Completion	1,037	40.50	
(b) Non-completion	1,525	59.50	

Variable	Dataset 2		
	***M* (SD)**	**Min and max**	***M* in % of max**
Confidence in basic study skills	13.50 (1.27)	8.42–16.10	83.85
Confidence for discipline	6.63 (1.13)	3.36–8.40	78.92
Basic mathematical skills	2.86 (1.09)	0.00–4.24	67.45
Consequence control	9.72 (2.18)	2.84–14.18	68.55
Metacognition	7.59 (1.36)	3.51–10.89	69.70
Variable	**Count (of respondents)**	**% of total (respondents)**	
Faculty/educational program			
(1) Law	101	16.50	

(Continued on following page)

TABLE 4 | (*Continued*) Descriptive Statistics per Variable, per Dataset.

Variable	Count (of respondents)	% of total (respondents)
(2) Cultural sciences	89	14.50
(3) Psychology	143	23.30
(4) Management sciences	153	25.00
(5) Informatics	62	10.10
(6) Educational sciences	27	4.40
(7) Environmental sciences	28	4.60
Missing	10	1.60
Prior level of education		
(1) Elementary school	9	1.50
(2) Pre vocational education	17	2.80
(3) Pre higher education	108	17.60
(4) Vocational education	60	9.80
(5) Higher education	307	50.10
University of applied sciences degree		
(6) Higher education	92	15.00
Scientific university degree		
Missing	20	3.30
Outcome measure		
(a) Completion	414	67.50
(b) Non-completion	199	32.50

Note. *Descriptives on age and sex can be found in* ***Table 1****, and are based on full participating respondents.*

separately. For categorical variables (including the outcome measure), also frequencies are reported.

Tables 5, **Tables 6** provide an overview of relationships between variables, for both data collections separately. Pearson correlations were calculated for relations between continuous variables. None of the correlations (in both datasets) exceeds 0.6, and therefore none of the associations is interpreted as high (Evans, 1996). Associations between categorical and continuous variables were examined via Analyses of Variance, of which the effect sizes in $\omega 2$ are reported. Values over 0.14 are considered high (Field, 2009). **Table 5** indicates several medium-size effects (a $\omega 2$ between 0.06 and 0.14, see Field, 2009). In dataset one this is the case for the associations between faculty and age ($\omega 2 = 0.064$), and between sex and organization ($\omega 2 = 0.0.67$). In dataset two the effect sizes on the association between faculty and age, prior level of education and age, prior level of education and basic mathematical skills, and sex and basic mathematical skills are medium-size ($\omega 2 = 0.070$, 0.062, 0.074, and 0.060, respectively). Associations between categorical variables (Cramer's V) are presented in **Table 6**. The interpretation of this effect size, ranging from 0 (no association) to 1 (perfect association), is dependent on the degrees of freedom (Cohen, 1988), i.e., the number of possible values of the variable with the least categories. In the present study, no strong associations between categorical variables were found. Medium associations were found between faculty and sex in both datasets (Cramer's $V(1) = 0.378$ and 0.376 for dataset one and two, respectively). In dataset 1 a medium association was found between faculty and prior level of education (Cramer's $V(5) = 0.179$).

Selecting Determinants of Completion

Dataset 1. The relationship between categorical variables and the outcome measure was examined by means of Chi-square analyses, of which the effect sizes (Cramer's V) are presented in **Table 6**. Study intention, financial support, emotional support, practical support, faculty, and prior level of education show to be significantly associated with completion. However, the effect size of the association between study intention and completion is less than small (i.e., Cramer's $V(1) < 0.10$). Also, the association of financial, emotional, and practical support with completion is very small (i.e., all Cramer's $V(1) < 0.10$). The associations of both faculty and prior level of education with completion, are slightly stronger, but still small (i.e., Cramer's $V(1) = 0.133$ for faculty and 0.122 for prior level of education). CIBER analyses results indicating the association strengths between continuous variables and the outcome measure are presented in a diamond plot (**Figures 2**, **3**). The left-hand panel shows the item scores of all participants: in green for completers, and in purple for non-completers. The diamonds in the right-hand panel indicate the association strengths (i.e., with 95% confidence intervals). The color of the diamonds indicates the association direction (i.e., red indicates a negative association, green indicates a positive association, and gray indicates weak associations). The wider the diamond, the wider the confidence interval of the association between a certain variable and completion, meaning that in another sample, a different association between predictor and outcome could be found. Furthermore, some confidence intervals (diamonds) overlap the zero-line (e.g., performance-approach goals and completion), which means that an association of 0 could be a possible outcome as well, in a 95% confidence interval. For dataset 1, the diamond plot (**Figure 2**) shows that performance-approach goals, work avoidance goals, contact with other students, elaboration, and organization are not strongly associated with completion (i.e., indicated by the gray diamonds, overlapping the zero-line). Hours planned to study and discipline positively

TABLE 5 | Pearson Correlation Coefficients of Associations between Continuous Variables and ω^2 of Associations between Categorical and Continuous Variables, per Dataset.

		1	2	3	4	5	6	7	8	9
Dataset 1										
1	Age		−0.148**	0.038	−0.237**	−0.183**	0.097**	0.157**	0.113**	0.109**
2	Hours planned to study			−0.322**	0.111**	−0.081**	0.022	0.107**	0.005	0.016
3	Paid working hours				−0.070**	0.045*	−0.019	−0.027	0.071**	−0.018
4	Performance approach goals					0.135**	0.123**	−0.127**	0.026	−0.007
5	Work avoidance goals						−0.064**	−0.370**	−0.139**	−0.257**
6	Contact with others							0.100**	0.165**	0.173**
7	Discipline								0.069**	0.205**
8	Elaboration									0.225**
9	Organization									
A	Study intention	0.012**	0.010**	0.001	0.000	0.000	0.000	0.003**	0.000	0.000
B	Financial support	0.028**	0.002*	0.019**	0.002*	0.000	0.000	0.000	0.002*	0.000
C	Emotional support	0.000	0.000	0.000	0.001	0.005*	0.000	0.001	0.000	0.002*
D	Practical support	0.007**	0.001	0.000	0.001	0.000	0.011**	0.000	0.000	0.003**
E	Faculty	0.064**	0.012**	0.024**	0.006**	0.025**	0.017**	0.009**	0.026**	0.056**
F	Prior level of education	0.028**	0.040**	0.020**	0.000	0.001	0.008**	0.003*	0.023**	0.010**
G	Sex	0.003*	0.010**	0.022**	0.000	0.007*	0.004**	0.001	0.004**	0.067**
Dataset 2										
1	Age		0.052	−0.095*	−0.002	−0.182**	−0.032			
2	Basic mathematical skills			0.295**	−0.028	−0.133**	−0.027			
3	Confidence in basic study skills				0.139**	−0.032	0.114*			
4	Confidence for discipline					0.056	0.165**			
5	Consequence control						0.090*			
6	Metacognition									
E	Faculty	0.070**	0.058**	0.027**	0.008	0.006	−0.001			
F	Prior level of education	0.062**	0.074**	0.014*	−0.001	0.013*	−0.007			
G	Sex	0.000	0.060**	0.032**	0.004	0.003	0.008*			

Note. *$p < 0.05$, **$p < 0.01$; *Pearson correlations between continuous variables are considered higher from 0.600 or higher (Evans, 1996). The effect size of the associations between categorical and continuous variables, ω^2, is considered low if lower than 0.06, medium between 0.06 and 0.140 and high if higher than 0.140 (Field, 2009). Results from the post-hoc analyses on the associations between categorical and continuous variables are available on request.*

associated with completion. Age and employment hours are negatively associated with completion. Of these associations, the association between discipline and completion differs the most from 0.

Based on the Chi-square and CIBER analyses the following modifiable variables are selected for the proposed self-assessment: study intention, hours planned to study, employment hours, discipline, financial support, emotional support, and practical support.

To gain insight into the proportion of explained variance, these variables were combined with all background variables (i.e., age, sex, faculty, and prior level of education), in a logistic regression model. Together, they explain 16.3% of the variance (Nagelkerke *R*2) in the completion outcome in dataset 1. Excluding the background variables, 8.92% of the variance in completion can be explained by the selected modifiable predictors of completion.

Dataset 2. Faculty and prior level of education show to be significantly associated with completion indicating small to medium effect sizes (Cramer's $V(1) = 0.231$ for faculty and 0.248 for prior level of education). The diamond plot in **Figure 3** shows that confidence in basic study skills, consequence control, and metacognition are not strongly associated with completion, indicated by the gray diamonds, overlapping with the zero-line in the right-hand panel. Discipline confidence and basic mathematical skills are positively associated with completion, in which the association between basic mathematical skills and completion differs the most from 0. Age is negatively associated with completion, as was the case in dataset 1. Note though, that the confidence interval is not far from including 0.

Based on Chi-square and CIBER analyses discipline confidence and basic mathematical skills have been selected as (modifiable) predictors. These variables were added, together with all background variables, in a logistic regression model. Together, they explain 21.7% of the variance in the completion outcome in dataset 2. Excluding the background variables, 7.62% of the variance in completion can be explained by the selected modifiable predictors of completion.

Resulting Local Model of Predictors of Completion

Figure 1 (*Theoretical Framework*) described the development and validation process of the current self-assessment. As explained, this study focused on collecting validity evidence regarding the internal structure of the selected variables in the current context (research question 1), as well as their relations to completion (research question 2), to establish a local model of predictors. **Figure 4** zooms in on the analysis stage of **Figure 1** to clarify the 'filled out' local model of predictors, resulting from the analyses described so far.

Predictors requiring an investigation of internal structure evidence are indicated with a double contour in the general model in **Figure 4**. As it happens, the internal structure of all these predictors appeared to

TABLE 6 | Associations between categorical variables (including the outcome measure) in Cramer's V.

		A	B	C	D	E	F	G	H
Dataset 1									
A	Study intention		0.089[b]	0.045[a]	0.075[b]	0.140[b]	0.074[a]	0.001	0.066[b]
B	Financial support			0.122[b]	0.244[b]	0.089[b]	0.081[b]	0.083[b]	0.085[b]
C	Emotional support				0.215[b]	0.041	0.069[a]	0.077[b]	0.057[b]
D	Practical support					0.074[a]	0.072[a]	0.072[b]	0.062[b]
E	Faculty						0.088[a]	0.378[b]	0.133[b]
F	Prior level of education							0.101[b]	0.122[b]
G	Sex								0.003
H	Completion								
Dataset 2									
E	Faculty						0.179[b]	0.376[b]	0.231[b]
F	Prior level of education							0.094	0.248[b]
G	Sex								0.021
H	Completion								

Note.
[a]p < *0.05.*
[b]p < *0.01; The effect size of associations between categorical variables, expressed in Cramer's V. The interpretation of this effect size, ranging from 0 (no association) to 1 (perfect association), is dependent on the degrees of freedom (Cohen, 1988), i.e., the number of possible values of the variable with the least categories. Results from the post-hoc analyses are available on request.*

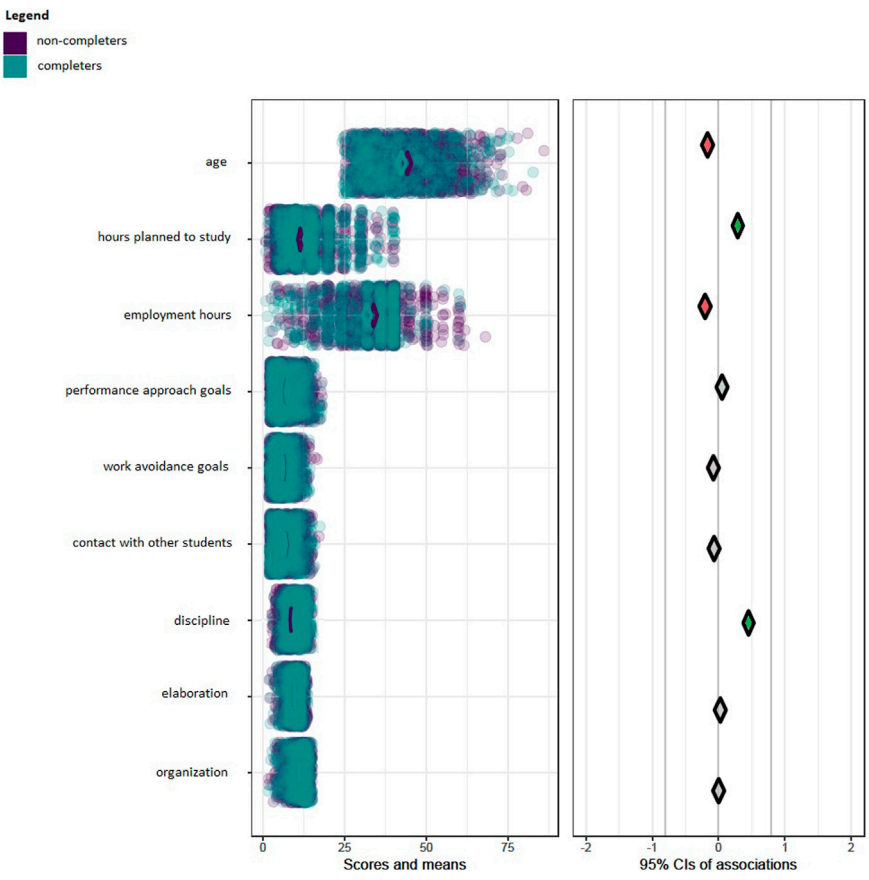

FIGURE 2 | Diamond Plot of the Associations between Continuous Variables and Completion in Dataset 1.

differ in the present study, as with an accent mark for these predictors in the local model of predictors. Of the nine variables, originally identified as predictors in the general model (Delnoij et al., 2020), seven are verified (at least partly) as predictors in the current context, and hence, included in the local model of predictors: academic self-efficacy, basic mathematical skills, employment hours, hours planned

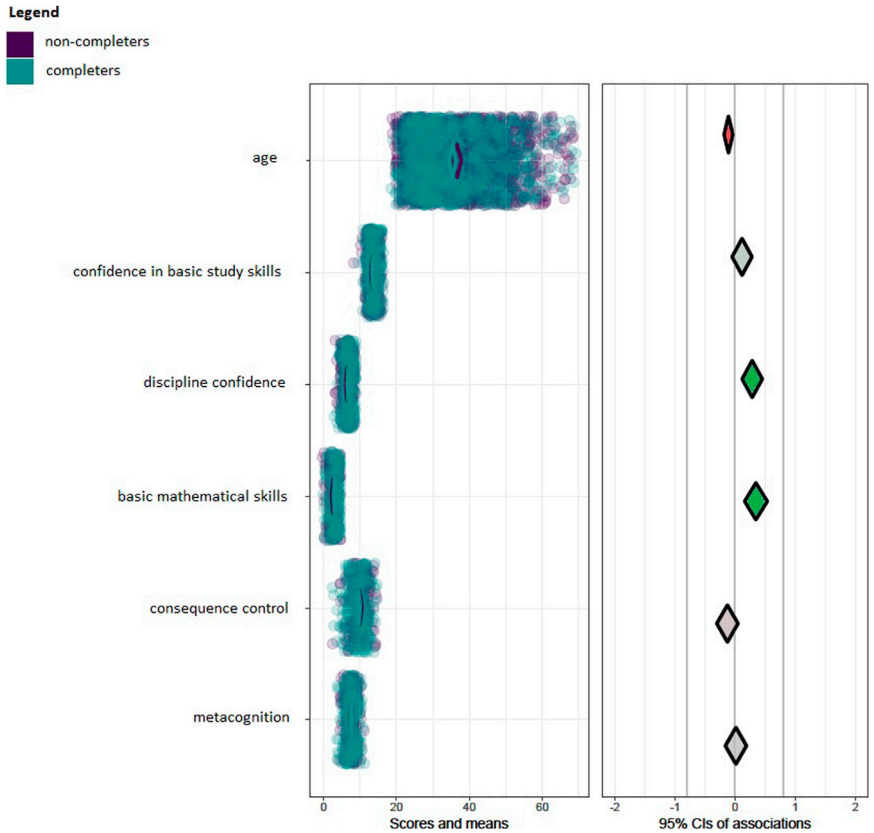

FIGURE 3 | Diamond Plot of the Associations between Continuous Variables and Completion in Dataset 2.

to study, learning strategies, social support, and study intention. Two variables, goal orientation and volition, are not verified as predictors of completion in the local context (indicated by the dotted arrows toward and the dotted contour of these predictors in the local model).

Identification and Classification

The self-assessment aims at identifying prospective students with lower chances for completion to provide them feedback on where there is room for improvement and how their chances for completion can be enhanced. In light of the open access policy in the current context, it is paramount that the risk discouraging prospective students who, in fact, would have been successful should be kept at a minimum. In other words, we strive to reduce the likelihood of false-negative predictions, at the expense of an increased likelihood of false-positive predictions. For this reason, high sensitivity cut-offs were required. We explored results for two different sensitivity cut-offs: 95 and 99%, which corresponds to a maximum of respectively, 5 and 1% of the prospective students possibly unjustly classified as non-completers. For the sake of comparability with previous studies, background variables were excluded in these analyses. Using the 95% sensitivity cut-off, 13.78 and 12.87% of the actual non-completers were correctly identified as such in dataset one and dataset two respectively. Using 99% sensitivity, 3.82 and 2.27% of the actual non-completers were correctly identified in dataset one and dataset two, respectively.

DISCUSSION

The main objective of this study was to select variables to be included in the self-assessment, as a means to enhance informed decision making prior to enrollment. All in all, this study has led to the inclusion of the following modifiable variables in the self-assessment: hours planned to study, employment hours, study intention, discipline, discipline confidence, basic mathematical skills, financial support, emotional support, and practical support. In line with findings of the literature (Muljana and Luo, 2019; Delnoij et al., 2020) these variables cover characteristics of both the student him/herself (e.g., discipline), and the students' environment (e.g., social support). The present study's findings on employment are in line with previous studies of dropout in online courses (Lee and Choi, 2011) and higher education in general (Riggert et al., 2006). Additionally, discipline seems to be an important topic in the predictors of completion in higher online education. In the present study, discipline appeared a predictor of completion. This association in the context of higher online education has previously been stressed in survey research (Waschull, 2005) as well as qualitative research (Gaytan, 2013). The present study's results for academic self-efficacy were (partly) in line with findings of review studies in the context of higher (online) education (Lee and Choi, 2011; Bowles and Brindle, 2017). However, it is not clear how academic self-efficacy was operationalized in these review studies. Our results showed that,

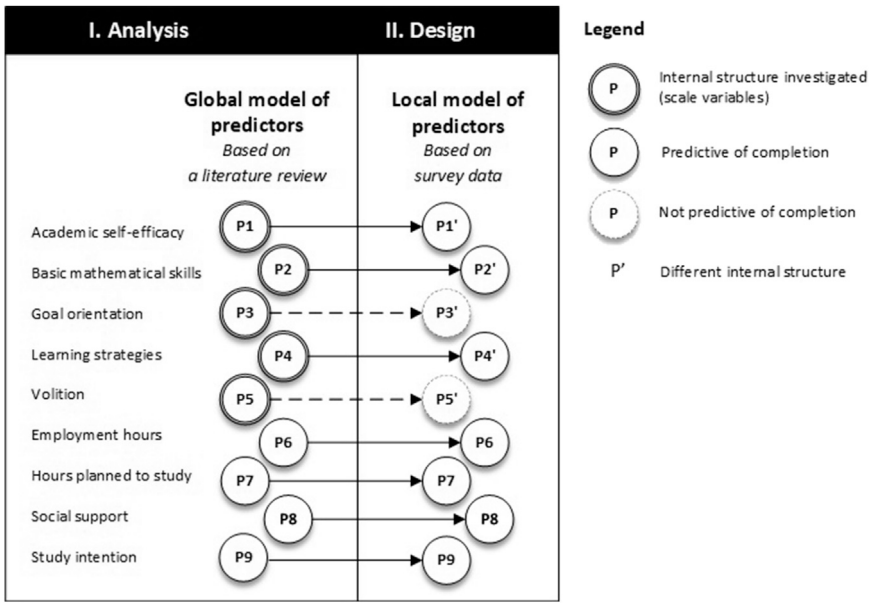

FIGURE 4 | Local Model of Predictors of Completion.

as a factor of self-efficacy, discipline confidence is associated with completion. Furthermore, the association between mathematical skills and completion is in line with findings using the same measurement (albeit in face-to-face education; cf. Fonteyne et al., 2017), as well as studies in the context of online education, using standardized tests (Morris et al., 2005). Finally, our findings on social support are in line with findings in comparable contexts (Asbee and Simpson, 1998; Park and Choi, 2009; Lee and Choi, 2011). However, some results are not in line with previous research or theories on predictors of completion. For instance, goal orientation (i.e., performance-approach and work avoidance goals) did not appear to be related to completion in the present study. A possible explanation lies in the context of the present study, which is characterized by a merely adult student population, combining a study with a job and/or family responsibilities. In this context, specific intentions, rather than the orientation of one's goals (e.g., oriented to outperform others), might be more important for completion. Though the effect was small, this was also suggested by our results, as we did find an association between study intentions and completion. In that regard, research carried out in the context of MOOCs (i.e., another example of open higher *online* education), demonstrated that intention is an important requisite for completion (Henderikx et al., 2017). Besides that, although performance approach goals (i.e., whether or not students' are oriented at outperforming others) might not relate to completion, they appear predictive for other correlates of students' success, such as grade point average (Neroni et al., 2018). Furthermore, in the present study, no association was found between volition (i.e., consequence control and metacognition) and completion. Theories in the field of distance education suggested that volition might be an important predictor of performance and achievement in this context (Corno and Kanfer, 1993; Keller, 2008). However, to our knowledge, there is no empirical evidence for the relationship between volition and completion, although some evidence exists for a relation between volition and academic procrastination in this context (Ucar and Bozkurt, 2019). Overall, we must note that rather strict cut-off values were applied in factor analysis, as we aimed for the most parsimonious tests, which was explained in the method section. This explains differences in the dimensionality of the measures used in the present study and, in turn, might explain differences in our results, compared to previous research.

The variables selected for the self-assessment, together with background variables explain 16.3% (dataset 1) and 21.7% (dataset 2) of the variance in completion. Whether or not these proportions of explained variance are meaningful, is open to debate. According to Allen et al. (2009), this depends on the practical utility of the test scores. In that sense, we consider these proportions of explained variance meaningful, taking into account the results on prediction accuracy of actual non-completers by selected modifiable predictors of the self-assessment irrespective of background variables: 13.78 and 12.87% (dataset 1 and 2, respectively) with a sensitivity of 95%. These are promising results, especially in comparison with similar research in *traditional* higher education, in which 3.7% of the failing students were identified correctly (Fonteyne et al., 2017). Note that in both cases the results have been achieved in a total sample prediction. Fonteyne et al. (2017) also investigated the classification results in program-specific contexts. Interestingly, 13.4% of the actual failing students were identified correctly using a program-specific prediction. In relation to the open access policy in the current context, in which we want to avoid unduly discouraging prospective students, we might consider being even stricter in setting a sensitivity cut-off. Therefore, we examined the prediction

accuracy of actual non-completers also at a sensitivity of 99%, resulting in 3.82 and 2.27% of non-completers that were classified as such in dataset 1 and 2, respectively. These results illustrate a trade-off in which a higher sensitivity results in less false negatives (i.e., maximally 5% at a sensitivity of 95 vs. 1% at a sensitivity of 99%) but at the expense of correct classification of actual non-completers. Note though that the percentage of actual non-completers - that can be classified correctly with a stricter sensitivity (99%) in the present study-is in line with the results obtained at a more liberal sensitivity of 95% in the context of traditional higher education (Fonteyne et al., 2017). In addition, in evaluating the effectiveness of interventions in education, it is not only important to take into account practical utility, but also factors like, for instance, cost-effectiveness and scalability (Kraft, 2020). Considering the latter, the self-assessment seems a promising intervention.

Limitations and Directions for Future Research

Several limitations are noteworthy in regard to the present study, as they point out directions for future research in this field of study. In regard to the practical application of newly constructed scales, the step from "predictor" to "test" (**Figure 1**) requires an extra step in terms of collecting evidence on (single) test content.

In light of the selected variables for the self-assessment, elaboration of interaction effects was not the focus of the present study. As these relationships might have implications for practice (e.g., gender differences in the relevance of certain variables for completion), a recommendation for future research is to examine these possible interactions, including specific study programs. As shown by Fonteyne et al. (2017), insight in program-specific relationships between factors and completion might result in better prediction accuracy and might have practical implications for feedback to be provided. Furthermore, a considerable part of the variance in completion remains unexplained. In that respect, there might be other modifiable factors associated with completion, which can possibly be included in the SA to establish a better prediction of completion, and thereby enhance the validity of the SA. For instance, in a review study by Muljana and Luo (2019), it has been shown that technological skills might be a relevant factor, especially in higher *online* education. Finally, in the next steps of the (design-based) development process of the SA, it is recommendable to include additional measures of actual behavior (e.g., sample tests) next to self-reported behavior, to enhance the predictive validity and fairness of the self-assessment (Kuncel et al., 2001; Niessen et al., 2016, 2018; Sackett et al., 2016). Actual (study) behavior in these sample tests is mimicked by a simulation of representative parts of academic programs in a certain context (Niessen et al., 2016). For instance, such a sample might involve studying literature and/or watching video-lectures, followed by a short exam.

Implications for Practice and Research

Currently, there is a high need and demand for online education, because of the covid-19 pandemic. Accessibility to educational programs will widen further when universities decide to continue offering (partly) online education after the pandemic (Gomez Recio and Colella, 2020). In that regard, (prospective) students need support in making a well-informed study or program choice. To that end, self-assessments prior to student enrollment seem a promising approach (Kubinger et al., 2012; Lee et al., 2013; Fonteyne and Duyck, 2015; Muljana and Luo, 2019; Nolden et al., 2019). Such approaches aim at achieving optimal alignment of students' skills, motivation and cognitive beliefs on the one hand and required skills and attitudes of a particular educational program on the other hand by raising awareness and providing early remediation (Menon, 2004; Hachey et al., 2013; Fonteyne and Duyck, 2015; Nolden et al., 2019). The present study revealed seven predictors of completion in the context of higher online education that are to be included as subtests in such a self-assessment. By these predictors, about 13% of actual non-completers could be correctly identified (with a sensitivity of 95%). It goes without saying that access to higher education constitutes a sensitive ethical issue, especially in the context of (open) online education. Therefore, development and implementation of self-assessments in this context requires thorough and careful validation, not only of the assessment as an instrument but also of the way it is used and whether it affects the decision-making process as intended (Niessen and Meijer, 2017). In the present study, the content, internal structure and predictive aspects of validity were investigated. Though validation is not a "once and for all" call and these aspects remain under evaluation (i.e., as the population and educational practice change over time), next steps should focus on the other aspects of validity as well. Prospective students' response processes need to be examined to determine whether the self-assessment is used as intended (Beckman et al., 2005; Downing and Haladyna, 2004). Furthermore, to determine the self-assessment's impact, the consequential aspect of validity needs to be evaluated (Beckman et al., 2005; Cook et al., 2014). This involves investigation of, for instance, the impact on prospective students' study choice certainty, enrollment behavior and study progress after enrollment.

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 Research ethics committee (cETO) Open

Universiteit. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LD: conceptualization, methodology, formal analysis, investigation, resources, data curation, writing (original, review and editing), visualization. JJ: conceptualization, methodology, investigation, resources, data curation, writing (review and editing), visualization, supervision. KD: conceptualization, methodology, formal analysis, writing (review and editing), supervision, project administration. HG: methodology, investigation, resources, data curation, writing (review and editing), supervision. RG: resources, writing (review and editing), supervision. JN: methodology, investigation, resources, data curation, writing (review and editing). MB: investigation, resources, data curation, writing (review and editing). RM: conceptualization, writing (review and editing), supervision, project administration.

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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.2021.668922/full#supplementary-material

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Can Universities be a Gleam of Hope During COVID-19? Entrepreneurial Intentions Approach for Academia in Pakistan

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The COVID-19 epidemic has wreaked havoc on the economics of several countries. Downsizing, job shortages, and unemployment are among the significant effects. The markets are supported by the need to train and educate our youth to be job producers rather than job seekers. This study sought to investigate the role of universities in the formation of students' attitudes toward entrepreneurship by analyzing the influence of locus of control, extracurricular activities, and curriculum on entrepreneurial intention among Pakistani university students. This study collected data from 536 students across 15 universities in Pakistan through a weblink questionnaire. SPSS and AMOS were used to test the theoretical model. Results confirmed that locus of control positively affects entrepreneurial intentions and is the strongest predictor among the other two variables. Extracurricular activities positively affect entrepreneurial intentions, and curriculum is also positively affecting entrepreneurial intentions. This study concluded that entrepreneurial education and acquaintance are essential in bringing entrepreneurial intentions among students. Locus of control is found to be the most substantial element in developing entrepreneurial intentions among students. Educational institutions can play a critical role by proactively contributing through their efficient and proficient curricula, professional and experienced teachers, and locus of control by combining curricular and co-curricular activities.

Keywords: locus of control, university curriculum, extracurricular activities, entrepreneurial intentions, theory of planned behaviors, COVID-19

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INTRODUCTION

The global COVID-19 epidemic has raised numerous issues, impacting millions to billions of individuals in the sanitary and health sectors. On the other hand, organizations have had to deal with the new realities of the global economic slump (Dias et al., 2020). Due to immersing economic pressure on the organizations at this particular time, companies were forced to downsize their employees, and many lost their jobs (Loayza and Pennings, 2020; Lord, 2020). COVID-19 has left poor nations with little choice but to work with a smaller workforce and less resources. It has also increased the pressure on wealthy nations to control inflows (Hopman et al., 2020). According to recent research, young people suffer the most, not just in terms of lost jobs but also in terms of time spent gaining expertize (Hopman et al., 2020). Pakistan, like many other emerging countries, has

recorded a large number of job terminations. With this figure anticipated to climb in the following months, young people's dread of being laid off has skyrocketed (Waris et al., 2020).

World economies are contracting in the modern period as a consequence of resource scarcity caused by COVID-19, which has resulted in significant unemployment rates and income inequities. Instead of seeking work, it is necessary to generate jobs for others (Crayne, 2020). As a result, sustaining the world's ever-growing population, the demand for better jobs, and better managing the economic impacts of COVID-19. The phrase entrepreneurship refers to forming a mindset in the pursuit of financial gain, job possibilities, and the best use of existing resources to achieve maximum results (Long, 1983). Entrepreneurship in SMEs (small and medium-sized enterprises) captured the attention during this challenging time by providing few employment opportunities. Simultaneously, several recruited a team of the same minds or family members to start a small business (Akpan et al., 2020; Fitriasari, 2020). Those who had entrepreneurial solid understanding and education were able to make a living. As a result, educating the kids about entrepreneurship can aid in the future fight against pandemics. It's only feasible if young people have entrepreneurial instincts and expertize. Students with greater experience, drive, and abilities will be more confident in their ability to overcome obstacles (Salamzadeh et al., 2014).

Universities are seen to be the formative force in any culture. They prepare students to deal with any unknown scenarios that may arise in the future. These institutions can foster entrepreneurial mindsets through their practical curricula, competent and experienced staff, locus of authority, and co-curricular activities. Higher educational establishments (universities) can play a critical role in developing entrepreneurial ambitions among the youth. Graduates from such colleges are the catalysts for economic growth, since they can make entrepreneurial decisions (Saeed et al., 2015). Studies strongly reflect the effects of entrepreneurial intentions from a very early stage, which later leads to the gestation phase of business development, compared to the people who lack intuition are reluctant to do business (Nabi et al., 2018; Meoli et al., 2020). The idea of exposure to entrepreneurship education in bringing entrepreneurial intentions tended to opt for their own business compared to the people who had little or no entrepreneurial education (Farsi et al., 2012; Wannamakok and Liang, 2019).

Studies have been extensively conducted in developed countries to measure universities' importance in students' entrepreneurial attitude development (Guerrero et al., 2016; Ozaralli and Rivenburgh, 2016; Zollo et al., 2017). Due to cultural restrictions and insufficient resources, the significance and value of entrepreneurial exposure and educational variables have been largely overlooked in underdeveloped nations. The administration in many developing nations is similarly skewed in favor of the country's wealthy elite. As a result, the newcomer has very limited ground on which to build their firm. As a result, pandemics have a greater impact on the educational ecology of underdeveloped nations (Kawamorita et al., 2020). Furthermore, there should be no gender discrimination and equal chances. Female entrepreneurs were formerly discouraged in Pakistan, but this is rapidly changing (Yousfani et al., 2019). It is necessary to appropriately address this issue and give more possibilities and government assistance to kids by teaching them at a young age and making them aware of their responsibilities.

Pakistan, like any other developing country, suffered a severe setback as a result of COVID-19. The entire country was put under lockdown during the first wave. Many industries were left with no choice but to reduce their workforces or close permanently. Those with entrepreneurial expertize and education, on the other hand, saw it as an opportunity. As a result, a large number of new SMEs arose, many of which prospered. The study's relevance stems from the need of having entrepreneurial expertize to deal with future unanticipated occurrences. Because the Pakistani society is more insistent on getting a suitable job than on helping or encouraging young people to establish their own business. This problem has resulted in greater employment demand than supply. As a result, Pakistan had a large number of job losses last year.

The goal of this study was to influence the cultural attitude of the Pakistani people, a society in which having a stable job is favored and appreciated above establishing a business. There aren't many universities in Pakistan that are completely focused on entrepreneurship education. Pakistan's government developed a detailed strategy for the newly formed SME task force, which aims to create an enabling environment and provide assistance to businesses (SME-led Economic Growth, Job Creation, and Poverty Reduction, SME Policy). Pakistan's unemployment crisis has been escalating for several years. With 4.45% unemployment in 2019, the unemployment rate is quite high. Furthermore, degree holders' career opportunities are heavily reliant on both the governmental and private sectors. To address these problems and challenges, it is thought that a re-examination of the higher education system is required to overcome the barriers that obstruct expansion and progress. In Pakistan, there hasn't been much research done on this issue. By analyzing entrepreneurial traits among university students, this article will add to this particular field of entrepreneurship.

Based on the theory of planned behavior (Ajzen, 1991), The purpose of this study is to look at the influence of entrepreneurial education (locus of control, co-curricular activities, and entrepreneurial curriculum) in developing entrepreneurial intuitions among university students. This research will aid in the development of a clear strategy to encourage entrepreneurship at the national level for our present and future generations, particularly graduate and postgraduate students so that they may be developed and capable of becoming good entrepreneurs and tackling any unforeseen events in the future.

LITERATURE REVIEW

University Curriculum

A curriculum is defined as a set of courses or subjects offered in any educational institute (Egan, 1978). It provides the institutions

with a guideline or a course of action based on which the learning process occurs, and objectives are achieved. The term curriculum can be taken as the backbone of the education system. A well-designed curriculum helps you move in the right direction and assists in achieving goals. It is designed to develop fundamental concepts at a very early stage. It then refines Individuals to perform advanced and complex skills (Young, 2014).

Worldwide, different curricula and syllabi are being employed in universities to develop students' specific skills. However, many scholars have focused explicitly on developing entrepreneurial curricula that should be dynamic and versatile in nature (Pillai et al., 2019; Riesterer, 2019). The entrepreneurial curricula must depict a learning experience course possible by merging theoretical and knowledge base teaching with a substantial practical approach. Such a versatile combination of courses and curricula can be best catered to with master's studies. The master's in entrepreneurship program needs some amendments that must have innovative and creative subjects apart from teaching managerial issues (Welter and Gartner, 2016; Ndou et al., 2019; Huang-Saad et al., 2020). This will help make the foundation for the education and knowledge process and provide a concrete and everlasting base to the economy. The other important aspect related to the curricula is its significant role in attitude development toward entrepreneurship. As living in a global village, entrepreneurial studies must be coherent apart from being dynamic and versatile. So, To standardize education with the latest trends, there must be "Internationalization" of curricula for Entrepreneurship (Guillotin, 2018).

Through different researches, it is explored that most of the young generation are now unemployed (Blustein et al., 2020). Unemployment was one of the biggest concerns for societies even before the COVID-19 pandemic. Unemployed are keen to start their own business, and they are passionate about entrepreneurship. However, the lack of theoretical knowledge makes it hard for them. Therefore, students must have the necessary theoretical know-how of the business world to start their entrepreneurial venture (Weber, 2015). In this way, they can minimize the chances of failure. Universities can cater to this thirst by offering relevant courses of entrepreneurship in their curricula.

If intelligently structured and then employed in higher education, the curriculum is the entity that can give fruitful results regarding entrepreneurship. It will foster potential students' interest in having their enterprises and motivate them to think outside the box (Saeed et al., 2015). As entrepreneurship is a risky field, it will take some time to change students' mindsets. Regarding the regulatory focus theory, It is argued that exposure to the entrepreneurship course, whether it is practically or theoretically oriented, creates a motivational element (Piperopoulos and Dimov, 2015). The students should be more exposed to education on entrepreneurship. It has been observed the students who intend to study it get benefitted from it and are more inclined toward the business. The study also corresponds to the theory of planned behavior as the students exposed to entrepreneurial education have developed entrepreneurship's intention (Piperopoulos and Dimov, 2015).

Nowadays, the most widely studied courses of entrepreneurship at the university levels are grouped into three broad categories: 1) Entrepreneurial business creation and management (Fairlie and Fossen, 2018); 2) Entrepreneurship: a historical perspective (Toms et al., 2020); and 3) Entrepreneurship in specific contexts (Dodd et al., 2016). According to the research by Guerrero et al. (2014), adequately designed curriculum and R&D in entrepreneurship can lead to better results at universities. It is evident from the prevailing literature related to the curriculum; it is challenging to teach a practical and intellectual subject theoretically. But teaching entrepreneurship somehow makes the thoughts present in the far-flung areas of the human mind into realities. Thus, this can encourage our young graduates toward entrepreneurship by giving them an educational system fully equipped with a practical and theoretical curriculum that can broaden their thinking horizons and nurture their potential capability.

H1: University curriculum has a direct relationship with attitude development toward entrepreneurial intentions.

Co-Curricular Activities

Co-curricular activities are voluntary activities that are out of the scope of the regular curriculum. They support educational activities and enhance social interaction, leadership, healthy recreation, self-discipline, and self-confidence (Batool and Raiz, 2019). Co-curricular activities provide an informal platform for interaction that helps a student or an individual in self-actualization. Educational institutes have quite diverse students, and this informal interaction will help students in the practical and creative exploitation of their hidden capabilities. Besides, entrepreneurship is more a practical subject that becomes boring and less interesting without practicality in teaching (Huang-Saad et al., 2020). Co-curricular activities can help in making it more interesting besides being challenging. It is a big challenge for the curriculum developers to make the courses aligned to their entrepreneurial needs and motivation. University students should be more exposed to entrepreneurial studies and co-curricular activities, increasing self-motivation (Kuratko and Morris, 2018).

These activities also help in developing leadership qualities and motivate the risk-taking attitude of students. This makes them courageous enough to endure challenges for their benefit and creativity, which in the long run can be seen as a positive sign toward entrepreneurship (Volkmann and Audretsch, 2017; Preedy et al., 2020). The universities are restructuring their settings to make them more congenial and in line with the objective of entrepreneurship. Universities can make it happen by following a comprehensive approach that includes weekly workshops, semester-wize business plan competitions, conferences, seminars. Entrepreneurial universities can provide the student with more environment to take new challenges and excel (Guerrero et al., 2014). Furthermore, researchers envisaged that such co-curricular activities with some experiential backup would help impart the subject matter's practical knowledge to the graduates (Preedy, 2018; Firmansyah et al., 2020).

In today's era, entrepreneurship is one of the fastest-growing disciplines at universities and colleges. There is much focus on the practical implication and learning of entrepreneurship rather than just traditional wisdom (Preedy et al., 2020). On the other hand, students have reported that co-curricular activities help better understand these skills. Universities can effectively play their role when plenty of funds are available at their disposal and government policies to assist them. Therefore, to make it a real success society, government and universities must join hands designing programs that involve co-curricular activities related to entrepreneurship. Presume government assistance is provided to students at an early level, and resources are made available. In that case, much burden can be taken from parents and donors (Lazaro and Anney, 2016).

H2: Cocurricular activities have a direct relationship with attitude development toward entrepreneurial intentions.

Locus of Control

Locus of control is defined as the influencing factors behind any decision or action (Spector, 1982). The locus of control can be internal or external. The external locus includes the environmental factor, i.e., society, culture. In contrast, the internal locus consists of the personal drive to achieve something or passion (MacDonald, 1971). It is a two-way process like universities trying to make their curricula and the environment more congenial to support and promote entrepreneurship. It is also upon the will of graduates what they opt for themselves as a career choice.

Internal factors have shown more influence on the decision-making of a person. Empirical results have shown that people are not willing for a risky venture. An entrepreneurial venture is possible only when the student is full of zest for that particular venture (Yurtkoru et al., 2014; Wu et al., 2018). The Post COVID-19 developmental stage of the market economy has raised an urge for entrepreneurship mindsets. It has become a very urgent issue involving youth in business as they have the most creative ways of thinking. They have high standards and internal motivation to decrease the employment issue to a much extent.

The other aspect related to locus of control in literature is people who are not employed previously. Taking the example of young graduates, who are least bothered about the risk factor, they are highly compelled to achieve and do something creative and worthy. An entrepreneurial person endures challenges and makes things right for others (Antoncic et al., 2018). They must have a strong sense of self-efficacy and self-actualization and a firm belief in their capabilities. Many researchers have also validated this concept that entrepreneurs have a strong locus of control (Asante and Affum-Osei, 2019; Kusumawijaya, 2019).

While researchers talk about the internal locus of control as more significant, they can't forget to quote that being an entrepreneur is an inherited or by-birth gift in entrepreneurs most often. These enduring nature capabilities like risk-taking and creative thinking are enhanced through comprehensive training in universities (Riesterer, 2019). In the past decade, it has been noticed that women have shown a substantial role in any country's economic growth. When they are exposed to entrepreneurial opportunities, they have performed great and contribute a lot to strengthening the economy (Hasan et al., 2016). Therefore, the youth needs to be encouraged for opting entrepreneurship to change the future of any country.

Researches have further envisaged that we can motivate an individual with an internal locus of control to become entrepreneurs. However, they need an environment that nurtures this passion for creativity (Trippl et al., 2015). Universities can effectively play this role by providing opportunities, a network of experienced faculty, and an appropriate amalgamation of curricular and co-curricular activities.

H3: Locus of control has a direct relationship with attitude development toward entrepreneurial intentions.

To sum up, this research aims to discuss the impact of the University curriculum, Locus of control, and extracurricular activities on entrepreneurial intentions among university students based on the theory of planned behavior. The theoretical model can be seen in **Figure 1**.

METHODOLOGY

Data Collection

The questionnaire was designed on a weblink and disseminated among the students through social websites, teachers, and friends in 15 universities of Pakistan. In order to avoid the homology deviation, a two-point data collection method was adopted, and the data was collected by referring to the literature of similar research topics. A code was assigned to each survey object, and they were asked to use the same code to fill out the questionnaires at two time points. The first phase was conducted in March 2020. 700 questionnaires were rolled out to students to acquire data against variables of University curriculum, Entrepreneurial intentions, and demographic information (gender, age, and education). Upon assessments of 630 returned questionnaires, 622 were effective. The second phase of the data collection was conducted in June 2020, and 622 questionnaires were sent back to collect data on the variables of Locus of control and extracurricular activities. Out of 622 questionnaires, 562 were received. Incomplete and influenced questionnaires were deleted, and 536 valid questionnaires were used for this study, with a response rate of 76.5%. All the research processes were rigorously monitored and standardized. Participants were asked to complete the survey items uniformly within the prescribed time limit, and the purpose of the research was conveyed to participants. Therefore, the objectivity, confidentiality, and authenticity of the collected data were ensured to a certain extent.

In the effective sample subject, the proportion of male students was 80.4%. The proportion of students aged 18–22 was 16.9%, the proportion of aged 23–27 was 50.9%, the proportion of aged 27–31 was 17.3%, the proportion of aged 32–36 was 14.7%. The proportion of students in early years (0–2) of bachelor's degree was 12.6%, the proportion of students in final years (2–4) of bachelor's degree was 30%, the proportion of students in master's degree was 53.5%, and proportion of Ph.D. was 3.7%.

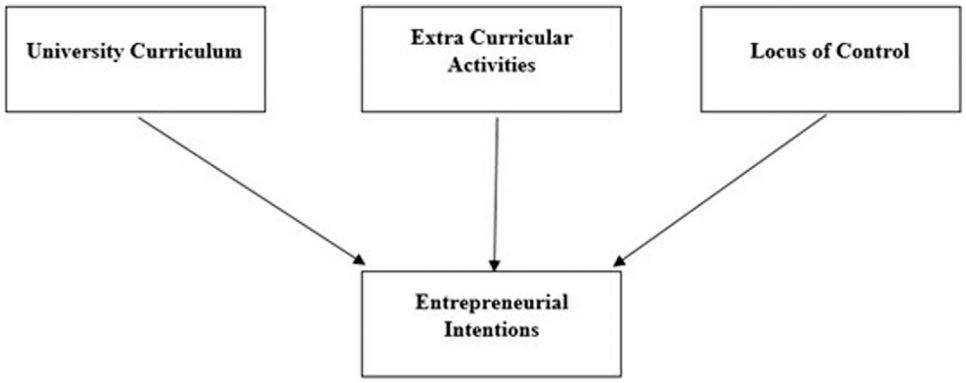

FIGURE 1 | Theoretical model.

Measures and Variables

In order to ensure the reliability and validity of the scales, this study adopted the scales from published literature in authoritative journals. All questionnaires were scored with Likert's 7 points, from 1 to 7 indicating "strongly disagree" to "strongly agree" (**Appendix**).

Extracurricular Activities

This research measured extracurricular activities through the two items scale by Toyokawa (Toyokawa and Toyokawa, 2002). One of the scale items states, "I have made an effort to become involved in various extracurricular activities." Respondents had to scores against a Likert 7-point scale. The higher scores relate to a better assessment of extracurricular activities. Cronbach's Alpha reliability of the scale was reported as 0.891.

Internal Locus of Control

Internal locus of control was measured through three items scale developed by Levenson and Miller (Levenson and Miller, 1976). One of the scale items states, "When I make plans, I am almost certain to make them work." This research used a Likert 7-point scale to measure Internal locus of control. Cronbach's Alpha was 0.759 in this research, which met the basic standard of psychometrics.

Entrepreneurial Intentions

For measuring entrepreneurial intentions, the scale used in this research was developed by Krueger et al. (2000), having a Cronbach Alpha value of 0.891. Responses were collected using a 7-point Likert scale. One of the eight items states, "I do my best to run my own business."

Curriculum

The curriculum was measured through nine items scale designed by De young (Boerschig and De Young, 1993). One of the scale items states, "The subject of entrepreneurship interests me very much because of interactive learning." This research used a Likert 7-point scale to measure curricula. The scale reported a high Cronbach's Alpha reliability of 0.815.

TABLE 1 | Confirmatory factor analysis.

Model	χ^2	df	χ^2/df	RMSEA	CFI	IFI	TLI
Four factors	724.101	203	3.567	0.071	0.914	0.915	0.988
Three factors	1668.806	206	8.101	0.115	0.796	0.797	0.771
Two factors	2375.776	208	11.422	0.140	0.698	0.699	0.664
One factor	3653.32	209	17.480	0.176	0.520	0.521	0.469

Control Variables

Based on a review of existing literature, this research found that demographic information may affect employees' mental state and behavioral responses, profoundly affecting this study's results. So demographic information should be controlled during the analysis process. This demographic information included: Gender, age, and education.

Ethical Issues

The research was granted access by the ethics committee COMSATS University, Islamabad, Pakistan and School of Management, Jiangsu University, Zhenjiang, People's Republic of China. The linkages between the Pakistan universities supported in getting the approvals from participating universities. The participating students were informed, and all the participants provided the written consent. The research was conducted in compliance with the Declaration of Helsinki. This study received funding from Jiangsu University and JiangSu Haicore Technology Joint Stock Co., LTD. The funder was not involved in the study design, collection, analysis, interpretation of data, the writing of this article or the decision to submit it for publication. All authors declare no other competing interests.

RESULTS

EFA and CFA

Harmon single factor analysis was adopted in this research to check the exploratory factor analysis (EFA) across the variables. The results presented the value of KMO = 0.888, Bartlett's spherical (Tobias and Carlson, 1969) test presented the Chi-

TABLE 2 | Descriptive statistics and correlation analysis.

	MEAN	SD	1	2	3	4	5	6	7
1 GENDER	1.1959	0.39726	**1**						
2 AGE	2.3116	0.95013	0.036	**1**					
3 EDUCATION	2.4832	0.76102	−0.085*	−0.390***	**1**				
4 LOC	6.0877	0.80613	0.081	−0.143**	0.097*	**1**			
5 UC	5.2174	1.29660	0.042	−0.122**	−0.037	0.274***	**1**		
6 ECA	5.3412	0.99683	0.034	−0.154***	0.011	0.278***	0.764***	**1**	
7 ES	5.7215	0.93503	0.012	−0.052	0.086*	0.637***	0.377***	0.388***	**1**

Note: LOC (locus of control), UC (university curriculum), ECA (extracurricular activities), ES (entrepreneurial intentions). F value is a test of the overall significance of all explanatory variables. The R-squared value indicates how well the model fits the sample data.

TABLE 3 | Hypothesis testing.

Variable	ES					
	Model 1	95% CI		Model 2	95% CI	
Control variable						
Gender	0.046	−0.154	0.246	−0.099	−0.247	0.048
Age	−0.021	−0.112	0.069	0.094**	0.027	0.162
Education	0.098	−0.016	0.211	0.083	−0.001	0.166
Independent variable						
LOC				0.664***	0.588	0.740
UC				0.086*	0.016	0.156
ECA				0.144**	0.053	0.235
F	1.473			78.083***		
R^2	0.008			0.470		
$\triangle R^2$	0.008			0.461		

LOC (locus of control), UC (university curriculum), ECA (extracurricular activities), ES (entrepreneurial intentions). F value is a test of the overall significance of all explanatory variables. The R-squared value indicates how well the model fits the sample data.
*Note: *p < 0.05, **p < 0.01, ***p < 0.001.*

square value of 7288.999 ($p < 0.001$). The four common factors extracted were consistent with the number of variables set in this study. The first-factor variability was 36.9%, which is lower than the critical value of 50% (Nagao, 1973). The results deemed the data free from serious common method bias issues. Furthermore, The data collection process was conducted anonymously under strict control to avoid any common method deviation.

This study used AMOS 24.0 to test the discriminant validity of the variables'. The results of the confirmatory factor analysis (CFA) are shown in **Table 1**. The results obtained from CFA suggests that the four-factor model fits the index best ($\chi^2/df = 3.567 < 5$, RMSEA = 0.071 < 0.08, CFI = 0.914 > 0.9, TLI = 0.988 > 9). These results are better in comparison to the combined effect of three-factor, two-factor, and single-factor models. Hence, this confirms the factors of internal locus of control, curriculum, extracurricular activities, and entrepreneurial intentions have good discriminative validity. This study used standard factor loadings from CFA to calculate CR and AVE. Every factor loading is higher than 0.50, stating that the variables have good convergent validity.

Descriptive Statistics and Correlation Analysis

In order to further explore the correlation between extracurricular activities, internal locus of control, entrepreneurial intentions, and curriculum, the data was analyzed using SPSS 20.0 software. Descriptive statistics and correlation analysis results are exhibited in **Table 2**: locus of control is positively related to entrepreneurial intentions ($r = 0.637$, $p < 0.001$), the curriculum is positively related to entrepreneurial intentions ($r = 0.377$, $p < 0.001$), extracurricular activities is positively related to entrepreneurial intentions ($r = 0.388$, $p < 0.001$). Therefore, the results preliminarily verified the theoretical hypothesis of this research.

Hypothesis Testing

This study tested the effect of internal locus of control, curriculum, extracurricular activities on entrepreneurial intentions through regression analysis shown in **Table 3**. In the regression equation model, gender, age, education level are first taken as control variables. Then regression analysis is conducted on the utility of target variables, respectively. The operational steps are conducted to explore the effect of internal locus of control on entrepreneurial intentions, the effect of curriculum on entrepreneurial intentions, and the effect of extracurricular activities on entrepreneurial intentions.

The results indicate that locus of control positively affects entrepreneurial intentions ($\beta = 0.664$, $p < 0.001$) and support hypothesis 1. In the case of curriculum on entrepreneurial

intentions, the results support the positive relationship (β = 0.086, $p < 0.05$) and support hypothesis 2. Hypothesis 3 suggested that extracurricular activities positively affect entrepreneurial intentions, and the results were supported correspondingly (β = 0.144, $p < 0.01$).

DISCUSSION

COVID-19 has wreaked havoc on the globe in a variety of ways, affecting virtually everyone in some capacity. Many people lost loved ones, and many more were financially impacted. However, one of the most pressing problems these days is the deterioration of economies and the shortage of employment opportunities. Young people were also impacted in a variety of ways, including disruptions in training/education, a drop in new job entrants, and income losses.

This study investigated three entrepreneurship-related qualities: curriculum, locus of control, and extracurricular activities, using the psychological characteristics school of thinking. **Table 3**'s findings, as well as the study's connections, were statistically significant. Additionally, in this study, locus of control was found to be the strongest predictor of entrepreneurial goals among students. This study was carried out to encourage workers to pursue entrepreneurship and to look at the variables that are required for such goals. This study focused on the impact of locus of control on entrepreneurial ambitions. The impact of curriculum on entrepreneurial ambitions was also assessed. Finally, the impact of extracurricular activities on entrepreneurial goals was investigated. The findings of this study are in line with those of earlier studies.

Theoretical Contribution

This study concluded from correlation analysis and **Table 3** that locus of control is the strongest predictor of entrepreneurial intentions than curriculum and extracurricular activities. Previous studies have also proposed a strong relationship between locus and control variables and entrepreneurial intentions (Asante and Affum-Osei, 2019; Kusumawijaya, 2019). When people have reasonable control over the events happening in their daily lives, they will feel more confident and trigger entrepreneurial intentions. This study concludes that current events and happenings cannot affect entrepreneurial intentions. Instead, individuals utilize it as an opportunity (Ibrahim and Mas'ud, 2016; Wang et al., 2016). Efforts and one's own beliefs are significant for shaping the future. Individuals with firm faith and persistence in achieving the desired goal are considered an essential predictor of entrepreneurial intentions. A person must be internally motivated because failures in start-up periods decrease the motivation level and society also discourages this risky occupation. So, an entrepreneur must have strong will-power and passion for proving him (Fellnhofer, 2017). Students with a strong locus of control can positively affect the entrepreneurial intentions. Consequently, this research enriched the theoretical and practical research results of locus of control on entrepreneurial intentions.

The curriculum can also be a very effective tool in attitude development toward entrepreneurship. When the universities' curriculum is dynamic, universities inculcate new courses with time, like project management. An effective curriculum can help support and motivate the students who are seeking entrepreneurship as a career choice. The results of this study are consistent with the finding of Val et al. (2017). They supported the idea of an effective curriculum in upbringing entrepreneurial intentions among students. Adapting to the new ways and teaching techniques with improved curricula can promote entrepreneurial intentions, which is also suggested by Pillai et al. (2019).

This study also concluded that extracurricular activities are the least effective on entrepreneurial intentions among students. However, we cannot ignore the role of such activities in the development of students. Findings suggest that extracurricular activities offer practical and social learning prospects for students. This study is consistent with the earlier findings that, Engaging in extracurricular activities (business talks, competitions, and student clubs) develops students' confidence and practical knowledge (Milner et al., 2016). Consequently, theoretical and empirical research results of extracurricular activities on entrepreneurial intentions are enhanced in this research.

Practical Implications

Education on entrepreneurship has become the driving wheel for developing countries and a priority element for policymakers during this challenging time. COVID-19 has struck almost all parts of the globe and created a job deficit. The large organization has opted for downsizing, and many people lost their jobs. However, SMEs have been in the spotlight of this period. Many SMEs acted timely to this situation and shifted to online setups. They instead took it as an opportunity to look into new ventures and services. This is all because of entrepreneurial education and the knowledge they had. This research indicates that entrepreneurship interventions into the education system are expected to create a society that brings economic benefits and enterprising behavior that benefits the existing SME and helps create new ventures. At the advanced phase of refining the market economy, youth entrepreneurship improvement issues have become more pressing. Youth, who has an imaginative state of mind and is directed to maintaining their particular businesses and innovation and risk, and who has the most elevated standard of information of the Internet advancements, is a part of the society. Drawing youth into the business environment elevates to tackling the employment issue in the labor market. Entrepreneurship is a risky field, and it requires much self-belief. Therefore universities must foster their students and provide conditions that build a locus of control.

Many scholars in the past have stressed that the locus of control relates to business success and creation (Asante and Affum-Osei, 2019; Kusumawijaya, 2019). This study's results supported the previous research and emphasized the importance of locus of control heavily. Compared with other variables, locus of control is the most prominent factor in upbringing the entrepreneurial intention. Therefore universities should pay the utmost attention to motivate their

students, providing them with more chances to interact socially. So they can polish their skills through seminars, workshops, conferences, and competitions. To summarize, this study helps universities design their entrepreneurial curricula with a mix of extracurricular activities. This will internally motivate the students to practice their skills and overcome the fear of failure.

Limitations and Future Directions

This research also inevitably has some limitations. Firstly, this research collected time-lagged data in COVID-19 times. The recency effect will cause the students to rate their entrepreneurial intentions at a higher level. Since the job market is declining and many people have lost their jobs, it is hard to find the new one. There is a high debate on having your small setup rather than dependent on others in future pandemics. Therefore, the recent events might have affected people's mindsets (Hopman et al., 2020). A further vertical investigation should be carried out for a relatively long period to determine a direct causal relationship. The obtained data test results will be more reliable.

Secondly, other control variables related to entrepreneurial intentions are not set except for demographic information factors discussed in this study. In this research, we set gender as a control variable. However, the data analysis result exhibited gender significantly affecting entrepreneurial intention (Guzman and Kacperczyk, 2019). Future studies should include the moderating/mediating role of gender to test if gender will affect this relationship. Cultural aspects need to be addressed and affect people's mindsets (Fritsch and Wyrwich, 2017). Risk-takers cultures promote and support the idea of entrepreneurial initiatives.

Moreover, personality traits can be a vital element as well. The need for achievement is positively linked to entrepreneurial intentions (Çolakoğlu and Gözükara, 2016). Risk tolerance is considered a positive factor in promoting entrepreneurial intentions (Karabulut, 2016), and entrepreneurial alertness can enhance individuals' entrepreneurial intentions (Obschonka et al., 2017). Therefore an in-detailed study of all the personality trait factors can help better understand the relationship's nature.

Thirdly, the entrepreneurial event theory can explain cultural and social factors' interaction on the individuals' entrepreneurial intentions (Kuehn, 2008). Since business and other studies students have different approaches and exposure toward entrepreneurship, this study has explored students' entrepreneurial choices as a whole. Future research should focus on designing the model to meet specific studies' programs. Lastly, this study analyzed data from 536 students in all the educations sectors (universities) of Pakistan. Further research needs to use various teaching methods taught at different levels. Teaching methods (successful entrepreneurial stories, failure stories and survival, practical learning, and support in learning) need to be addressed. Therefore, future studies with an extended sample can better understand education's role in students' entrepreneurial intentions.

CONCLUSION

Seeking for the word entrepreneurship, the first thing that comes to mind is "Setting up a New Enterprise," but it is more. Entrepreneurship is a broad term that defines people's jeopardized attitude for value creation in employment generation, making profits. Optimal use of limited resources in the most creative way to maximize the benefits of creating jobs and supporting the economy in hard times like COVID-19, there is an immense need to go toward the last resort of enterprising economies by training youth for entrepreneurship. Educational institutions can play a vital role by dynamically participating through their efficient and proficient curricula and skilled faculty by a blend of curricular and co-curricular activities to the new generation.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion 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 research was granted access by the ethics committee COMSATS University, Islamabad, Pakistan and School of Management, Jiangsu University, Zhenjiang, People's Republic of China. 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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APPENDIX: RESEARCH INSTRUMENTS

	Curriculum
1	The entrepreneurship course is developed to meet the criteria of the curriculum
2	The subject of entrepreneurship interests me very much because of interactive learning
3	I gain a new experience through pursuing the entrepreneurship course
4	My liking to study entrepreneurship is more compared to other subjects
5	I can develop entrepreneurship skills through the program
6	I enjoy learning by doing in the entrepreneurship course
7	I have a better understanding about business as a result of taking up the entrepreneurship course
8	I like to study entrepreneurship because it teaches real-world situations
9	The entrepreneurship program taught me to deal with tolerance of ambiguity in the real world
	Extracurricular activities
1	I have made an effort to become involved in various extracurricular activities
2	I have extracurricular activities that I have particularly become involved in
	Internal locus of control
1	My life is controlled by others
2	I can't protect myself against others
3	My own sections control my life
	Entrepreneurial intentions
1	Launching a business in my country (Pakistan) is easy
2	I am sure that my business will be successful
3	I do my best to run my own business
4	I have enough knowledge and information to run a new business
5	I am sure that I can launch a business
6	I am so eager that launch a business in future
7	I have tensions and worries about launching this business
8	I am too eager to run a business I like someday

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Distance Education in Social Work During the COVID-19 Pandemic: Changes and Challenges

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The COVID-19 pandemic has had an extensive impact on the global higher education sector. In a written survey, staff and students at the Lucerne School of Social Work reported how they had coped with the challenges to their teaching or respective learning situation. The initial survey was conducted during the lockdown in spring 2020, and the follow-up survey was performed in the period of relaxed sanitary measures in summer 2020. During the first wave of the survey, 51 employees and 225 students participated. In the follow-up survey, 28 employees and 117 students partook. Findings indicate that the increased workload created by the transition was stressful for both staff and students but overall was handled well. Staff and students who felt supported by the university management experienced less psychological distress. Since the outbreak of the pandemic, there has been an effort to develop hybrid forms of teaching. Because the social work curriculum contains building blocks that are difficult to implement in the form of distance learning, the transition posed challenges for both staff and students. During times of transition, university management must carefully assess the support needs of staff and students and take appropriate action.

Keywords: distance learning, distance teaching, social work, COVID-19, stress, higher education, distance education

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INTRODUCTION

The COVID-19 pandemic has had an extensive impact on the global higher education sector. In light of rising concerns about the current pandemic, a growing number of universities across the world either postponed or cancelled all campus events such as workshops, conferences, sports (both intra and inter university), and other activities. As of the 26th April 2020 UNESCO reported there have been 1,563,992,622 affected learners worldwide from pre-primary to tertiary education. This equates to 89.3% of all enrolled learners, globally and includes 183 country-wide closures (UNESCO, 2020). Obviously, the Swiss education system was and still is also affected by the impact of the COVID-19 pandemic. Due to a sharp rise in infections, the Swiss Federal Council declared the "extraordinary situation" as early as March 16, 2020, passing an ordinance that placed massive restrictions on public life. Primary schools as well as universities had to close immediately. While elementary schools had already reopened by May 11, 2020, Swiss universities were able to resume teaching on June 8, 2020 under the condition that they apply strict public health measures. Due to the second and third COVID-19 waves, classes at the universities were again taught in the form of distance learning, in the fall. It is assumed that classes will remain restricted for an indefinite period of time.

Following the onset of the pandemic, it became necessary to hold educational sessions and meetings in the form of videoconference meetings. Videoconferencing was a critical tool that allowed universities and many businesses to continue working during a "shelter-in-place" phase. Zoom in particular helped hundreds of millions of people by making videoconferencing free and easy to use (Bailenson, 2021). However, migrating from traditional or blended learning to a fully virtual and online delivery strategy will not happen overnight and thus has been associated with many challenges (Crawford et al., 2020). In general, an entirely online course requires an elaborate lesson plan, teaching materials such as audio and video contents, as well as technology support teams. Due to the sudden emergence of the COVID-19 pandemic and its related public health measures, most faculty members had to face diverse challenges regarding online teaching, such as lack of experience with planning and conducting online courses, no time for early preparations, and lack of support from educational technology teams (Bao, 2020).

The challenge of this transition, however, did not only affect the university staff, but also the students. For both groups, the rapidly changing work and study arrangements were deemed to cause work or study-related stress, which might be affected by a number of personal stressors including having to work remotely, having to change tasks, and having to combine all of this with home-schooling children and caring for shielding elderly family members or neighbors (Der Feltz-Cornelis et al., 2020). The literature concretizes various additional problems that arise when teaching and studying at home during the pandemic: Firstly, there are a wide range of distractions from teaching and studying at home. Secondly, not all lecturers and students are able to find suitable spaces for teaching and studying. Thirdly, teaching and studying can be constrained by insufficient hardware and an unstable network at home (Zhang et al., 2020). Psychological symptoms such as worries, physical symptoms due to stress, especially stress due to remote working and living circumstances might lead to reduced work productivity related to the COVID-19 outbreak (Der Feltz-Cornelis et al., 2020). Other negative impacts include the feelings of isolation and disconnectedness that may be experienced during lockdown and remote working (Williams et al., 2020). It is therefore unsurprising that findings suggest pre-existing mental health crises in universities could worsen, not only for students but also for academics who may struggle to reconcile the increased demands with their needs at home, and who must forfeit their right to a good work-life balance (Watermeyer et al., 2021).

The changed working and studying conditions during the pandemic were not only a challenge for the wellbeing of university staff and students. The professional social work curriculum was also reaching its limits due to increased distance teaching and learning. There are compulsory elements of the curriculum that cannot be offered as part of distance learning, such as internship, which measures the capabilities or competencies of students to enable them become a qualified social worker (Azman et al., 2020). Crucial to social work education is the mutual reinforcement of academic and practical learning, which includes the process of socialization in the academic and professional community of social work, learning through exposure to complex and ill-structured social practice and through reflection on the interface between scientific knowledge, practice knowledge and service users` knowledge (de Jonge et al., 2020). The adapted forms of teaching and learning also present challenges from a didactic point of view. Research has found that when undergraduate social work students have an experience of "being known" by instructors and classmates, their motivation to learn, ask questions, and engage with course material increases (Rodriguez-Keyes and Schneider, 2013). Thus, it is apparent that there are limits to distance learning in social work education for the reasons mentioned above. However, in times of pandemic, universities for social work have no choice.

Although a vaccine first became available in December 2020, there are concerns about the long-term effects of COVID-19 on the educational sector. The pandemic has served as a "digitalization booster," and this could be seen as a positive consequence. Nonetheless, it is necessary to consider the extent to which distance learning should be included in the social work curriculum in post-pandemic times. Furthermore, it is necessary to determine how lecturers as well as students can be supported to make the best use of these new forms of teaching and learning. Thus, the experience of the first wave of the COVID-19 pandemic needs to be carefully evaluated and strategies developed to inform how social work colleges can adapt after COVID-19.

In consideration of this issue, the present study will examine the experiences of staff and students at the Lucerne University of Applied Sciences and Arts–School of Social Work, Switzerland (hereafter Lucerne School of Social Work). Specifically, it will identify which work or study-related situations university staff (lecturers and scientific staff) and students experienced as challenging during the first lockdown (first COVID-19 wave) in spring 2020. The perspectives of both university staff and the students were gathered in order to understand differences and similarities in the challenges experienced. The aim of this study is to analyze the teaching and learning situation of staff and students during the first lockdown in spring 2020 and once again during the period of relaxed sanitary measures in summer 2020. Evidence is needed to inform recommendations on which structural measures can be used to support staff at the Lucerne School of Social Work so that they can best fulfill their educational mission in times of the current pandemic and the period thereafter. Moreover, strategies must be developed to ensure that students achieve good educational outcomes, even in times of a pandemic.

RESEARCH QUESTIONS

In April 2020, the Lucerne School of Social Work in Switzerland launched the longitudinal study "Remote work and studying during the COVID-19 pandemic" with two survey waves among university staff and students. The first survey lasted from April 23, 2020 through the end of May 2020, i.e., during the lockdown. The second survey started on June 15, 2020 and staff and students' responses were received until August 14, 2020. This period coincided with the time of relaxed sanitary measures.

This study explores the following research questions.

1. To what extent did the workload of staff and students change during the first wave of COVID-19 in spring 2020, and the period of relaxed sanitary measures in summer 2020?
2. What challenges and opportunities did staff and students identify during that period in relation to remote work, distance learning, and distance teaching?
3. In what way(s) did the staff and students feel supported by the university management?
   The body of knowledge regarding the psychological and societal impacts of the pandemic and the related public health measures is growing constantly. For example, studies now indicate that there has been an increase in psychological distress for university staff and students (Der Feltz-Cornelis et al., 2020; Fornili et al., 2021). Similarly, findings from Swiss universities have revealed, that students during the lockdown were on average more depressed, slightly more anxious, more stressed, and felt more lonely than half a year earlier (Elmer et al., 2020). Therefore, using the data collected through the research project "Remote work and study during the COVID-19 pandemic", additional analysis was conducted on the following questions:
4. How psychologically distressed were the university staff and students?
5. Was there a possible association between perceived support by the University to work/study from home and the level of psychological distress?

Regarding the latter, we assumed that staff and students' stress levels would be lower in circumstances where they felt supported by the University.

METHOD AND MATERIALS

The survey has been designed and conducted using the Enterprise Feedback Suite (EFS) Survey by Questback. All employees and students at the Lucerne School of Social Work were invited to participate by email. They were informed about the purpose of the survey and about their anonymity and right to withdraw. All participants voluntarily gave their informed consent to participate. The Ethics Committee Northwest and Central Switzerland approved this study.

Sample

A total of 139 employees were registered as working at the Lucerne School of Social Work, in 2019. Of these, 79 were lecturers, 26 were scientific collaborators and 34 were administrative or technical staff (University of Applied Sciences and Arts, 2019). The responses of those who were directly involved in social work education, i.e., lecturers and scientific collaborators were considered in this study. From 105 employees (lecturers and scientific collaborators) 51 individuals participated in the first survey (response rate: 48,6%). The response rate was lower in the second survey: 28 employees took part. The response rate for the university staff is therefore 26,7%.

779 students were following an undergraduate degree course in 2019. An additional 50 students were enrolled in a master's program (hereafter all referred to as "students") (University of Applied Sciences and Arts, 2019). Of the total 829 students, 225 participated in the first wave of the survey (27.1%). The response rate was lower in the second survey: 117 students took part. The response rate for the students is 14.1%.

In total, therefore, 276 respondents (both staff and students) took part in the survey in spring 2020 and 145 in summer 2020. Due to the relatively low response rate, it is noted that the results are not representative. The IDs of the participants were not linked. For this reason, the data from the first survey and second survey are treated as independent samples and a group comparison was carried out.

Variable Specification

Sociodemographic Variables

We asked participants to report on their gender (male, female, other), age, nationality, and highest achieved education (see **Table 1**).

Change in Workload

The change in workload was measured with a self-constructed item "How has your work/study-related workload changed in the last 30 days?" The following answers were possible: 1) Reduction in workload 2) Additional workload due to COVID-19-related transition 3) Less capacity due to care responsibilities 4) Increased workload due to additional tasks 5) Workload remains unchanged 6) No response. Multiple answers were possible (see **Figure 1**).

Perceived Support from the University (University Staff)

Respondents could rate a total of five self-constructed statements using a 4-point Likert scale (1 = disagree, 2 = somewhat disagree, 3 = somewhat agree, 4 = agree, 5 = no response). 1) I feel sufficiently supported by the University to be able to work from home, 2) I have the necessary facilities to work/study from home, 3) I think the University is managing the situation related to the COVID-19 pandemic well 4) I think the University is communicating the changing conditions regarding the COVID-19 pandemic well 5) I find the University cares about my wellbeing (see **Table 2**).

Perceived Support from the University (Students)

The students could rate a total of three statements using a 4-point Likert scale (1 = disagree, 2 = somewhat disagree, 3 = somewhat agree, 4 = agree, 5 = no response). 1) I personally believe that I am adequately informed about the further process for my studies (exams, internships, etc.), 2) I feel well supported by the lecturers in continuing my studies, 3) A transition to distance learning should also be sought for the period after the COVID-19-pandemic (Sann et al., 2020) (see **Table 3**).

Challenges and Opportunities Regarding Remote Work, Distance Learning, and Distance Teaching

In the first survey, university staff and students were asked in an open-ended question on the one hand about the currently perceived challenges of working at home, distance teaching and distance studying (what are the challenges), and on the other hand what they experienced as positive in this regard (what works well).

TABLE 1 | Sociodemographic characteristics.

Characteristics		Staff		Students	
		T1 (n = 51)	T2 (n = 28)	T1 (n = 225)	T2 (n = 117)
		N (%) or M ± SD	N (%) or M ± SD	N (%) or M ± SD	N (%) or M ± SD
Age		45.2 (9.2)	46.5 (9.5)	29.7 (7.6)	30.3 (7.8)
Gender	Female	28 (54.9)	15 (53.6)	178 (79.1)	94 (80.3)
	Male	21 (41.2)	10 (35.7)	40 (17.8)	19 (16.2)
	Other	0 (0)	0 (0)	1 (0.4)	0 (0)
	No response	2 (3.9)	3 (10.7)	6 (2.7)	4 (3.4)
Nationality	Swiss	15 (53.6)	22 (78.6)	209 (92.9)	110 (94.0)
	Non-Swiss	10 (35.7)	4 (14.3)	12 (5.3)	6 (5.1)
	No response	3 (10.7)	2 (7.1)	4 (1.8)	1 (0.9)
Highest achieved education	Secondary	0 (0)	0 (0)	143 (63.6)	67 (57.3)
	Tertiary	44 (88.3)	26 (92.9)	76 (33.8)	49 (41.9)
	No response	7 (13.7)	2 (7.1)	6 (2.7)	1 (0.9)

Psychological Distress from the University Staff and Students

In addition, the survey included a validated anxiety scale. The 4-item Patient Health Questionnaire-4 (PHQ-4) is a rapid self-reported measure. Respondents rate their symptoms using a 4-item Likert rating scale ranging from 0 (not at all) to 3 (almost every day), and the total score ranges from 0 to 12 (Löwe et al., 2010). We used Cronbach's α to measure the scale's reliability – the internal consistency. The PHQ-4 is a well-validated screening instrument, demonstrating a high internal consistency (Cronbach's α = 0.81) (Cronbach et al., 1951). The scale categorizes the severity of clinically relevant depression and/or anxiety according to the PHQ-4 score, as follows: Normal (0–2), Mild (3–5), Moderate (6–8), Severe (9–12).

Data Analysis

Data were analyzed using descriptive statistics and correlations. Due to a lack of normally distributed dependent variables (e.g., psychological distress), we used Spearman rank correlation to measure the associations between "Perceived support from the University" and "Psychological distress." For the same reason, Mann-Whitney U tests were used to compare differences between two independent groups (e.g., differences in perceived support in spring and summer 2020). To investigate effect size we used Pearson`s product-moment correlation coefficient r. A correlation coefficient of 0.10 is thought to represent a small effect, a coefficient of 0.30 a moderate, and one of 0.50 a large effect (Cohen, 1988). We used IBM SPSS 27 for the statistical analyses.

The analysis of the open-ended questions on "Challenges and opportunities in relation to remote work, distance learning and distance teaching" was carried out in two steps: Firstly, the data were extracted from SPSS; secondly, categories were inductively formed for each question following the qualitative content analysis, drawing from Mayring (2007). This step was conducted in a paper-based manner. The answers were then assigned to the respective categories and interpreted. Finally, the inductive categories for both questions were compared and contrasted. The analyses were conducted separately for the group of employees and for the group of students.

RESULTS

Sociodemographic Characteristics

Table 1 shows the characteristics of the survey participants from the first survey (T1) and the second survey (T2).

Among the university staff, slightly more females than males participated (54.9% in the first survey and 53.6% respectively in the second survey). The average age was 45.2 years for the first survey and 46.5 for the second survey. 53.6 and 78.6% respectively had Swiss citizenship. It is natural to expect that all employees had a tertiary degree.

The high proportion of female students (79.1 and 80.3% respectively) who participated corresponds to the fact that the proportion of women at the Lucerne School of Social Work is 72% (University of Applied Sciences and Arts, 2019). The average age was 29.7 and 30.3 years, respectively. The relatively high average age can be explained by the fact that some of the students were already working in a profession, social work constitutes their secondary education. Most students who participated in the survey were students with Swiss citizenship (92.9 and 94.9% respectively). It is worth noting that 33.8 and 41.9% of the participating students, respectively, already had a tertiary degree.

Change in Workload

At the time of the lockdown in spring 2020 and the relaxed sanitary measures in summer 2020, all employees of the University were employed at a minimum of 50%, which corresponds to a workload of 21 hours per week. 69.8% of the students were employed for at least 50% (n = 157), 29 students were employed between 10 and 40% (12.9%) and 37 did not work at all at the time of the survey (16.4%). However, the workload at which one is employed does not always reflect the effective workload. For this reason, staff and students were asked how the actual workload changed between spring and summer 2020. To answer this question, respondents had a total of five answers (multiple responses). Since each answer option in the respective sections refers to a percentage in relation to the total sample, the sum of each category does not have to equal 100% (see **Figure 1**).

FIGURE 1 | Change in staff and students` workload due to COVID-19 pandemic.

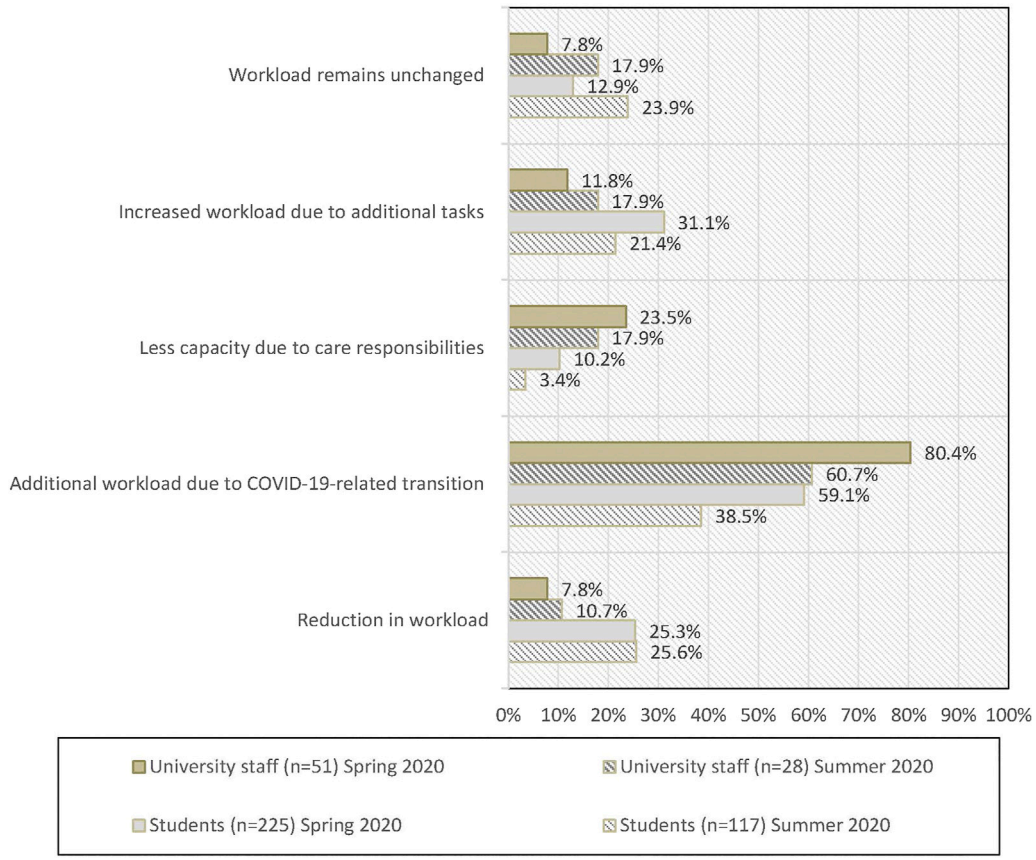


TABLE 2 | Staff perceptions of support, over time.

	T1		T2					
	M	*SD*	*M*	*SD*	U	z	*p*	N
I feel sufficiently supported by the University to be able to work from home	3.52	1.53	2.71	1.18	447.000	−2.479	0.013	76
I have the necessary facilities to work/study from home	3.15	1.32	2.89	1.29	515.000	−1.156	0.248	73
I think the University is managing the situation related to the COVID-19 pandemic well	3.26	1.45	3.18	1.49	567.500	−0.875	0.381	74
I think the University is communicating the changing conditions regarding the COVID-19 pandemic well	2.42	1.33	2.11	1.26	640.500	−0.197	0.844	75
I find the University cares about my wellbeing	3.77	1.48	3.42	1.30	578.500	−1.049	0.294	76

TABLE 3 | Students''perceptions of support, over time.

	T1		T2						
	M	*SD*	*M*	*SD*	U	z	*p*	N	r
I personally believe that I am adequately informed about the further process for my studies (exams, internships, etc.)	3.21	0.80	3.44	0.69	14,009.000	2.448	0.014	326	0.14
I feel well supported by the lecturers in continuing my studies	3.19	0.77	3.37	0.74	13,518.000	2.175	0.030	323	0.12
A transition to distance learning should also be sought for the period after the COVID-19-pandemic	2.23	1.07	2.54	1.14	13,586.500	2.328	0.020	321	0.13

What is most striking about the results is that in the spring of 2020, a total of 80.4% of the employees reported that they had managed a higher workload because of the immediate transfer to online working. Only 7.8% of faculty staff reported that they had less to do. 11.8% had extra work due to assignments directly related to the pandemic. 23.5% indicated that they had less capacity due to care responsibilities (children or relatives in need of care). Due to the closure of schools, kindergartens and daycare centers in the spring of 2020, employees often had to organize not only their own work or studies but also provide childcare and home schooling (depending on the age of their children). As of May 11, 2020, school or kindergarten classes resumed, which meant relief for parents or for family caregivers. Thus the situation appeared to have eased somewhat in the summer of 2020. However, 60.7% of employees continued to report that they had a higher workload due to online course delivery. 17.9% continued to report having less capacity to work at the University because of care responsibilities.

In spring 2020, students also experienced a significant amount of extra work due to the transition (59.1%). The situation had eased by the summer, where only 38.5% reported that they had additional workload due to COVID-19. Workloads due to care responsibilities (children or relatives in need of care) are somewhat less pronounced among students than among employees: Nonetheless, this affected 10.2% of students in spring 2020 and 3.4% in summer 2020 (see **Figure 1**).

Perceived Support from the University – Staff Perspectives

Staff were asked to rate five statements about perceived support from the University in relation to home working (see **Table 2**). Statements were rated, on a scale from 1 ("disagree") to 4 ("agree"). Between 46 and 48 respondents answered the total of five questions in the first survey and between 26 and 28 respondents answered the questions in the second survey (see **Table 2**). What is most striking is that the perceived support received from university management decreased over time (between spring and summer 2020). Currently, we can only speculate about the reasons for this. It is possible that for example, expectations for university management to take action to address the enlarged workload increased over the continued pandemic. If such responses are not forthcoming or are not considered sufficient, this can lead to staff feeling a lack of support. Working under highly volatile and possibly less than optimal conditions for an extended period adds to the frustration. It is likely that the form of communication used by university management also influences whether employees perceive that they are supported. However, a significant difference in responses between the two points in time was found for the statement "I feel sufficiently supported by the University to be able to work from home" (see **Table 2**), even though the effect size is small ($r = 0.28$). The statement that received the highest level of agreement both in spring and summer 2020 was "The University cares about the wellbeing of employees."

Perceived Support from the University – Student Perspectives

The students were asked to rate three statements about perceived support from the University using a 4-point scale from "do not agree" (1) to "agree" (4).

Between 207 and 210 respondents answered the total of three questions in the first survey and between 114 and 116 respondents answered the questions in the second survey (see **Table 3**). Overall, the students reported feeling significantly more supported by the University in summer 2020 than they did in spring, even though effects were only small (see **Table 3**). This is exactly the opposite experience to that reported by university staff. A plausible reason for this is that the second survey occurred after the exam session. The tension inherent to this assessment period may therefore have eased somewhat. The students also seemed to have become more used to the situation over time. Overall, the results demonstrated that the students felt supported by the lecturers. What is particularly remarkable is that the support for the statement that distance learning should be maintained after the pandemic had increased during the summer. This result is particularly important with regard to the University's strategy on distance learning in the post-pandemic times.

Distance Teaching – Staff Perspectives

In the first survey, which was conducted in the spring 2020, university staff were asked in an open-ended question about the currently perceived challenges of distance teaching on the one hand and on the other hand what they experienced as positive in this context. 34 respondents (66.7%) answered this question. Eight inductive categories were formed and assigned to the statements, drawing upon the qualitative content analysis according to Mayring (2007), which are highlighted below (additional workload, lack of direct (informal) exchanges, technical aspects, aspects of the social work curriculum, motivated students, familiarization with new teaching formats, didactic implementation, flexibility of the colleagues).

As mentioned earlier, the additional workload associated with the transition was the biggest challenge for university staff ($n = 15$). Specifically, the development of didactic concepts that had to be adapted for distance teaching was mentioned. Likewise, communication with the students in a distance teaching format proved to be more time-consuming. Instead of face-to-face instruction, information was now communicated via email or Zoom meetings, which had to be organized.

Another frequently mentioned difficulty was the lack of direct (informal) exchanges with the students ($n = 13$). The interactive exchange was also limited via Zoom. The lecturers had the impression that the students were also inhibited from asking questions if something was unclear. It was felt to be frustrating that there were limited opportunities to observe student responses. Associated with the limited ability to directly communicate is the additional challenge of moderating and keeping a discussion going in a distance teaching format. This makes it difficult both to build relationships with students and to measure learning outcomes.

Aspects concerning technical difficulties were also mentioned and the fact that not all lecturers and students have the necessary digital literacy was also perceived as problematic (n = 6). Three respondents specifically mentioned the short time in which they had to manage the digital transition and two mentioned that they did not receive the required software licenses in time. Despite the difficulties mentioned, when asked what worked well in distance teaching ten lecturers mentioned the technology and the support provided by the IT support team.

Five respondents also stated that familiarizing themselves with new formats and dealing with new media had worked out well ("technical challenges are feasible"), and that the didactic implementation had been successful.

Since learning how to conduct conversations is an important matter relating to aspects of the social work curriculum, three lecturers stated that part of the curriculum could not be implemented in the distance format. Moreover, study excursions, by their very nature, could not be offered as a digital substitute.

When asked what worked well in distance learning, some lecturers reported that the students were accommodating and motivated (n = 10). The flexibility of colleagues or external lecturers was mentioned by two respondents. Not all indicators were mentioned as either an opportunity or a challenge. In summary the issue that concerned the university staff most was the increased workload. Furthermore, there was a clear uncertainty regarding the application of digital teaching methods. It is obvious that digitization at universities needs to be supported by IT staff. Thus, strategies regarding teaching in the context of adapted learning environments are necessary.

Distance Learning: Students' Perspectives

Alike to university staff, students were asked what they experienced as challenging in distance learning and what worked well. 194 students (86.7%) provided responses to the questions. As mentioned above, inductive categories were formed and assigned to the statements. The analysis resulted in 13 main categories (additional workload due to distance learning, direct (informal) exchanges, interactive sequences, organizational matters, exams, inconsistency in distance learning, quality of teaching and instructional design, learning outcome, self-management, independent processing of assignments and the (non-collaborative) elaboration of the course material, learning environment and other life domains, aspects of the social work curriculum, technical aspects associated with distance learning).

Overall, students reported a large additional workload due to distance learning or high demands was a notable difficulty related to distance learning (e.g., more, or excessive amounts of course content, more time required for exchanges, assignments too extensive or too numerous; n = 30). However, as an advantage of distance learning, five respondents named the fact that commuting was no longer necessary. This aspect is particularly important since many students live in other cities.

A total of 42 students indicated that they strongly missed the direct (informal) exchanges during the lockdown. The lack of or reduced (informal) exchange with students and lecturers and thus the resulting loss of support was mentioned most frequently (n = 19 students). However, 27 respondents, stated that (informal) exchange and support worked well within distance learning, for which both lecturers (n = 11) and fellow students were mentioned as a source of support (n = 15). The interactive sequences in class were partly perceived as cumbersome and exhausting (n = 47).

Many students experienced discussions in the digital classroom as difficult and perceived them as more sluggish and boring than in face-to-face classes. Group work in distance learning was also perceived as more demanding and strenuous (n = 40). However, there were also twelve respondents who felt that the opportunities for interaction in distance learning were positive.

Regarding organizational matters, especially systematic storage and access to teaching materials, a total of 34 students mentioned difficulties. In contrast, 38 students specifically mentioned these aspects when asked what had worked well in distance learning. While 17 respondents mentioned the late or short-term accessibility of teaching materials or the difficult access to materials or books as difficulties, 30 students stated that precisely this aspect worked well in distance learning.

Uncertainties regarding the exam (e.g., procedure, other related information) were mentioned as difficulties by four students. On the other hand, six students stated that the above-mentioned aspects worked well.

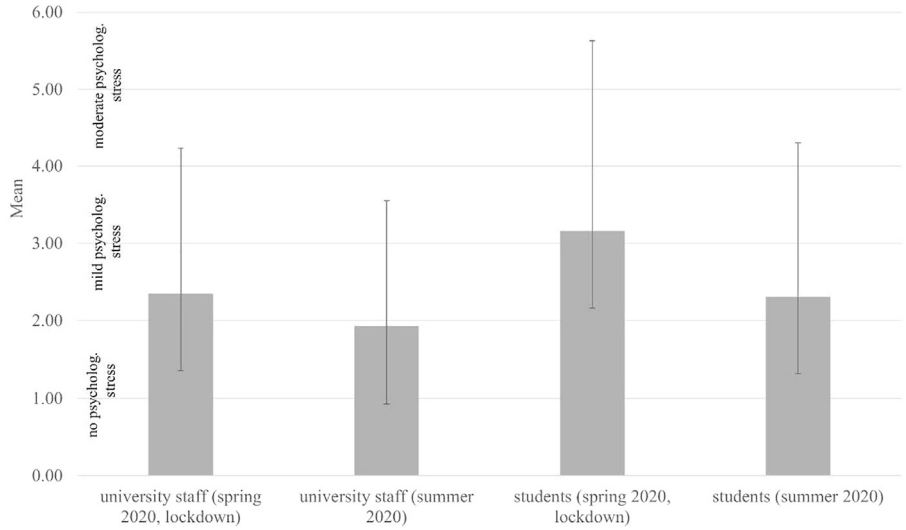
In relation to inconsistencies in distance learning, 10 students mentioned difficulties due to the lecturers designing the various lessons in distance learning, differently (e.g., creating different workflows).

A total of 34 students mentioned difficulties in distance learning relating to the quality of teaching and instructional design. In contrast, 68 students reported that these aspect features had worked well during distance learning. More specifically, 25 students complained that the structure, the design and/or the preparation of the teaching material had not been (equally) appropriate in all modules. In contrast, 55 students stated that this had worked well (for the majority). Five students complained that on some occasions, the lecturers' instructions had not been clear or comprehensible enough (e.g., with regard to learning objectives or assignments), whereas this was mentioned by 20 students as something that had worked well. Only one student felt that the lecturers' guidelines were too narrow. Some students also criticized the lack of oral input by the lecturers, or the insufficient feedback given on the assignments (n = 4), while three felt this had worked well.

Some students considered the learning outcome from distance learning approaches to be less effective, they perceived or at least feared a loss of quality of learning or questioned the quality of learning (n = 7). In contrast, two students stated that they were able to learn some content well or even more effectively due to distance learning.

The distance learning modality also received some criticism, or a lack of acceptance, from students due to the increased challenges associated with a greater need for self-management. A total of 38 students mentioned difficulties in terms of

FIGURE 2 | Level of psychological distress (PHQ-4) in university staff and students, over time.



motivation (n = 18), self-discipline (n = 18) and concentration (n = 11). In contrast, seven students reported that self-management worked well.

The independent processing of assignments and the (non-collaborative) elaboration of the course material was perceived as a challenge by a total of 29 students (e.g., difficulties in understanding and lower retention rates). In contrast, 47 students reported that this worked well for them, and particularly appreciated the flexible scheduling.

33 students mentioned one or more difficulties relating to the learning environment and other life domains (e.g., due to distractions, other people in the house, the combination of studying and homeschooling, no suitable place of work available or insufficient equipment, not enough time for studying due to demands from other life domains). Five students explicitly mentioned long periods of screen use as problematic. The maintenance of the work-life balance or the delimitation of the different areas of life was explicitly mentioned as a difficulty by six respondents. Two students saw it as a problem that the regular (daily) structure has disappeared. On the other hand, four respondents stated that the work-life balance could also be implemented effectively during distance learning and 13 students stated that their learning environment in distance learning was advantageous.

Twelve students mentioned, among the perceived difficulties, that certain contents or modules related to aspects related to the social work curriculum were unsuitable in the context of distance learning (e.g., interviewing, study trip, practice projects). 11 students, on the other hand, were explicitly convinced that distance learning is also well suited for social work education.

51 students believed that the technical aspects associated with distance learning worked well. In contrast, 14 respondents reported difficulties in the technological aspect of distance learning. The difficulties mentioned included technical malfunctions, the technical effort in general or insufficient technical capacities or the unsuitability of specific tools (e.g., "Zoom").

It is obvious that there are different points of view regarding the implementation of the new forms of distance learning, which were used due to COVID-19-pandemic. In general, however, the students coped well with the situation. It is also apparent that self-management-competencies had become even more important in the context of distance learning. It is therefore important to empower students to develop the appropriate competencies.

PERCEIVED SUPPORT AND LEVELS OF PSYCHOLOGICAL DISTRESS

Considering the findings relating to perceived support, additional research was conducted to determine how stressed university staff and students were and whether the level of perceived support from the University had an impact on the level of psychological distress experienced by staff and students.

The level of psychological distress was assessed with the Patient Health Questionnaire-4 (PHQ-4). On average university staff tended to show signs of mild psychological distress during the first lockdown in spring 2020 (see **Figure 2**). Accordingly, about half of this group showed no signs of psychological distress (n = 25; 49.0%), 15 respondents showed signs of mild psychological distress (29.4%), and three showed signs of moderate psychological distress (5.9%). In summer 2020, respondents showed less psychological distress (see **Figure 2**). About two thirds (n = 18; 64.3%) showed no signs of psychological distress, and nine respondents (32.1%) showed mild psychological distress according to the PHQ-4. A Mann-Whitney-U-Test was carried out to determine if there were differences in levels of psychological distress in spring and summer 2020. There was no statistically significant difference in the levels of psychological distress between both groups, U = 513.500, Z = -0.822, p = 0.411.

All in all, at both points in time, students showed higher levels of psychological distress than university staff (see **Figure 2**).

TABLE 4 | Level of psychological distress in students and staff, over time.

	PHQ-4: students		PHQ-4: staff					
	M	*SD*	*M*	*SD*	*U*	*z*	*p*	*N*
T1	3.16	2.47	2.35	1.89	3,411.000	−1934	0.053	238
T2	2.31	2.00	1.93	1.62	1,374.500	−0.744	0.457	139

Although 87 students (38.7%) showed no signs of psychological distress during the lockdown, 80 respondents (35.6%) experienced mild psychological distress, 19 students (8.4%) showed signs of moderate distress, and nine showed signs of severe psychological distress (4.0%). However, in summer 2020 less students showed signs of psychological distress. At this time, more than half of the respondents (n = 66; 56.4%) showed no psychological distress, 40 (34.2%) mild psychological distress, 5 (4.3%) showed signs of moderate and 1 of severe psychological distress. This difference in levels of psychological distress in spring and summer 2020 was statistically significant, U = 8,743.500, Z = −2.942, p = 0.003, r = −0.17. That is, students felt significantly more stressed during the lockdown in spring 2020. In addition, the results indicate that students felt more distressed during the lockdown in spring 2020 and in the summer 2020 than university staff, even though these differences were not statistically significant (see **Table 4**). However, stress levels in both groups decreased after the lockdown. A plausible explanation for this difference could be the levels of perceived support received by both groups from the University.

As expected, employees and students who felt more supported by the University experienced less psychological distress. Accordingly, we found a moderate statistically significant negative association between the staff's perception of being sufficiently supported by the University to work from home and their level of psychological distress (PHQ-4) (see **Table 5**). For students, an association between their stress level and their feeling of being supported by lectures in continuing their studies was also negative and statistically significant but weak.

Students were more stressed at both time points but felt better supported. Combined with the finding that the relationship between stress and perceived support was weak for students but moderate for staff, this suggests an important difference between the two groups: it seems plausible that to reduce work-related or work-associated distress, perceived support from the employer is more important than when it is not an employer-employee relationship. It is probably the case that other sources of support have been more important to students, such as family or friends. Accordingly, perceived support from the University was only able to reduce students' stress levels to a limited extent.

DISCUSSION

This study examined how staff workload and student educational situations changed during the first wave of COVID-19 (spring 2020) and following the first wave (summer 2020). Not surprisingly, the workload increased for both university staff and students. This result corresponds with the evidence that the teaching transition involved a heavy workload (Bao, 2020). The additional workload for the staff was primarily because courses had to be redesigned, which requires a great deal of effort (Crawford et al., 2020). As the findings of the present study indicate, employees had extremely limited time resources available for this purpose. Effective distance and online teaching requires the use of distinctive skills and abilities on the part of the qualified academic staff and the availability and skills of a learning design team to train and facilitate this implementation of distance and online courses (Davis et al., 2019). The problem with the additional workload was exacerbated for those staff and students who had to take care of children or relatives. A study also conducted at the Lucerne University of Applied Sciences which examined this particular issue, revealed that women with care responsibilities were particularly affected by the additional workload (Lanfranconi et al., 2021).

University staff already had the option to work remotely before the pandemic. However, the responses of the staff made it clear that a workplace at the University has more functions than just completing the work that needs to be done. Personal contact with colleagues and students is very important. This trend is reflected in research as well. Prior to the pandemic, the option of remote working under flexible work policies was typically used by

TABLE 5 | Association between level of psychological stress and feeling of support by the University (spring, 2020).

		M	*SD*	PHQ-4 score	"I feel sufficiently supported by the University to be able to work from home"	"I feel well supported by the lecturers in continuing my studies"
Staff (N = 43)	PHQ-4	2.35	1.89	1.00	−0.406 (p = 0.007)	not applicable
	"I feel sufficiently supported by the University to be able to work from home"	3.52	1.53	−0.406 (p = 0.007)	1.00	not applicable
Students (N = 192)	PHQ-4	3.16	2.47	1.00	not applicable	−0.298 (p = 0.000)
	"I feel well supported by the lecturers in continuing my studies"	3.19	0.77	−0.298 (p = 0.000)	not applicable	1.00

companies to attract talented employees. When remote work is imposed rather than voluntarily chosen, and when it is implemented by individuals with limited experience of remote working, switching to remote work as the only option for employees poses a significant challenge (Li et al., 2020). The results do not provide a clear picture of whether students work more effectively at home. One plausible challenge is that some students are less well equipped for working remotely, for example because they live in shared apartments and have less space available. It is also possible that they have limited experience of distance learning.

As a tendency, it can be stated that both staff and students felt partially or rather well supported by the university management. It is striking that the perceived support from the University decreased among the university staff in summer 2020 compared to spring, while the students felt better supported in summer. Regarding the employees, it is likely that dissatisfaction tended to emerge after the increased workload could not be reduced to the desired extent. From the answers to the open-ended questions, it appears that the students appreciate the lecturers' efforts to make the best of the situation. Nevertheless, numerous implications can be derived from the results of the open-ended questions should the pandemic situation persist. Students need the security of being able to plan their studies. Furthermore, even in times of crisis, consistency is needed regarding teaching, including the finer details of document storage, deadlines and information on the exams.

However, the changes in education also make differences in self-management-competencies between students more visible. The results suggest that some students experienced problems with self-management in the context of distance learning. This finding is in line with previous research results: Some students can study quite independently and create an appropriate rhythm of study and private activities. Others find this quite difficult because, in their own words, they lack sufficient self-discipline, concentration and time self-management skills. This group is more dependent on the regularity of lessons and the support from teachers, but in an asynchronous learning network they have to do without these benefits (de Jonge et al., 2020). It is therefore the lecturers' task to empower the students with suitable didactic concepts to acquire the corresponding competencies.

While digitization in social work education has so far been approached rather hesitantly (Smoyer et al., 2020), the pandemic acts as a digitization booster. It is likely that forms of teaching and exchange that had to be used in times of the pandemic will also be pursued in post-pandemic times. One such example being international Zoom conferences, which, in addition to saving time resources, also makes sense in terms of protecting the environment by minimizing travels. Within this context, the question is raised as to how the digital literacy and self-management-competencies for students can be enhanced to prepare them optimally for their future working lives. Despite the many advantages, exclusively digitalized social work training is not an option for the post-pandemic period. Several staff and students were concerned about the lack of direct exchange on the one hand and the form of exchange, mostly via Zoom, on the other. Some emphasized that a digitally delivered course or digital video conferencing is exhausting. Several explanations for "zoom fatigue" can be found in the literature: Excessive amounts of close-up eye gaze, cognitive load, increased self-evaluation from staring at a video of oneself, and constraints on physical mobility (Bailenson, 2021). Thus, teaching via video, e.g., Zoom, is not equivalent to face-to-face teaching. Moreover, it was clearly expressed that important components of social work training, such as interview skills training, are difficult to implement in a digital environment. It is obvious that study journeys and field practice experience cannot be conducted digitally. Considering that practical training is of central importance in social work, it can be stated here that distance learning is not the exclusive future model of training.

However, given that digitization is playing an increasingly important role in all areas of work, the fact that the pandemic has led to an increase in digital literacy among both staff and students is certainly a positive development. Thus, digital literacy is no longer a "nice to have" but indispensable competence for both staff and students. Since the pandemic is likely to be followed by a return to traditional classroom teaching, strategies need to be developed to ensure that future students can benefit from the experience and learning gained. Accordingly, the acquisition and continued use of digital literacy skills will need to be ensured within the curriculum. There are many reasons to believe that COVID-19 has created "a new normal" for the universities—one that will continue after the pandemic (Lischer et al., 2021).

An important finding of the study is that a proportion of both students and staff experienced high levels of psychological distress at both time points, with those of students being higher than those of university staff. This is surprising because overall, students indicated that they felt well supported by faculty staff. Based on the present results, we can only speculate as to why this is so. However, findings suggest that students, as well as the general population, may be experiencing psychological effects from the outbreak of Covid-19, such as anxiety, fear, and worry, among other reactions (Cao et al., 2020). Further results demonstrate that reduced social interactions, lack of social support, and emergent stressors related to the COVID-19 crisis can have a negative impact on students' mental health (Elmer et al., 2020). However, the finding that students were more stressed than staff can also be well explained in terms of developmental psychology: Middle-aged people have more effective stress management strategies than younger people. For example, they are often more practiced at preparing for and dealing with challenging situations (Aldwin et al., 2010). This seems to be a plausible explanation. However, we do not know the extent to which these psychological symptoms were pre-existing or whether they were solely related to the COVID-19 crisis. What is important is the finding that staff and students who felt more supported by the university management experienced less psychological distress. It can be assumed that the pandemic will have longer-term implications for the stress levels of both employees and students, and the university management should give this issue due

consideration. It is particularly important that the levels of well-being and psychological health of the employees is monitored from time to time and that appropriate actions are taken in response, such as occupational health management measures. Likewise, appropriate measures are needed for students who are affected by psychological distress, such as low-threshold counseling.

Limitations

This study investigated university staff and students` experiences, over time and compared their responses. Thus, insights into social work education since the beginning of the pandemic are provided. However, the present study has several limitations. The response rate for the second wave of the survey was relatively low, therefore the responses cannot be regarded as representative. Thus, the results have an explorative nature. Since the data was not linked at a personal level, no intraindividual comparison between the responses of the two surveys was possible. Furthermore, data on certain variables such as course type (full-time or part-time) and year of study was not collected. Nevertheless, the group comparison provides important insights into how employees and students coped with the transition period. Within the scope of the survey, we generated evidence of how the psychological stress of university staff and students changed between spring and summer 2020. However, we do not know how the perceived stress levels of the employees has changed compared to the time before COVID-19.

CONCLUSION

Social work will need to develop new ways of dealing with the "new normal" in the post-pandemic period. It is therefore important that the experiences gained are carefully evaluated and incorporated into the didactic concepts. Since the outbreak of the pandemic, there has been an effort to develop hybrid forms of teaching (e.g., a combination of face-to-face-classes and distance learning). These will increasingly have to rely on distance learning as a complement to traditional classroom teaching, e.g., in the form of blended learning. Schools of Social Work are particularly challenged because the curriculum contains building blocks that are difficult to implement in the form of distance learning. However, the results indicate that some learning content can certainly be taught in the form of distance learning. These newly developed forms of learning should be used to empower students to acquire the digital skills they need for their future careers. Any future adjustments to the curriculum must therefore be critically evaluated. Distance learning, for example, must not be used to replace face-to-face teaching to economize. Moreover, adaptations to the learning curriculum must not involve an excessive increase in workload. University personnel need the time and resources to implement the innovative teaching practices on an evidenced-based foundation.

In addition to the implications of the study on the curriculum, implications related to employee and student well-being can also be derived. An important finding of the study is that both staff and students who felt supported by the university management were less distressed. Accordingly, it is the responsibility of university management to carefully monitor the needs of both groups in this regard and to take appropriate actions.

DATA AVAILABILITY STATEMENT

The dataset presented in this article is not readily available. Once we have clearance from the University's ethics committee, data will be made accessible. Requests to access the dataset should be directed to suzanne.lischer@hslu.ch.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee Northwest and Central Switzerland. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SL: Conceptualision, methodology, funding acquisition, project administration, writing original draft. SC: formal analysis, methodology PK: formal analysis, NS: Conceptualisation, data curation sentence point CD: Writing–original draft (supporting).

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Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model

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The COVID-19 pandemic significantly shifted education from traditional to an online version, which was an emergent state for teachers and students. The substantive situation thus raises the importance of technology integration in education, and teachers are required to update their competencies, respectively. In this regard, the study assessed online teaching competencies of faculty members following, technological pedagogical content knowledge (TPACK) model. Closed-ended surveys were employed for quantitative analysis of randomly selected 256 faculty members from public universities in Karachi, Pakistan. Results indicated that teachers possessed adequate levels of knowledge across all the domains of TPACK. The highest competency was obtained by content knowledge (CK), while technological knowledge (TK) was reported at the lowest level. Furthermore, a significant difference was noted in terms of gender and teaching experience. Correspondingly, the study proposes that the TPACK model should be employed in the professional development programs to develop teachers' TPACK for integrating information communication and technology in the pedagogical practices. The findings of the study present a constructive overview of teachers' digital competencies and technology use in teaching and learning in the time of the COVID-19 and also play a significant role in the integration of technology in the post-pandemic time in higher education. The study also suggests relevant educational authorities and policymakers for assessing and enhancing the technological competencies of teachers for quality online education.

Keywords: technology integration, online teaching practices, higher institutions, technological pedagogical content knowledge, COVID-19, teaching experience, gender difference

INTRODUCTION

As it can be seen worldwide, the COVID-19 pandemic has caused a significant interruption in all the domains of human lives. Likewise, the educational sector also encountered many challenges by the institutional closure from schools to universities, and traditional education shifted to the online paradigm (UN, 2020). The scenario of this technological transition affected the education of about half of the student population globally (UNESCO, 2020). Thereby, the situation raises the importance of technology integration in education, and teachers are required to update their competencies to endow quality education and make changes to their curriculum and instruction accordingly. Regarding the application of information communication and technology (ICT) in education, however, instructors and learners are familiar with the traditional technological teaching aids, such as Smartboards and PowerPoint; still, their practical employability is required in the teaching practices (Nikolopoulou and Gialamas, 2016; Guillén-Gámez et al., 2018). Besides, this provisional period raised the necessity, especially for the teachers, to gain competency in applying ICT in their teaching practices. Meanwhile, the application of ICT in higher education has remained a major subject of concern for decades at the global level (e.g., US Department of Education, 2017; Daniela et al., 2018). Many studies have highlighted that the application of ICT in the classroom setting has become a critical factor for meeting the needs of the learner in the knowledge society (Martins et al., 2019). Besides, the successful integration of ICT can make the learning process more exciting and keep learners motivated (Hanafi et al., 2017), which are considered as the significant predictors of their academic performance (Xu et al., 2021). In the same manner, the utilization of ICT is suggested by the government of Pakistan to optimize the educational outcomes, as it helps to enhance the pedagogical competencies of teachers and boost learners to learn actively [Pakistan Ministry of Education (MoE), 2018].

Moreover, the effective integration of ICT is essential in systematizing an efficient online educational program. The successful application of ICT not only contributes to learners' satisfaction but also helps individuals to acquire their desired outcomes (Cervero et al., 2020). It is, therefore, essential to develop competencies in teachers to use ICT effectively in their pedagogical practices by organizing professional development programs (Guillén-Gámez et al., 2020). However, teachers' professional training for the efficient use of ICT in teaching did not apply because of the sudden pandemic situation and put students at risk (Guillén-Gámez et al., 2020; Hong et al., 2021). Consequently, it caused excessive pressure on teachers to achieve students' required educational attainment (Rodriguez-Segura et al., 2020). Although teachers made every effort to continue students' learning, yet they had to encounter several challenges in adopting digital platforms for teaching, which include insufficient inter-institutional coordination (Talsma et al., 2021), little understanding, and investment in advanced technologies (Akram et al., 2021). In the past decade, however, in Pakistan, online learning has also been handled significantly, still been endured with the various constraints that prevent the effective integration of ICT in educational practices (Kanwal and Rehman, 2017; Salam et al., 2017). Earlier studies indicate that students generally show better academic performance in digital platforms comparing with the traditional ones (Shehzadi et al., 2020). On the other hand, the digital competencies of teachers are found inadequate, particularly in the formulation of lesson plans (Farid et al., 2015). However, most of the teachers are digitally literate and can conduct online lessons, yet they are found incapable of integrating ICT efficiently in their teaching practices (Al-Samarraie and Saeed, 2018). Consequently, their digital instructional approaches may remain unsuccessful in delivering the content effectively (Adnan and Anwar, 2020). In this regard, the situation raises the importance of teachers' professional learning to acquire technological competency, as a successful pedagogical practice would mainly be possible if teachers possess a sound technological competency. The relationship between technological competency with educational content was considered necessary by Mishra and Koehler (2006) and presented this in their framework, namely, technological pedagogical content knowledge (TPACK). Their primary focus was derived on the basis of the premise that teachers are required to acquire technological competency to use it effectively in the instructional approaches. Regarding evaluation, several studies have presented instruments to evaluate the technological competencies of teachers differently, but their main focus remained on teachers' knowledge, beliefs, and adaptation (Ertmer, 2005; Aldunate and Nussbaum, 2013; Kim et al., 2017). The complementary fact in various studies was that they comprised only one of the components of the concept.

In contrast, technological competency involves all the major components, such as knowledge (technological, pedagogical, and content), skills, and attitudes (Voogt et al., 2015), whereas limited literature and studies have been found regarding all the major components. In addition, the acquisition of TPACK depends on social, cultural, and contextual attributes, which may vary from one country to another. However, several studies have been investigated teachers' digital competencies through all the determinants of TPACK in various countries (i.e., Lin et al., 2013; Scherer et al., 2018; Ortega-Sánchez and Gómez-Trigueros, 2019; Acikgul and Aslaner, 2020; Castéra et al., 2020). But, to the best of our knowledge, this is the first study that aims to examine teachers' digital competencies *via* all the mentioned sub-components of TPACK during the pandemic phase, specifically in the context of higher education in Pakistan. In this regard, the present study examines the integration of ICT in faculty members' pedagogical practices by unfolding their technological competencies level. Subsequently, lecturers and professors from public universities of Karachi city of Pakistan were considered for a case study under the guidance of the following research questions:

1. What are the levels of TPACK of faculty members across higher institutions of Karachi?

2. Is there any significant difference between faculty members' TPACK regarding their gender and teaching experience?

REVIEW OF LITERATURE

Online Teaching Competencies

The term online teaching can be exemplified with the help of these principles: (1) The learner and teacher interconnected with each other distantly *via* different digital platforms, (2) learning and learning materials can be accessed through technology, (3) the interaction between teacher and learner takes place *via* technology, and (4) teacher assists learner with the help of different digital channels of communication (Anderson, 2011a). In a general manner, online teaching is viewed as similar to the teaching for all other formal learning/teaching environments (Anderson, 2011b). On the other hand, teaching competency signifies the skills, attitudes, and knowledge of the teachers that enable them to perform in a way that meets or exceeds the expected standards successfully (Richey et al., 2011). Without having adequate competencies, it is difficult for teachers to execute and organize online instructional programs efficiently as teaching is characterized by selecting a number of tactics for a specified discourse, which may involve lesson planning or instructional and learning materials. In this regard, the previous literature finds several categories and characteristics of online teaching competencies. For instance, Thomas and Graham (2017) emphasize course design as the core component of teachers' competencies. Bigatel et al. (2012) focused on teaching behaviors and did not focus on instructional design. Contrarily, few researchers provide a brief description of teachers' online competencies by means of personal, social, pedagogical, and technological characteristics (Guasch et al., 2010; Baran et al., 2011; Palloff and Pratt, 2013). Other researchers propose a framework to demonstrate the features of teaching competencies. Among those, the widely used and renowned model is considered as the TPACK model, developed by Mishra and Koehler (2006). The present study employs the TPACK model to investigate online teaching competencies.

Technology Integration in Pedagogical Practices

Several studies draw attention to the importance of technology integration in pedagogical practices and imply that it does not facilitate only students but also the teacher in the learning process (Salam et al., 2019). Islam et al. (2019) indicate that the utilization of technology in teaching makes teacher competent in pedagogical as well as content areas in the classrooms and helps learners to learn efficiently by the use of technological tools. Several studies highlight the advantages of technology use for teachers. For instance, the study of Vongkulluksn et al. (2018) highlights that the teachers prefer to spend more time teaching in the classrooms, who are good at utilizing technology. Furthermore, the technological competencies of teachers enable them to adapt other teaching strategies and approaches easily; as a result, their performance gets enhanced.

Oliva-Córdova et al. (2021) ascertain that the usage of technology in teaching practices enables learners to learn effortlessly; however, its efficient application generally depends upon teachers' technological and pedagogical competencies. Various studies have identified the importance of these competencies and knowledge of teachers in teaching practices. Ifinedo et al. (2020) indicate that teachers' technological knowledge either explicitly or implicitly contributes significantly to integrating ICT successfully, while teachers' ICT pedagogical practices have found the lowest technology integration predictor. The results further suggested including professional training to assist teachers in integrating ICT efficiently by enhancing their technological competencies. To investigate the impact of teachers' training programs on their online teaching effectiveness, Brinkley-Etzkorn (2018) conducted a survey. The findings revealed a significant change in teaching competencies and designing course syllabi in teachers, while no significant difference in teaching was observed according to their student perceptions.

Moreover, the knowledge of technology and expertise in the utilization of technology are considered two different modes of competencies (Instefjord and Munthe, 2017). For instance, it is identified by some studies that despite having technology literacy, teachers were not capable of using technology in teaching efficiently (Dinçer, 2018; Alanazy and Alrusaiyes, 2021). It indicates that technological knowledge and using technology in pedagogical practices are two different concepts. Several studies and theories have been proposed to highlight this aspect. Briefly, it can be summarized that the effective use of technology in teaching practices is possible only if teachers are equipped with all the fundamental competencies (Ifinedo et al., 2020). Likewise, the TPACK model also ascertains that ICT cannot be integrated efficiently in educational practices until teachers do not possess all the essential technological skills (Mishra and Koehler, 2006). This model is comprised of three main components of teachers' knowledge or acquaintance (shown in **Figure 1**), i.e., technological, pedagogical, and content. Although all three components of the model seem different and separate knowledge domains, interfaces and associations among these core concepts establish the central point of the overall framework (Archambault and Barnett, 2010). After following the convergence of the mentioned components, knowledge of teachers can be classified as technological content knowledge (TCK), pedagogical content knowledge (PCK), and technological pedagogical knowledge (TPK), while the complete form of all components of knowledge is represented as TPACK (Schmidt et al., 2009).

Teachers' TPACK Concerning Their Gender and Teaching Experience

It is indicated by several empirical studies that teachers' characteristics also play a significant role in integrating ICT, which may vary across the countries; for instance, some studies have identified a significant difference in gender with a more inclination of males toward digital instructional development than females (Marín-Díaz et al., 2020). In terms of TPACK, studies also indicate the gender difference; for instance, Lin et al. (2013) identified higher pedagogical knowledge in female

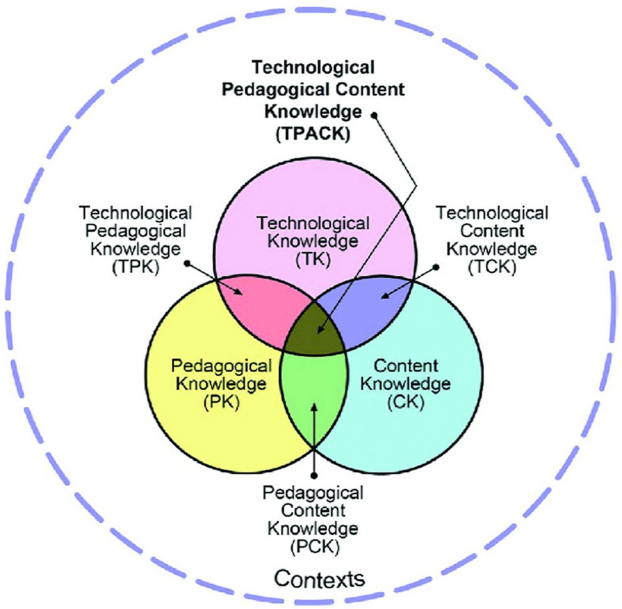


FIGURE 1 | The technological pedagogical content knowledge (TPACK) framework (retrieved from http://tpack.org).

teachers with lower technological knowledge. Scherer et al. (2017) revealed that in all technological domains of TPACK, male teachers reported significantly higher competencies than females. In contrast, the TCK of female teachers was reported higher than the male teachers (Ortega-Sánchez and Gómez-Trigueros, 2019). However, a study by Castéra et al. (2020) came across different results and found no significant difference between genders in terms of teachers' TPACK.

Another element of central concern in the acquisition of digital competencies is the teaching experience of teachers. Regarding years of teaching experience, studies show mixed results. For instance, Koh et al. (2014) identified a significant difference in ICT integration concerning the teaching experience and determined that TPACK of novice teachers was higher than experienced teachers. In contrast, Jang and Tsai (2012) identified that senior teachers' technological skills were higher than novice teachers. Therefore, the hypotheses of the study can be posited as:

H1: *"There is a significant difference between faculty members' TPACK with respect to their gender."*

H2: *"There is a significant difference between faculty members' TPACK with respect to their teaching experience."*

METHODOLOGY

For examining faculty members' TPACK, a quantitative survey design was employed as it was considered the most appropriate approach to gain accurate reflection *via* numerical representation (Watson, 2015). Subsequently, the study was guided by questionnaires, which were mailed and also emailed by the researcher to various universities.

TABLE 1 | Demographic statistics of the respondents.

Category	*N*	%
Gender		
Male	143	55.8
Female	113	44.1
Departments		
Social sciences	99	38.6
Natural sciences	95	37.1
Arts and humanities	62	24.2
Age		
20–29	44	17.1
30–39	126	49.2
40–49	86	33.5
Teaching experience		
Up to 1 year	38	14.8
2–5 years	175	68.3
>6	43	16.7

Participants of the Study

The population of the study comprises all the faculty members from public universities of Karachi, which consists of 11 universities with estimated 785 faculty members [Higher Education commission (HEC), 2015]. For ensuring a stable data analysis, the sample size was calculated by applying the Yamane Taro sample formula for a finite population (Israel, 1992) and obtained a sample size of 260 respondents. The sample size for conducting this study was appropriate, as the size of the sample between 30 and 500 at a 5% confidence level is identified as adequate (Altunışık et al., 2004). Subsequently, the questionnaires were distributed to lecturers/professors who were selected randomly from different public universities in Karachi. After excluding questionnaires with incomplete information, 256 questionnaires were considered for the data analysis. The ages of the respondents ranged from 29 to 54 years, encompassing 44.1% ($n=113$) were females and 55.8% ($n=143$) were male faculty members. Their further details are presented in **Table 1**.

Ethical Concerns

In order to ensure the reliability of the findings, the study followed all the ethical concerns to conduct the study. These concerns include the granted approval from the supervisor on account of the ethical committee. The other ethical concerns include assurance of the privacy and honor of the participants of the study, and questionnaires were filled after taking their consent.

Survey Instrument

The instrument utilized in this study was adopted from the validated scale formulated by Schmidt et al. (2009), which was devised on the basis of the TPACK theoretical framework to examine teachers' competencies within three basic domains, i.e., pedagogies, technology, and content. The said questionnaire was intensively used by other researchers (e.g., Scherer et al., 2018; Ortega-Sánchez and Gómez-Trigueros, 2019).

TABLE 2 | Confirmation of the model fitness.

$\chi 2$	*df*	*p*	RMSEA	CFI	TLI	SRMR
1154.781	275.411	0.000	0.05	0.96	0.97	0.04

TABLE 3 | Reliability evaluation.

Constructs of the questionnaire	No. of items	Alpha value
Technological knowledge (TK)	07	0.73
Content knowledge (CK)	03	0.71
Pedagogical knowledge (PK)	07	0.70
Pedagogical content knowledge (PCK)	04	0.72
Technological content knowledge (TCK)	04	0.71
Technological pedagogical knowledge (TPK)	05	0.70
TPACK	08	0.75

Before conducting data, the questionnaire was modified according to the study's approach; for instance, the questions from the domain (content knowledge) were rephrased from a specific subject to a general subject. Furthermore, the last three qualitative questions were also excluded from the survey. The modified form of the questionnaire comprised seven dimensions of 38 items, including (1) technological knowledge (TK) 7 items, (2) content knowledge (CK) 3 items, (3) pedagogical knowledge (PK) 7 items, (4) PCK 4 items, (5) TCK 4 items, (6) TPK 5 items, and (7) TPACK 8 items. The responses of each group's items were laid down upon a five-point Likert scale extending from "Strongly Disagree" to "Strongly Agree."

Confirmation of the Model Fitness

In order to increase the reliability of the findings, it is imperative to align empirical data with the theoretical framework of the study. Thereby, the fitness of all the dimensions of the TPACK model was investigated through confirmatory factor analysis as shown in **Table 2**. The chi-square value was less than 5 (i.e., $\chi 2/df = 4.1$), which indicates the significant fitness of the model (Schermelleh-Engel et al., 2003). The other indicators were also reported significant (shown in **Table 2**), as their values were less than the threshold values, i.e., RMSEA ≤ 0.06, CFI ≥ 0.95, TLI ≥ 0.95 (Hu and Bentler, 1999); SRMR < 0.05 (Cangur and Ercan, 2015).

Reliability of the Instrument

The reliability of all the constructs of TPACK was investigated through Cronbach's alpha scale. The value of each construct was above 70% (shown in **Table 3**), which shows satisfactory consistency, as the collected data are reviewed as reliable if the alpha value is more than 60% (Tavakol and Dennick, 2011).

DATA ANALYSIS

All the collected data were analyzed by employing various descriptive and inferential statistical tests, i.e., descriptive test (mean and standard deviation) and inferential test (*T*-test and ANOVA). Subsequently, the analysis was completed by applying the receiver operating characteristic (ROC) curve, which enabled the examination of the differences between subsamples with respect to their TPACK scores. The ROC curve is a two-dimensional graphical representation of the values of sensitivity vs. 1-specificity ranges from 0 to 1, which helps in determining the difference between different subgroups (Bradley, 1997).

TABLE 4 | Descriptive analysis of teachers' TPACK.

Factors of TPACK	*M*	*SD*
Technological knowledge (TK)	3.1	0.81
Pedagogical knowledge (PK)	4.1	0.69
Content knowledge (CK)	4.6	0.21
PCK	4.2	0.65
TCK	3.4	0.79
TPK	3.3	0.74
TPACK	3.2	0.71

Research Question 1

Technological pedagogical content knowledge of faculty members was investigated by means of descriptive statistical tests, i.e., mean and standard deviation, which are shown in **Table 4**. Knowledge of all the domains of TPACK was rated above 3, which demonstrates that faculty members possess adequate knowledge as $M \geq 3$ (Rabe-Hesketh and Everitt, 2003). Among all domains of TPACK, the highest mean value was obtained by the content knowledge (CK), i.e., 4.6, while technological knowledge (TK) obtained the least mean value.

Research Question 2 (Hypotheses)

Before checking hypotheses, the normality test was conducted through Shapiro–Wilk test to know whether the data meet the criteria of conducting a parametric test since it is considered the most prevailing test to investigate normality (Razali and Wah, 2011). Results showed that the data were normally distributed as S-W value was 0.83 and the significant value was greater than 0.5, i.e., 0.61, which allows parametric tests to be conducted. Subsequently, the posited hypotheses of the study were checked by employing inferential statistics, i.e., *T*-test and ANOVA, where *T*-test was employed to investigate the difference between faculty members' TPACK with respect to their gender and ANOVA was applied to test the hypothesis regarding teaching experience of faculty members.

Hypothesis 1

All the components of TPACK were compared by applying the *T*-test (shown in **Table 5**). Results revealed a significant statistical difference between male and female respondents (i.e., $T = 10.34$; $p = 0.000$) at alpha level 0.05. Therefore, the hypothesis regarding faculty members' TPACK with respect to their gender was accepted. Furthermore, male faculty members got a significantly higher mean score (4.12) than the female teaching faculty (3.67), which shows that the TPACK of male faculty members was greater than the female ones.

TABLE 5 | *T*-test analysis by gender of teachers.

Gender	*N*	Mean	*SD*	*df*	*T*	Sig
Male	143	4.12	0.78	142	10.34	0.000
Female	113	3.67	0.49			

TABLE 6 | ROC curve parameters (female gender).

AUC[a]	*CI*[b] 95%	Standard error	Sig
0.921	0.887–0.956	0.017	0.000

[a]*Area under curve*
[b]*Confidence interval*

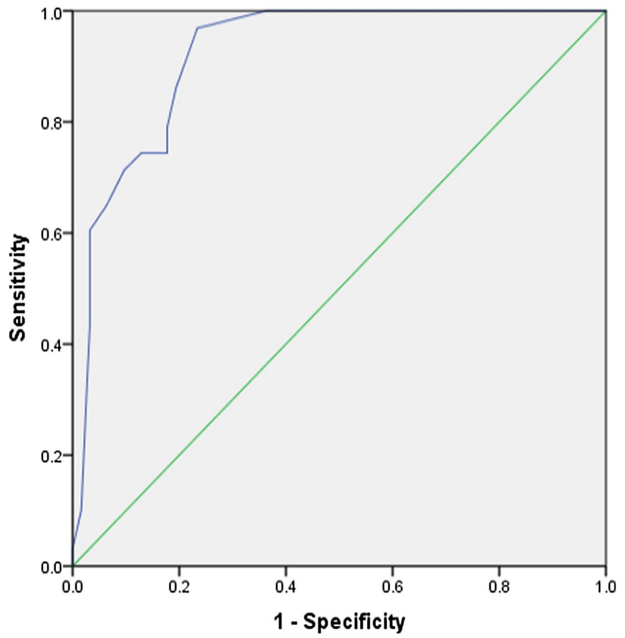


FIGURE 2 | Receiver operating characteristic (ROC) curve (gender).

In addition, the gender difference with respect to TPACK scores was represented graphically through the ROC curve. The results shown in (**Table 6**; **Figure 2**) showed high sensitivity and specificity with an area under curve (AUC) of 0.921 with a significant statistical difference, i.e., $p = 0.000$ at alpha level 0.05.

Furthermore, to investigate the most optimal predictors of teachers' TPACK, the mean of all the sub-components was compared with respect to their gender (shown in **Figure 3**). Results reveal that the TK of male faculty members was significantly greater than the female ones. However, the CK was found significantly higher in female faculty members than the male ones.

Hypothesis 2

For examining the distinction between faculty members' TPACK with regard to their teaching experience, the mean of TPACK was compared with the teaching experience of all the faculty members by applying the ANOVA test (shown in **Table 7**). Results reveal a significant difference between faculty members' teaching experiences with their TPACK. Therefore, the hypothesis regarding the teaching experiences of faculty members was accepted, which further demonstrates that the TPACK of teachers with experience of 2–5 years is higher than the novice and inexperienced teachers.

In order to find out the further differences across all possible pairs of the faculty members' teaching experiences, Tukey's honestly significant difference *post-hoc* test was conducted. Since Tukey's HSD test helps to compare the means of all the possible pairs (Abdi and Williams, 2010). Results from Tukey's *post-hoc* test (**Table 8**) demonstrate that only one out of three groups had a significant difference among each other, i.e., teaching experiences up to 1 year vs. 2–5 years.

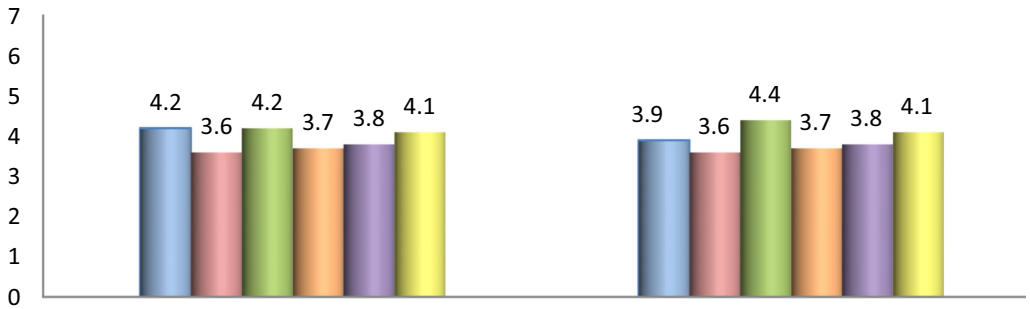
In addition, the difference in teaching experience with respect to TPACK scores was represented graphically through the ROC curve. The results shown in (**Table 9**; **Figure 4**) illustrated high sensitivity and specificity with an AUC of 0.716 with a significant statistical difference, i.e., $p = 0.000$ at alpha level 0.05.

DISCUSSION

COVID-19 outbreak has transformed the traditional educational practices and brought teaching-learning around digital format across the world. This transformation not merely raises the importance of the educational technology infrastructure of the country but also establishes a prerequisite for teachers to integrate technology in their pedagogical practices effectively to sustain students' learning. Since the systematic implementation of ICT in teaching practices is remained at an early stage and a limited focus has been given at the higher education level. In this regard, the current study gives a deep insight to understand the levels of core competencies of faculty members' TPACK with the role of personal variables (i.e., gender and teaching experience) in the acquisition of digital competencies during the COVID-19 period.

In view of the obtained findings, the study reveals that faculty members possess adequate knowledge in all the sub-components of the TPACK model, which shows that teachers have sufficient knowledge and skills regarding technology use in their pedagogical practices. This finding shows consistency with the findings of Mouza et al. (2014), where participants experienced a significant gain in all sub-components of TPACK. Hence, our results indicate that TPACK is an excellent framework to examine teachers' competencies in the context of universities' teachers of Pakistan.

The results further indicate that the highest competence of faculty members among all other domains was obtained by the content knowledge (CK), which shows that faculty members seem more confident in their content knowledge than other domains of expertise. A similar finding is also identified by Acikgul and Aslaner (2020); accordingly, teachers' content knowledge was found adequate. In contrast, the study conducted by illustrated that teachers were confident primarily in the pedagogical knowledge (PK). It is therefore imperative to draw attention toward teachers' content knowledge through continuous monitoring and by offering in-service workshops to sustain



	Male	Female
TK	4.2	3.9
PK	3.6	3.6
CK	4.2	4.4
PCK	3.7	3.7
TCK	3.8	3.8
TPK	4.1	4.1

FIGURE 3 | Distribution of components of TPACK by gender.

TABLE 7 | ANOVA by teaching experience of teachers.

Academic interests	*N*	Mean	*SD*	*F*	Sig
Up to 1 year	38	4.28	0.32	5.47**	0.000
2–5 years	175	4.49	0.31		
>6	43	4.40	0.28		

$^{**}p < 0.05$

TABLE 8 | *Post-hoc* test.

Test	Sig
Up to 1 year vs. 2–5 years	0.004
Up to 1 year vs. >6	0.32
2–5 years vs. >6	0.446

TABLE 9 | ROC curve parameters (teaching experience).

AUC[a]	*CI*[b] 95%	Standard error	Sig
0.716	0.655–0.777	0.031	0.000

[a]*Area under curve*
[b]*Confidence interval*

the students' learning outcomes, as it helps learners to understand concerning concepts significantly.

Technological knowledge involves operating particular technologies, which plays a crucial role in integrating technology in the process of teaching and learning (Chai et al., 2010). Besides, successful e-learning can only be yielded when teachers can use technology in their pedagogical practices appropriately. On the other hand, the technological knowledge (TK) of faculty members was found at the lowest level among all other domains, which indicates that teachers lack technological competence. Thus, they require professional guidance to update their technological skills. The findings of Schmid et al. (2021) also indicated that teachers' technological and TCK emerged as the least acquired competencies. Therefore, to enhance the technological literacy in teachers, ICT training centers with ICT professionals should be originated at the national and provincial levels.

The knowledge regarding the interaction between all domains of TPACK plays a significant role in the development of an innovative learning environment (Ortega-Sánchez and Gómez-Trigueros, 2019). However, the other reported lowest competence of faculty members was found in the domain of TPACK. This finding reflects the finding of Lye (2013), who indicated that teachers possess low TPACK, and they need improvement in several areas of TPACK. In light of this result, teachers should be given a range of guidance in terms of all the domains of TPACK and the interaction between those domains by providing both initial and ongoing support to implement the technologies in their pedagogical practices successfully.

This study further found that male teachers' TPACK was significantly higher than female faculty members. This finding reflects the finding of Koh et al. (2010), where male teachers showed more positive attitudes, competencies, and knowledge with respect to technology use. This result indicates that female faculty requires more support to gain their competencies in all the sub-components of TPACK. Regarding teaching experience, it is usually expected that teachers' knowledge increases with the increase in years of experience. In contrast, the results showed a statistical significance in the TPACK of faculty members' knowledge, where faculty members with experience of 2–5 years shown higher TPACK than the teachers with more experience and novice teachers. This finding supports

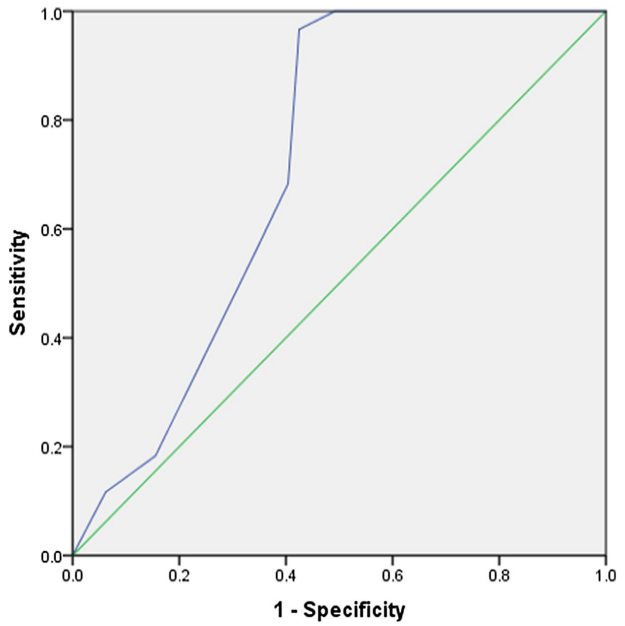


FIGURE 4 | ROC curve (teaching experience).

the results of Claro et al. (2018), where years of teaching experience were found significantly associated with the TPACK of teachers. Based on the personal factors, policymakers and teachers should be aware of gender differences' effect on technological knowledge and competencies; therefore, gender differences should be monitored closely by conducting longitudinal TPACK studies. There should be an equal emphasis on training programs on pre-service as well as in-service teachers so that teachers of all levels may learn effectively to integrate technology into their educational practices.

In addition, the study suggests that the new technological instructional context in the COVID-19 phase appeared as an important moderator for teachers in upgrading their competencies in terms of TPACK. Regarding the contextual environment, Mishra (2019) indicates that the addition of contextual knowledge (XK) may reveal the situational and institutional limitations that teachers work within. During the COVID-19 pandemic, teachers and learners experienced their practices in multiple new and unfamiliar contexts, which impacted teachers' abilities to teach successfully remotely in the digital environment. Therefore, future studies should examine teachers' XK comprehensively to determine the influence of different contextual factors on teachers' TPACK with a focus on facilitating teachers with contextual change.

Finally, remote work and online learning are teaching conditions that will continue to advance steadily. In turn, the post-COVID-19 reactivation and recovery processes do not seem to contemplate that the teaching and learning processes as before. Therefore, future research should be aimed not only at understanding human behavior while studying or teaching virtually but also at understanding the TPACK model and building better ways to integrate technology into educational practices. In this regard, the findings of the study are highly significant, not particularly in determining the technology integration during the COVID-19 pandemic phase, which is currently the most crucial issue, but also for the integration of technology in the post-pandemic time in higher education.

CONCLUSION

Based on the obtained results, the study affirms that the COVID-19 pandemic phase significantly influenced the digital competencies of faculty members and reveals adequate knowledge in all the sub-components of the TPACK, with a significant difference in terms of gender and teaching experience. Regarding consistency, the TPACK model was verified by means of factorial analyses in terms of seven sub-components and in the context of higher education faculty members in Pakistan, which supports the value and appropriateness of the model. Accordingly, the study suggests that the TPACK model should be employed in the professional development programs to develop teachers' TPACK for integrating technology efficiently by bridging the gap between ICT knowledge and ICT practice.

IMPLICATIONS AND LIMITATIONS

The findings of this study contribute to society in several ways. Regarding theoretically, this study has enriched the literature on the technological competencies of teachers during the COVID-19 transitory period and verified the reliability of the TPACK model in the context of Karachi, Pakistan. It can be further used for verification in other cities and countries. In terms of methodological contribution, the study provides tentative insight in evaluating the impact of the COVID-19 transitory period on teachers' digital competencies and their state of implementation in pedagogical practices. Regarding academics, this study provides a pragmatic direction to relevant educational authorities and policymakers for the improvement of online education by providing pertinent solutions and recommendations as per the situation. In addition, the future planning of professional development and training programs for the teachers can be based on the feedback provided by the faculty members. The study can further contribute to elevating e-learning outcomes and satisfaction during as well as post-pandemic phase.

Furthermore, the study also noted some limitations. Firstly, faculty's response biasness may have affected the results since digital competencies were assessed self-reported quantitatively. Therefore, the future studies may select other approaches to unfold the understanding of teachers and establish the criteria for evaluating the TPACK of teachers. Secondly, the current study only focused on the TPACK model to assess the digital competencies of faculty. The findings of this study can be further strengthened in the future by employing other indicators to examine the teachers' competencies in teaching with technology.

Finally, the analysis was cross-sectional and evaluated the teaching practices of university teachers during the period of

the COVID-19 pandemic. Online technological, pedagogical, and content competencies of teachers may change over time, which should also be observed. Therefore, a longitudinal study should be conducted to strengthen the evidence by understanding the causal effects and interrelationships among various other variables, critical in elevating the online pedagogical practices at the higher level in Pakistan.

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

HA is the principal investigator of the study. From conceptualization to the data analysis, she conducted by herself. All authors contributed to the article and approved the submitted version.

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Readiness and Intention for Adapting New Normal COVID-19 Prevention Campaign for Sustainable Response Among Debre Berhan University Student's During Campus Re-Entry: A Cross-Sectional Study

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Background: The COVID-19 pandemic has had a profound effect on the general healthcare system and higher education worldwide. Adapting to the culture of "new normal," an emerging response to COVID-19, is crucial for public health recovery and learning. This study investigated students' readiness and intention for adapting to the ''new normal'' COVID-19 prevention campaign during campus re-entry in Debre Berhan university in Ethiopia after the country eases lockdown restrictions.

Methods: A cross-sectional study was conducted from 20th to 30th January 2021, among graduate students in Debre Berhan university, Ethiopia. A simple random sampling technique was used to select 423 participants. A structured and pre-tested self-administered questionnaire was used to collect the data and bivariate and multivariable logistic regressions were fitted. Adjusted odds ratio (AOR) with a 95% confidence interval (CI) were used to interpret the strength of association and the statistical significance level was declared at a p-value of ≤0.05.

Result: In this study 423 participants were involved. The level of readiness and intention of adapting to the ''new normal'' prevention campaign were 49.4 and 54.8% respectively. Being a health science student (AOR = 1.82; 95% CI: 1.18, 2.81), being married (AOR = 2.10; 95% CI: 1.1, 4.05), having a smartphone (AOR = 1.84; 95% CI: 1.09, 3.12), and being knowledgeable towards COVID-19 (AOR = 1.56; 95% CI: 1.04, 2.34) were found to be

Abbreviations: CDC, center for disease control and prevention; COVID-19, coronavirus disease 2019; WHO, world health organization; HE, higher education; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; DReAM, D-distancing, Re-respiratory etiquette, A-aseptic techniques and M-mask.

significant factors associated with intention towards adapting to the ''new normal'' prevention practice. Also, the main reason why participants had no intention to carry out the ''new normal'' prevention campaign were a shortage of quality required preventive supplies (60%) and those who perceived themselves personally not at risk of COVID-19 (31.3%).

Conclusion: In this study, although information on the COVID-19 outbreak is continually evolving, readiness and intention for adapting to the ''new normal'' COVID-19 prevention campaign were insufficient. It is critical to improve readiness and intention through increasing knowledge and emphasizing the importance of new technologies and handy protective supplies that may encourage the sustainable practice of new norms post-pandemic.

Keywords: adaptation, COVID-19 prevention campaign, intention, readiness, new normal

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), imposing a huge toll on individuals, families, communities, and societies across the globe (Tadesse et al., 2020; Adane et al., 2021). It is considered to be the third pandemic within the 21st century (Stanley, 2020). The COVID-19 global health pandemic has a profound effect on the general healthcare system and Higher Education (HE) at the global level (Thompson, 2020). In December 2019, China's center for disease control (CDC) reported a novel coronavirus as the causative agent of the COVID-19 outbreak (ECDC, 2020). The World Health Organization (WHO) also declared COVID-19 as a public health emergency of international concern on January 31, 2020 and declared it as a pandemic on March 11, 2020 (Cucinotta and Vanelli, 2020; WHO Director-General, 2020).

According to United Nations Educational, Scientific, and Cultural Organization (UNESCO), on April 1, 2020, schools and higher education institutions (HEIs) were closed in 185 countries, affecting 1,542,412,000 learners, which constitutes 89.4% of total enrolled learners across the world (Marinoni et al., 2020). At the same time, various universities and other higher education institutions had already anticipated the impacts of the move online or the influences of the economic crisis on national and international students and their families (IAEA COVID 19, 2021). Consequently, many universities in the world had moved to an emergency remote teaching via online platforms for about a year since the occurrence of COVID-19 (i.e., "lockdown") (Ye et al., 2020). However, these measures can have a profound negative impact on individuals, communities, and societies from the poorest households and on those who require special needs (Ferri and PatriziaGrifoni, 2020; WHO, 2020; Greyling and Rossouw, 2021; Scroll and For, 2021).

The term "new normal" first appeared during the 2008 financial crisis to refer to the dramatic economic, cultural, and social transformations that caused precariousness and social turbulence, impacting collective perceptions and individual lifestyles (El-erian, 2010). This term has been used again during the COVID-19 pandemic to point out how it has changed essential aspects of human life (World Health Organization, 2021). Cultural philosophers argue that there is an interplay between culture and both personal feelings and information consumption during times of crisis (Alexander and Smith, 2020). Nevertheless, it is up to us to adapt to the challenges of the current pandemic and similar crises, and whether we respond positively or negatively can significantly affect our personal and social lives. Indeed, there are many lessons we can learn from this crisis that can be used in building a better society. How we respond to change will depend on our capacity to adapt, to manage resilience in the face of adversity, and our flexibility when forced to make changes. We may have to adjust to a new normal as people get back to work, school, and a more normal life. As such, "we have touched the end of the beginning. New conventions, rituals, images, and narratives will no doubt emerge, so there will be more work for cultural sociology before we get to the commencement of the end" (Biddlestone et al., 2020).

In early November 2020, Ethiopia partially emerged from the first wave of the COVID-19 pandemic and social activities gradually resumed. The higher education system in Ethiopia was planned to reopen after 8 months' lockdown following permission from the Ethiopian Ministry of Health by considering an adaptation to the culture of "new normal" prevention response to COVID-19. "However *'new normal' is not normal*," it is a term resulting from the adaptation process while in the COVID-19 pandemic (CRISTOBAL et al., 2021). Countries worldwide are trying to adjust to the disruptions in the education landscape caused by the COVID-19 pandemic and will have new behaviors to prevent infection, captured in the acronym *DReAM* (World Health Organization (WHO), 2021; UNESCO, 2020). The acronym stands for: D–Distancing–maintain a physical distance of at least 1 m from others, avoid crowded places, close-contact settings, and confined and enclosed spaces; Re–Respiratory etiquette–cough/sneeze into your elbow and contact a doctor if you have suggestive signs/symptoms; A–Aseptic techniques–wash your hands frequently with soap and water for at least 20 s or use a hand sanitizer with at least 70% alcohol, avoid touching your eyes, nose, and mouth, and regularly disinfect frequently touched surfaces; and M–Mask–wear a face mask, ensuring you put on, take off, and store your mask properly at all times (Pragholapati; Pradipta et al., 2020). Practicing *DReAM* will control COVID-19 transmission and enable the continuation of economic and social activities such as reopening

of schools. The Ethiopian government is preparing to reopen schools and the Ministry of Higher Education has issued guidelines to limit the number of students per classroom and dormitory and face-to-face class sessions (World Bank, 2020. Educat, 2020). Adaptation of such behaviors is an essential component in the battle against the pandemic (Roberts and David, 2021). Nevertheless, returning to universities during the COVID-19 pandemic may not feel normal, at least for a while (Edmunds, 2020; Mekonen and Mekuria, 2020). It is important to prepare for a safe return to campus for all, with millions of students around the world at risk of being left behind in COVID-19 education response plans. Moreover, following the government's implementing strategies to re-open universities, understanding the necessity of students is a very cost-effective approach to scale up their compliance with "new normal" approaches during the post-pandemic period. This may enable HE stakeholders' strategic readiness towards the projected healthcare costs for effective prevention and response to the COVID-19 pandemic (Jackson, 2020). What we are learning from COVID-19, similar to what we have seen in previous pandemics, is that readiness is crucial. So, it is important to enchance preparedness while schools reopen.

Ethiopia shares a major proportion of the global burden of this infectious disease (Mohammed et al., 2020; Musa et al., 2020). The pandemic still has the potential for greater loss of life in Ethiopia; more efforts are needed to increase prevention capacity and bring changes in behavioral intention (Dennis, 2020; Mohammed et al., 2020). As of August 17, 2021, in Ethiopia, COVID-19 had caused 290,818 confirmed cases, with 4,495 deaths and 265,663 recovered cases (MoH Ethiopia (2021). Hence, the Ethiopian Ministry of Health has taken immediate steps to achieve an overall decrease in COVID-19 spread through restricting mobility within and across borders, physical distancing, hand washing, and the use of personnel protective equipment (PPE) masks (Balachandar et al., 2020; Wang et al., 2020; Adane et al., 2021).

Universities are places where students live and study near each other. Nowadays, the foundations of this unique ecosystem have been impacted significantly by the rapid spread of the COVID-19 outbreak, creating uncertainty regarding the implications for higher education. University students are recognized as a vulnerable population, suffering from the pandemic due to a multitude of factors: communal residency in on-campus and off-campus housing, sharing cafeteria, and having dynamic social groups with strong mobility and socialization during the COVID-19 pandemic (Browning et al., 2021; Holzer et al., 2021; Ihm et al., 2021). One study in Ethiopia reported 47, 54, and 42.8% of the higher institution students had good knowledge, a positive attitude, and good prevention practices towards COVID-19, respectively (Angelo et al., 2020).

Although Ethiopia has achieved a certain success in the fight against the COVID-19 pandemic, the potential risk of new epidemic waves requires the readiness of the entire healthcare workforce, including university students. However, although there has been a surge of articles on knowledge towards COVID-19 and its prevention measures, the level of readiness and intention in carrying out the "new normal" practices are unknown. Further, there is a scarcity of evidence on the intention and restraining cognitive impairments of university students to adapt "new normal" practices endorsed by WHO and/or national public health institutes, particularly during campus re-entry. Therefore, this study was intended to assess 1) student's levels of readiness and intention to adapt the "new normal" COVID-19 prevention campaign, and 2) to evaluate potential factors associated with intention of adapting to COVID-19 prevention and perceived barriers among university students in Ethiopia.

METHODS AND MATERIALS

Study Design, Period, and Setting

An institution-based cross-sectional study was conducted from 20th to January 30, 2021, at Debre Berhan University, northeast Ethiopia. Debre Berhan University is one of thirteen new governmental universities founded in 2007. It is located in the Amhara regional state, in the town of Debre Berhan, which is the capital of the North-Shewa Zone, around 130 km far from Addis Ababa (the capital city of Ethiopia). The university had ten colleges and fifty departments. Currently, the university has a total number of 27,371 students: 17,397 males and 9,974 females. Of these, 11,573 are regular undergraduate and postgraduate students. Overall, the university has approximately 3,300 graduating class students who attend regular programs at different programs and years of study. During the design of this study, graduating class students were the first candidates for the re-admission program after the COVID-19 "lockdown."

Source and Study Population

All graduating class students of Debre Berhan University were the source population, while graduate students in the selected departments during the data collection period in the university were the study population.

Inclusion and Exclusion Criteria

All graduating class students of Debre Berhan University during the data collection period were included. This is because they were the first candidates during school reopening after the COVID-19 "lockdown" as our focus during the design of this study. However, students with active SARS-CoV-2 infection were excluded.

Sample Size Determination

The sample size for this study was determined by using a single proportion formula depending on the following assumptions: 50% proportion of students' intention towards COVID-19 prevention practice, 95% level of confidence, and 5% margin of error.

$$n = \frac{Z\alpha/2)^2 p(1-p)}{(d)^2} = \frac{(1.96)^2 * 0.5(1-0.5)}{(0.05)2} = 384 \qquad (1)$$

Where n = required sample sizes, α = level of significance, z = standard normal distribution curve value for 95% confidence level = 1.96, p = proportion of intention for adapting to the "new

normal" COVID-19 prevention practice, and d = margin of error. By considering a 10% non-response rate, the final sample size was 423.

Sampling Technique and Procedure

Study participants were selected from all regular graduating class students using a simple random sampling technique. Nineteen representative departments were selected from all colleges. Each of the selected departments was selected using lottery method. A sampling frame was prepared by acquiring the list of students from the registrar's office. Then, in the selected departments, the required sample size was proportionally allocated to the total number of students. From all students of the selected departments, a simple random sampling technique was used to pick the required sample size using a pre-determined sampling frame of all departments.

Precautions: Face masks were worn by the data collectors who were distributing the questionnaire as per the guidelines for the prevention of COVID-19. To minimize further risks of COVID-19 transmission, participants' hands were sanitized before and after the questionnaire. Face masks were also provided to students who were not wearing one with the collaboration of the COVID-19 prevention task force and the recommended social distance was observed between the study staff and participants.

Measurements and Operational Definitions

The dependent variable in this study was the university students' intention for adapting to the "new normal" COVID-19 prevention campaign endorsed by WHO. The participants were asked four questions to assess "new normal" practices, relating to wearing a mask, engaging in social distancing, handwashing with soap and water, and routine sanitizing of hands with sanitizer for sustainable response. The response options for each question were "Never," "Occasionally," or "Always'." Thus, based on the summative scores designed to assess intention for adapting to the "new normal" WHO COVID-19 prevention practice, respondents answer above the mean score was considered as favorable intention of adapting to the "new normal" prevention campaign and those who scored below the mean value were considered as having Unfavorable intention. The higher values indicate higher intention (Andarge et al., 2020a; Dires et al., 2021).

Readiness: A total of 10 questions were prepared to determine readiness towards COVID-19 prevention. Each item has a "Yes" or "No" response giving a score of one and zero (i.e., a score of 1 was given for "Yes" and a score of 0 was given for "No"). The higher values indicate higher readiness to adapt to COVID-19 prevention. Depending on the mean score of readiness assessment questions, respondents who scored above the mean score were considered as having "Good readiness" and those who scored mean or below were considered as having "Poor readiness". Likewise, the participants' readiness was coded as "1" for Good readiness and "0″ for Poor readiness (Lazarus et al., 2021).

Knowledgeable towards COVID-19: Participants' knowledge was determined by asking the eleven "Yes" or "No" knowledge assessment questions. Respondents who scored above the mean were categorized as knowledgeable (W/Mariam TGAyanaw et al., 2020) and vice versa.

Data Collection Tool and Quality Assurance

The data were collected using a pre-tested, self-administered, and structured questionnaire. The tool was developed from different literature (Andarge et al., 2020b; Iyengar et al., 2020; Mulu et al., 2020; Pradipta et al., 2020; Desalegn et al., 2021; He et al., 2021; Lazarus et al., 2021; Mekonnen et al., 2021; Sazali et al., 2021) following the COVID-19 Community Guidelines by CDC and the WHO and validated to fit the research objectives. To assess the study objectives, the questionnaire comprises four parts: 11 socio-demographic characteristics, 11 knowledge assessments, 10 readiness questions, and five for intention to adapt "new normal" practice assessment questions. The face and content validity of the questionnaire was checked by public health experts. The questions prepared in English were first translated into Amharic (local language) and then back into English to ensure consistency. A pre-test was conducted on 5% of the samples size at Debre Berhan Health science college. The language clarity and validity of the tool were checked and required amendments were made after the result of the pre-test. Thus, the internal consistency of each item scale was checked and Cronbach's alpha coefficients for intention, readiness, and knowledge were 0.88, 0.78, and 0.69 respectively; this was verified as an acceptable range. Further, two BSc degree and two MSc holder midwives gathered the data and supervised the process. Before the actual work, data collectors and supervisors had received training on the purpose of the study, collection procedures, and confidentiality assurance.

Data Management and Analysis

Data were checked, coded, and entered into Epi Data version 4.6, and were exported to SPSS version 25 for analysis. Data cleaning was carried out before statistical analysis and descriptive statistics were used to present the participants' characteristics. Both binary and multivariable logistic regression was fitted to identify statistically significant independent variables and the level of significance was determined at a p-value of ≤0.05. The model fitness of the multivariable logistic regression analysis was assessed using the Hosmer-Lemeshow goodness-of-fit test. Finally, the strength of association was interpreted using the Adjusted Odds ratio (AOR) with its 95% confidence interval and its p-value of ≤0.05.

Ethical Considerations

The study was conducted following the approval of the Debre Berhan University Institutional Review Committee (protocol number: P006/20). The study was conducted following the Ethiopian Health Research Ethics Guideline and the declaration of Helsinki. A formal letter of administrative approval was obtained from each college. Anonymous written consent was obtained from each study participant following a clear explanation of the goal of the study.

RESULT

Socio-Demographic Characteristics of Respondents

A total of 423 participants were involved in this study, giving a response rate of 100%. The mean age of study

TABLE 1 | Participants' demographics in Debre Berhan University, Northeast Ethiopia, 2021 (*n*= 423).

Variables	Frequency (%)
Age (in years)	
<25	245 (57.9)
≥25	178 (42.1)
Sex	
Male	281 (66.4)
Female	142 (33.6)
Field of study	
Health	213 (50.4)
Non-health	210 (49.6)
Residence comes from	
Rural	246 (58.2)
Urban	177 (41.8)
Marital relation	
Single	305 (72.1)
Married	48 (11.3)
In relationship	70 (16.5)
Average monthly income	
<500	134 (31.7)
500–999	153 (36.2)
≥1000	136 (32.2)
Have a smartphone?	
Yes	350 (82.7)
No	73 (17.3)
Mothers' level of education	
No formal education	284 (67.1)
Formal education (1–12 Grades)	114 (27.0)
College and above	25 (5.9
Fathers' level of education	
No formal education	246 (58.2)
Formal education (1-12 Grades)	119 (28.1)
College and above	58 (13.7)
Family members use COVID-19 prevention methods?	
Yes	321 (75.9)
No	102 (24.1)
Family members ever infect with COVID-19?	
Yes	52 (12.3)
No	371 (87.7)

participants was 24.17 (SD ± 1.73). Of these, the majority were males (66.4%). Regarding marital status, most of the respondents (72.1%) were single. About three hundred and fifty (82.7%) of the study participants have a smartphone and three-fourths (75.9%) of the study participants' family members have used COVID-19 prevention methods. Furthermore, half (50.4%) of the participants were Health Science students (**Table1**).

Knowledge Related Characteristics of Respondents

Overall, 63.1% 95% CI (59%, 68%) of university students were knowledgeable about COVID-19 and its prevention measures. The mean knowledge score of the respondents was 12.47 ± 2.1 (12.27–12.67). Of the 423 participants, a majority (95.3%) answered that they were aware of COVID-19 prevention measures. Most (95.5%) of the study participants knew the typical symptoms of COVID-19 (**Table 2**).

Readiness to Adapt New Normal COVID-19 Prevention Practice-Related Characteristics of Respondents

In this study, half (49.4%) 95% CI (45%, 54%) of the university students had a good readiness to prevent COVID-19. The average readiness score of the respondents was 7.18 ± 2.0 (6.99–7.37). Similarly, 294 (69.5%) of students would self-quarantine if they had developed signs and/or symptoms suggestive of COVID-19 infection and 265 (62.6%) understood they might transmit COVID-19 to their family members and classmates. Moreover, just a fourth of the participants declared they would not successfully control COVID-19 by adapting to the WHO prevention measures (**Table 3**).

Intention for Adapting New Normal COVID-19 Prevention Practice-Related Characteristics of Respondents

The overall prevalence of students' intention to adapt to "new normal" COVID-19 prevention was 54.8% (95% CI: 50%, 60%). The mean score of the intention of implementing the "new normal" mitigation measures among respondents was 4.65 ± 2.8 (4.38–4.92). Of the total study participants, 232 students have had favorable intentions for adapting to the "new normal" prevention measures during their campus re-entry. A few of the participants (22, or 5.2%) were not intending to comply with physical distancing as recommended by their campus (**Table 4**).

Perceived Barriers for Students Who did not Intend to Adapt the New Normal COVID-19 Prevention Practice

However, more than half of the study participants have a favorable intention to practice routine COVID-19 prevention measures, although there were multiple perceived barriers to a lack of intent to adapt. Thus, the top two perceived reasons for unfavorable intention by the study participants were the shortage of required preventive supplies (60%) and perceived considering not at risk of COVID-19 pandemic (31.3%) (**Figure 1**). Perhaps students leaving their campus (went crowded places) due to different reasons, such as purchasing necessities (42%), meeting their friends outside (21%), and having fun and leisure (20%) during the outbreak made it difficult to prevent the disease (**Figure 2**).

Factors Associated With the Intention for Adapting the New Normal COVID-19 Prevention Practice

The association between covariates with response variables was estimated by the odds ratio using logistic regression analysis. Controlling the effect of confounding factors, being a health science student, married, knowledgeable, and having a smartphone had statistically significant associations with intention towards adapting to the "new normal" COVID-19 prevention measures during multivariable analysis.

TABLE 2 | Participants' knowledge related characteristics about COVID-19 in Debre Berhan University, Northeast Ethiopia, 2021 (*n*= 423).

Questions	Frequency (%)
Causative organism of COVID –19?	
Bacteria	17 (4.0)
Virus	390 (92.2)
I don't know	16 (3.8)
Know the risk factors for COVID-19?	
Yes	388 (91.7)
No	35 (8.3)
Know the WHO COVID-19 prevention guideline?	
Yes	403 (95.3)
No	20 (4.7)
What are WHO COVID-19 prevention guidelines?	
Applying facemasks *	379 (89.6)
Keep physical distancing*	251 (62.0)
Routine hand washing/sanitizer*	295 (72.5)
Self-quarantine*	87 (21.4)
Contaminated objects and surfaces can transmit COVID-19?	
Yes	392 (92.7)
No	31 (7.3)
To which population group COVID-19 infection is found to be affected?	
Neonates and children*	300 (70.9)
Young and middle-aged adults*	265 (62.6)
Elderlies and patients with underlying chronic diseases*	411 (97.2)
I don't know*	1 (0.2)
Do you know the typical symptoms of COVID-19?	
Yes	404 (95.5)
No	19 (4.5)
What are the typical symptoms of COVID-19?	
Dry cough*	352 (87.1)
Fever *	331 (81.9)
Shortness of breath*	300 (74.3)
Vomiting*	63 (15.6)
Frequent handwashing with water, soap, and alcohol-based hand rub sanitizer prevents COVID-19?	
Yes	397 (93.9)
No	26 (6.1)
Keeping social distance as per the standard prevents VOVID-19?	
Yes	397 (93.9)
No	26 (6.1)
Timely isolation of potentially risky/or confirmed people is important to prevention COVID-19?	
Yes	386 (91.3)
No	37 (8.7)
Wearing a facemask is important to prevent acquiring COVID-19?	
Yes	386 (91.3)
No	37 (8.7)
Know the measures if you develop symptoms and signs suggestive of COVID-19?	
Yes	333 (78.7)
No	90 (21.3)
Overall participant's knowledge	
Not knowledgeable	156(36.9)
Knowledgeable	267(63.1)

=multiple responses are noted.

This study revealed that students studying in the health science departments were 1.82 times more likely to have had a favorable intention than those who were in another department (AOR = 1.82,95% CI:1.18, 2.81). According to the results, married students had more favorable intentions than their single counterparts (AOR = 2.10, 95% CI: 1.1, 4.05). The odds of having favorable intentions among students with smartphones were 1.84 times higher compared to those who did not have a smartphone (AOR = 1.84, 95% CI: 1.09, 3.12). Likewise, the odds of having a favorable intention of adapting to the "new normal" prevention actions among knowledgeable respondents were 1.56 (AOR = 1.56, 95% CI: 1.04, 2.34) times higher as compared to their counterparts (**Table 5**).

DISCUSSION

Coronavirus disease 2019 is still a life-threatening infection worldwide and continues to be a public health concern in Ethiopia. Currently, as the disease has no cure, vaccine

TABLE 3 | Participants' readiness-related characteristics about COVID-19 prevention campaign in Debre Berhan University, Northeast Ethiopia, 2021 (*n*= 423).

Questions	Frequency (%)
Do you consider COVID-19 is dangerous?	
Yes	310 (73.3)
No	113 (26.7)
Do you consider self-quarantine if you have signs and/or symptoms suggestive of COVID-19 infection?	
Yes	294 (69.5)
No	129 (30.5)
Do you consider you will be successfully controlled COVID-19 by obeying WHO prevention measures?	
Yes	318 (75.2)
No	105 (24.8)
Do you consider you should limit your social activities due to COVID-19 infection on the campus?	
Yes	329 (77.8)
No	94 (22.2)
Do you perceive that you may transmit COVID-19 to your family members and classmates?	
Yes	265 (62.6)
No	158 (37.4)
Do you consider you should avoid leaving campus due to COVID-19 infection?	
Yes	275 (65.0)
No	148 (35.0)
Do you consider you are overwhelmed with the new COVID-19 regulations?	
Yes	255 (60.3)
No	168 (39.7)
Do you consider the coronavirus outbreak has made you less in control of your life?	
Yes	244 (57.7)
No	179 (42.3)
Do you consider there's a great risk that you'll get the coronavirus from people whom you contact?	
Yes	147 (34.8)
No	276 (65.2)
Do you avoid face-to-face meetings, giving preference to phone calls, email, or virtual meetings?	
Yes	294 (69.5)
No	129 (30.5)
Overall participant's readiness	
Poor readiness	214 (50.6)
Good readiness	209 (49.4)

TABLE 4 | Participants' intention of adapting the ''new normal'' COVID-19 prevention practice-related characteristics of in Debre Berhan University, Northeast Ethiopia, 2021 (*n*= 423).

Variable	Frequency (%)
Will you apply face masks, as advised?	
Always	319 (75.4)
Occasionally	97 (22.9)
Never	7 (1.7)
Will you maintain physical distancing, as advised?	
Always	213 (50.4)
Occasionally	18 (44.4)
Never	22 (5.2)
Will you wash your hands with soap and water, as advised?	
Always	288 (68.1)
Occasionally	133 (31.4)
Never	2 (0.5)
Will you use hand sanitizers, as advised?	
Always	190 (44.9)
Occasionally	183 (43.3)
Never	50 (11.8)
Overall intention towards adopting prevention practice	
Unfavourable intention	191(45.2
Favourable intention	232(54.8)

supplies dwindle in Africa, and the existence of new COVID-19 variants means prevention is a better available effective weapon to tackle the global consequences of the pandemic on students and learning. Hence, good intentions are an important starting point. Practice of COVID-19 prevention encapsulated in *DReAM* needs to have adequate readiness and intention. This study assessed Debre Berhan university students' readiness and intention for adapting to "new normal" prevention endorsements and the factors that influence their intention and perceived barriers. Overall, half (49.4%) had good readiness and 54.8% of the respondents had a favorable intention for adapting to "new normal" mitigation measures. Moreover, student's intention was influenced by the field of study, marital status, knowledge towards the pandemic, and having a smartphone.

The current study revealed that half (49.4%) 95% CI; 45%, 54%) of participants had good readiness to fight against the COVID-19 pandemic. In agreement with this finding, a study from Addis Ababa established healthcare professionals' preparedness as 50% (Desalegn et al., 2021). The finding is higher as compared with other studies conducted in Ethiopia which shows Southwest Ethiopia at 25% (Mekonnen et al., 2021),

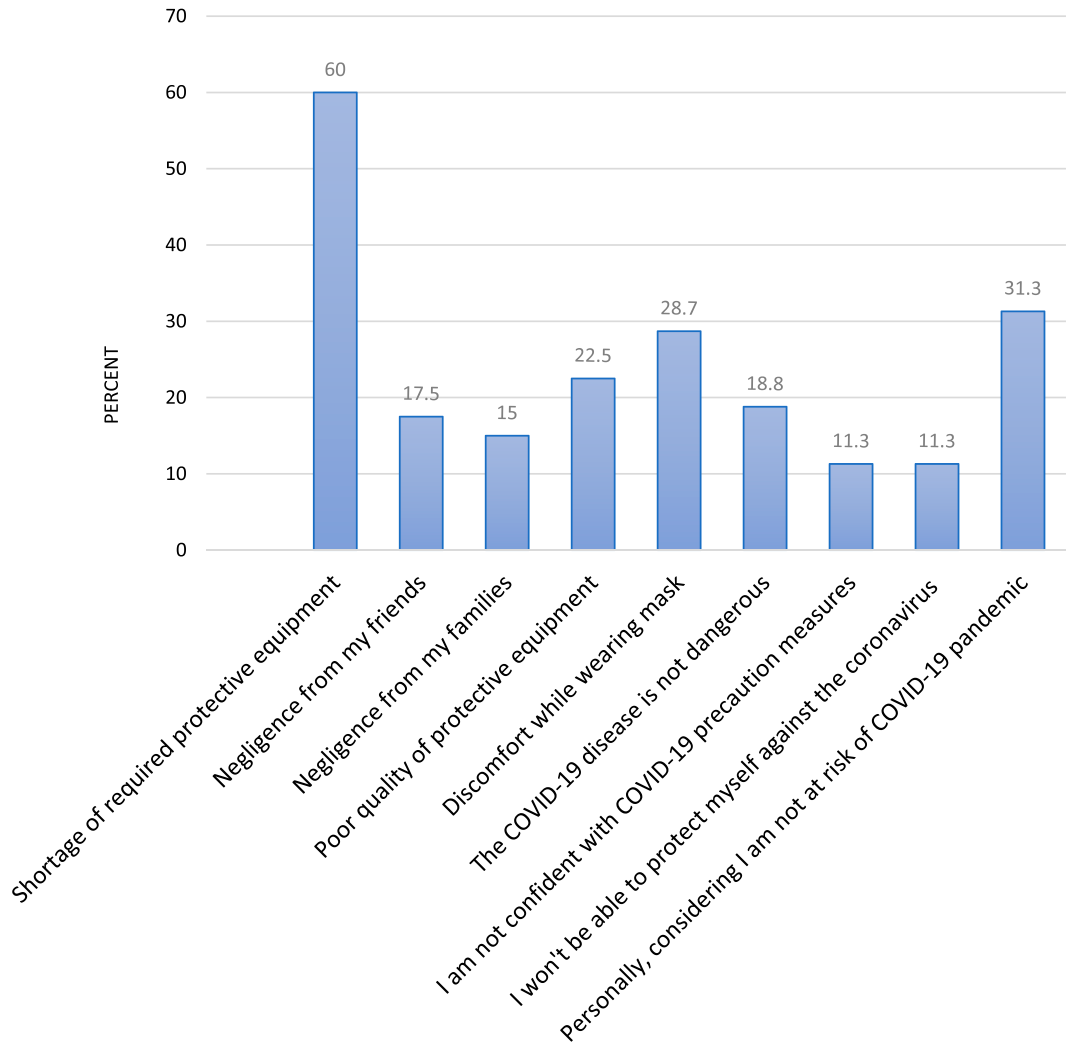

FIGURE 1 | Destributions of reasons why not intend to carry COVID-19 WHO prevention measures among Debre Berhan University students, Northeast Ethiopia, 2021.

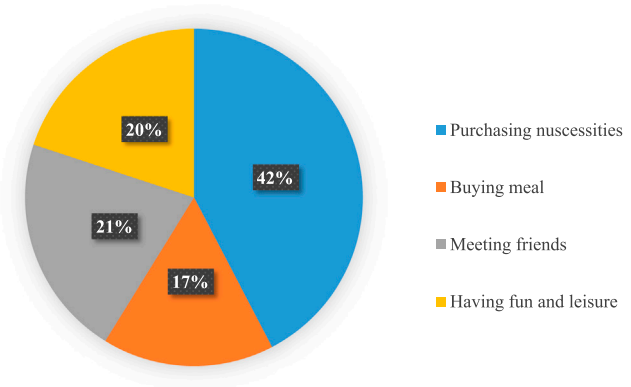

FIGURE 2 | Main reasons for went outside university campus among Debre Berhan University students, Northeast Ethiopia, 2021.

Awi Zone at 20.2% (Adane et al., 2021), North Shewa Zone at 25.5% (Mulu et al., 2020), and Indonesia at 18.6% (Lazarus et al., 2021). This variation might be due to the difference in study setting (i.e. Ethiopia Vs Indonesia) and target population which greatly influence the awareness of the symptoms and the complications of COVID-19. Besides, the time gap among studies is a factor, since the COVID-19 outbreak is a global agenda and rapidly disseminated relevant information on the pandemic has led to unexpected changes in people's daily lifestyles (Lin and Lin, 2021). Also due to poor healthcare, limited resources, low living standards, and environmental factors among prisoners (Mekonnen et al., 2021) as compared with the current study (i.e. readiness among prisoners 25% vs 49.4% in the current study). Thus, prisoners and detainees live in prison facilities close proximity with one another which likely increases the risk of person-to-person and droplet transmission of pathogens like COVID-19. In Indonesia, institutions have

TABLE 5 | Bivariable and multivariable analysis of variables on intention for adapting COVID-19 prevention campaign Debre Berhan University, Northeast Ethiopia, 2021 (*n*=423).

Variables @	Intention		COR(95%CI)	AOR(95%CI)
	Favorable	Unfavorable		
Age (in years)				
<25	127	118	1	1
≥25	105	73@	1.34(0.91,1.97)	1.23 (0.81, 1.85)
Sex@				
Male	154	127	1	1
Female	78	64	1.0 (0.67, 1.51)	1.03 (.65, 1.65)
Place of residence				
Rural	128	118	1	1
Urban	104	73@	1.31(0.89, 1.94)	1.15 (0.69, 1.9)
Field of study				
Non-health	147	142	1	1
Health	85	49@	1.68 (1.1, 2.55)	1.82 (1.18, 2.81)**
Marital status				
Single	157	148	1	1
Married	32	16	1.89 (1.0, 3.58)	2.10 (1.1, 4.05) *
In relationship	43	27@	1.5 (0.88, 2.55)	1.37 (0.79, 2.36)
Average monthly income				
≥1000	80	73	1.13 (.71, 1.79)	1.18 (0.73, 1.92)
500-999	85	49	1.79 (1.1, 2.91)	1.15 (0.72, 1.85)
<500	67	69@	1	1
Do you have smartphone?				
Yes	201	149	1.83 (1.1, 3.04)	1.84(1.09, 3.12) *
No	31	42@	1	1
Mothers' educational status				
No formal education	152	132	1	1
Formal education (1-12)	66	48	1.19(0.77,1.85)	1.0 (0.55, 1.73)
College and above	14	11	1.1 (0.49, 2.52)	0.58 (0.19, 1.74)
Fathers' educational status				
No formal education	130	116	1	1
Formal education (1-12)	66	53	1.1 (0.72, 1.72)	0.87 (0.53, 1.41)
College and above	36	22	1.46 (0.81, 2.62)	1.49 (0.80, 2.76)
Do family members use COVID-19 prevention methods?				
Yes	180	141	1.23 (0.79, 1.92)	1.23 (0.76, 2.0)
No	52	50@	1	1
Family members ever infected with COVID-19?				
Yes	30	22	1.14 (0.63, 2.05)	1.06 (0.56, 1.98)
No	202	169@	1	1
Participant's knowledge				
Not knowledgeable	75	81	1	1
Knowledgeable	157	110	1.54 (1.04, 2.29)	1.56 (1.04, 2.34)*
Participant's readiness				
Poor readiness	113	101	1	1
Good readiness	119	90@	1.18 (0.81, 1.73)	1.23 (0.83, 1.84)

***=p-value <0.001, *=p-value<0.05*

implemented a massive open online course, which may mitigate COVID-19 misinformation and help students in similar real-world circumstances (Lazarus et al., 2021). This implies that, when assessing management of COVID-19 risks, the local epidemiological situation of the destination country as well as its international and national strategy should be accounted for (Cauchemez and Kiem, 2021; Leung et al., 2021).

This study depicted that the overall participants' intention for adapting to the "new normal" COVID-19 prevention campaign was 54.8% (95% CI: 50%, 60%). This is in line with another study from Ethiopia in which 52% of adults with chronic conditions were intending to engage with personal preventive practice (Andarge et al., 2020b). Unfortunately, due to the lack of similar literature to relate the changes in the intention of the "new normal" adaptation process during the pandemic, the appraisal and comparison were based on existing works. Thus, this finding was higher as compared to the previous study conducted among patients with chronic disease in Dessie Town, which was 28.3% (Dires et al., 2021). This variation might be due to the difference in study participants as this study employed university students who may have access to more information and tend to have good media exposure. Evidence has shown that regular exposure to media influences an individual's preventive behavior and excessive preventive intention (Liu et al., 2020). On the other hand, a study from the American general population of 80% (Lennon et al., 2020)

indicated a greater national intent to comply with WHO recommendations of COVID-19 prevention. This discrepancy might be due to the difference in the study population. The American study was conducted during the paradigm shift in the emergence of the pandemic (i.e., during the start of stay-at-home order) and would reflect people's response to such an unprecedented crisis. In addition, as an online survey, they might not verify or describe the true prevalence, and response bias may have been introduced.

This study demonstrates that there was a positive statistical association between being in the health sciences field of study and the intention to adapt to the "new normal" COVID-19 prevention practice. This might be linked to adapting appropriate actions to limit the spread of the pandemic in the medical students (Sazali et al., 2021). This is because medical students have a better inclination and are readily accessible to accurate information that was obtained from their learning courses. Even though the current study did not explore the information source regarding COVID-19, it should be considered that the source of information from the mass media had a great influence on student's intentions regarding the infectious disease.

Married participants also had higher odds of adapting to COVID-19 prevention practice than their counterparts. This study is supplemented with a study from the northwest part of Ethiopia which reported that the odds of good prevention practice in married study participants was 3.9-times higher than unmarried participants (Akalu et al., 2020). This could be because married people are responsible for taking care of their families and so have more positive protective attitudes and higher adherence rates to protective behaviors than single individuals (He et al., 2021). Moreover, married individuals may still have worried and decide to adapt to prevention practices against COVID-19 considering they are helping their families (Handebo et al., 2021). However, some studies reported that marital status does not affect the preventive measure rank (Yitayih et al., 2020; Birihane et al., 2020). This disagreement might be the difference in sample size, which was done only among 247 study participants in Jimma and 182 in Northern Ethiopia (Yitayih et al., 2020; Birihane et al., 2020) Another relevant finding from the study was that having a smartphone had a significant positive link to a higher intention of adapting to the "new normal" prevention campaign than those who have not. This is consistent with a review of articles as digital technologies are being harnessed to support the public-health response to COVID-19 worldwide (Sazali et al., 2021). A plausible explanation is that, since smartphones can be seen as an important source for regular updates and news related to COVID-19, these participants will have better information (Liu et al., 2020). Similarly, smartphones help in avoiding face-to-face contact (maintain social distancing and avoid virus transmission) (Iyengar et al., 2020).

In the present study, we have also assessed the perceived barriers in participants who had no intention to carry out the "new normal" WHO prevention recommendations. Thus, shortage and poor quality of required preventive equipment/ supplies was reported in 60%, perceiving themselves as personally not at risk of COVID-19 in 31.3%, and discomfort while wearing masks was reported in 28.7%. This finding is supported by other studies from Ethiopia and Indonesia (Lazarus et al., 2021)as there is a gap in necessary supplies (Dires et al., 2021; Mersha et al., 2021). In addition, 33.8% of participants described that they would go outside university campuses (crowded places) in order to purchase necessities 42%, meet friends 21%, and or for fun and leisure 20%. In this regard, the evidence from this finding calls upon policymakers and program managers to play a major role in implementing an integrated approach of health education and communication for a greater effect on negatively perceived barriers of COVID-19 prevention. University stakeholders should try their best to provide sufficient supplies of protective equipment that the student could use to take protective actions.

Knowledgeable respondents were more likely to intend to practice routine WHO COVID-19 mitigation measures than their counterparts. This agreement might be as stated in previous studies Ethiopia (Asemahagn, 2020), Ghana (Nkansah et al., 2020) and Saudi Arabia (Khan et al., 2014); it could be inferred that knowledge is a precondition for the formation and promotion of positive attitudes. This could also be explained by the awareness they access from different information sources, media, and experts which improves their level of practice (Nations et al., 2020), (Al-Mohaissen, 2017). Therefore, improving people's knowledge and fostering positive intent to prevent outbreaks is critical to improving protective behaviors in the response to COVID-19 (Alves and Samorinha, 2020; Zhong et al., 2020). This is consistent with the findings of other recent studies in Ethiopia (Andarge et al., 2020a; Akalu et al., 2020). Furthermore, this finding indicates a need for targeted measures to improve protective behavior. There is still much to understand about COVID-19 and its impact in diverse contexts. Readiness and response movements towards the new normal COVID-19 prevention should continue to be motivated by rapidly accumulating scientific and public health knowledge.

The authors acknowledge this study has some limitations. First, as a cross-sectional study, we could not verify causal association. Second, the study answers reflect a single moment in time and may not be generalizable over time. Third, there is a lack of similar documentation to link respondent's intent changes to the local context.

CONCLUSION

In this study, although information on the COVID-19 outbreak is continually evolving, the status of readiness and intention to adapt to the "new normal" COVID-19 prevention campaign was not sufficient enough. Poor readiness and unfavorable intention for adapting to the new normal COVID-19 prevention campaign was reported among students in the non-health sciences field of study, unmarried, not knowledgeable, and participants who did not have a smartphone. Multiple perceived barriers were the cause of a lack of intent of adapting routine prevention practices. Thus, the main reason why participants had no intention to carry out the "new normal" WHO prevention recommendations were shortage and poor quality of required preventive supplies (60%) and perceiving themselves as personally not at risk of COVID-19

(31.3%). This suggests that the policymakers and the health offices should consider these findings while developing strategies against COVID-19. Also, there is a need to focus on adapting new technologies and protective supplies, self-care practices, and appropriate capacity building through COVID-19 risk communication and public education.

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 Debre Berhan University institutional review board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

BT had a major role in the conceptualization, data curation, develop the proposal, and data entry. All authors participate in formal analysis and writing the original draft. They equally participated in manuscript preparation, revision, and approved the manuscript to be considered for publication.

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Rural Population and COVID-19: A Model for Assessing the Economic Effects of Drop-Out in Higher Education

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Higher education is one of the ways to overcome social inequalities in rural areas in developing countries. This has led states to develop public policies aimed at access, retention and timely graduation of students in those sectors, yet the high drop-out rates among the rural student population, which were catalysed by COVID-19, prevent the intrinsic and extrinsic benefits of obtaining a higher education degree from materialising. Thus, the study of the phenomenon of dropout before and after the pandemic has not sufficiently addressed the economic issues raised by this phenomenon for the different actors at the educational level. The purpose of this paper is to model the economic effects of rural student dropout at the higher education level for students and families, Higher Education Institutions (HEIs) and the State, based on public policies for access to higher education, in the pandemic and post-pandemic scenario. In order to delimit the operationalisation of the proposed model, a set of undergraduate training programmes in Colombia was taken as a reference. System dynamics was used as the main modelling technique. The model was based on data from the 20 training programmes with the highest number of students enrolled in rural areas for the year 2019, by running three computational simulations. The results showed the description of the dynamic model and the financial effects of dropout for the actors of the educational level with the current policies of access to higher education, the scenario in which COVID-19 would not have occurred and the consolidation of the public policy of tuition fee exemption in public HEIs as a result of the pandemic. It was concluded that the model developed is very useful for the valuation of these economic effects and for decision-making on policies to be implemented, given that the costs of dropout are characterised by high costs for students and their families as well as for HEIs, and where it was determined that current policies are inefficient in preventing and mitigating dropout.

Keywords: drop-out, COVID-19, rurality, model, economic effects, higher education

INTRODUCTION

Higher education has been conceived as a way to overcome social inequalities in developing countries (Marginson, 2011; OECD 2015; Herbaut and Geven, 2020; Guzmán et al., 2021a), hence, the interest of the states to intervene through the development of public policies with the aim of facilitating access, permanence and timely graduation of students at this level of education (Herbaut and Geven, 2020). That said, it is recognised that there are a number of population groups where social inequalities are more pronounced, especially those located in rural areas. This was confirmed by the United Nations when it stated that by the year 2020, 80% of the world's poor people would live in rural areas, and that in some countries the majority of the population would be concentrated in rural areas (United Nations, 2021).

In this context, public policies developed by states to facilitate access, retention and timely graduation of students in rural areas of developing countries, especially in developing countries, have been based on a paradigm in which the state assumes the role of funder of students (Marginson, 2016; McCowan, 2016). In this way, the State finances tuition under the form of educational credits or tuition fee exemptions, either totally or partially, where in the latter case, it relies on the Higher Education Institutions (HEI), the family or the student him/herself to cover the totality of the expenses.

Although there has been a generalised concern on the part of states regarding access, retention and timely graduation in higher education for rural populations, it is necessary to recognise that the strategies used for financing bring with them multiple effects for the actors at the educational level (student and family, HEI, State, among others), especially when there are high dropout rates in this student population, as exemplified in the Colombian case where the Ministry of National Education (Ministry of National Education, 2009) indicated that the dropout rate per cohort was close to 50%. Taking into consideration what was previously stated added to the context of the COVID-19 pandemic, it has been identified as a catalyst for problems at the educational level (e.g: Pokhrel and Chhetri, 2021; Dennis, 2020; Mailizar et al., 2020; Abbasi et al., 2020; Sobaih et al., 2020; Favale et al., 2020; Basilaia and Kvavadze, 2020; Kerres, 2020; Wang et al., 2020), including dropout levels among the most vulnerable populations (Guzmán et al., 2021a; United Nations, 2020), Hence, a critical analysis of the economic effects of this pandemic on education stakeholders related to the drop-out phenomenon is required.

In this sense, both public policy makers and researchers at the higher education level have not analysed in detail, either before or during the pandemic, the financial problems caused by drop-out in rural populations for students and their families, HEIs and the state, within the framework of public policies for financing higher education. This is largely due to the lack of robust models that allow the valuation of the economic effects of dropout, as well as the general interest of the academic community in analysing other aspects of the COVID-19 pandemic for this student population, such as the use of and access to technological resources (Cameron-Standerford et al., 2020).

In this context, the analysis of the economic effects of dropout in the framework of public higher education funding policies, prior to and during COVID-19, has been characterised by being clustered at the national or state level (e.g.: Sahoo et al., 2021; Dennis, 2020; World Bank, 2020; Denning, 2017; Richburg-Hayes et al., 2015; Bettinger, 2015), or, cases of individual studies in an HEI (e.g.: Bernal, 2018; Barragán and Rodríguez, 2015), for which there is not a panorama reflecting the realities of rural students. In addition, the improvements developed are not usually of a holistic nature and integrate the actors at the educational level, but are characterised by being individualised for each of the actors (student and family, HEI or State), especially in the field of modelling (e.g: Cristia and Pulido 2020; Moreno et al., 2019, Sosu and Pheunpha 2019; Hällsten 2017; Fack and Grenet 2015; Rubin 2011; Qu, 2009).

Considering the public policies of access to education, the phenomenon of dropout in rural populations, the effects that COVID-19 has had on the educational level, the fragmentary analysis of the economic effects of dropout and the lack of models that integrate the actors of the educational level, especially in rural populations, the aim of this article was to model the economic effects of rural student dropout at the higher education level for students and families, HEIs and the state, based on public policies for access to higher education, in the pandemic and post-pandemic scenario. For the operationalisation of the proposed model, a set of undergraduate training programmes in Colombia was taken as a reference.

The selection of Colombia for the operationalisation of the model is due to the various social disparities experienced in the country, which are directly or indirectly related to the level of education, and which have been catalysed by COVID-19 especially in rural areas, such as: high levels of poverty, low employability, poor accessibility to basic services such as electricity and internet, unequal access to information and communication technologies, among others. This was made evident in the Agronet Report (2020), where in rural areas 44,362 people became newly unemployed and 108,000 unemployed 2 weeks after the declaration of the national health emergency, and the contraction of the economy has affected the rural population, leading to a generalised decrease in food prices and, therefore, in the income of this population.

With the fulfilment of the objective, various contributions are made to the analysis of the problem of drop-out in the rural student population. Firstly, this article complements the advances in the understanding of both the economic effects of dropout in the framework of COVID-19 and its modelling, as it concerns all higher education actors; this complementation is based on the methodological contribution in terms of dynamic modelling, adding a holistic perspective to the analysis in relation to rural populations, as well as a more robust model for the understanding of the studied phenomenon. Secondly, this article provides feedback to the managers of public policies on the financing of higher education based on credit and tuition fee waivers with the aim of maintaining, modifying or eliminating them, in order to mitigate to some extent the financial consequences of dropout and overcome the social inequalities experienced in rural areas of developing countries.

Thirdly, the model makes it easier for direct and indirect users of educational access policies to make informed decisions by recognising the economic effects of dropping out.

This article is divided into five sections. The first one was the introductory overview and justification; the second concerns the theoretical framework and proposed model, which presents the conceptualisation of dropout, the documented economic effects on education stakeholders and concludes with the proposed dynamic model; the third concerns the methodology used for the fulfilment of the objective and for the operationalisation of the model through the use of system dynamics; the fourth reports on the design of the model and the results of the computational simulations developed; and the fifth discusses the main findings and incorporates the conclusions.

THEORETICAL FRAMEWORK AND PROPOSED MODEL

Drop-Out

Student drop-out as an educational phenomenon does not have a single meaning, but rather there are multiple definitions in the literature and public policies. This is a result of the complexity of this phenomenon which involves several levels of analysis as stated by Guzmán et al. (2021a), Guzmán et al. (2021b) and Kehm et al. (2019). In this sense, this variety of conceptualisations allows for a broader understanding of dropout because it links different aspects, variables, representations, models and effects of dropping-out.

Taking into consideration what was previously stated, the meanings can be categorised as theoretical and operational. In the case of the theoretical ones, they obey those provided by the academic community in which the interaction of multiple explanatory variables of the drop-out phenomenon is contemplated, such as the one given in the framework of the ALFA GUIA project in which this phenomenon was defined as "the cessation of the relationship between the student and the training programme leading to the award of a Higher Education degree, before achieving the degree. It is also an event of a complex, multidimensional and systemic nature, which can be understood as cause or effect, failure or reorientation of a training process, choice or obligatory response, or as an indicator of the quality of the education system" (Proyecto ALFA GUIA DCI-ALA/2010/94, 2013, p. 6); or, as explained by Zuñiga (2006), the student's decision to terminate his or her training process in advance of its completion.

The second category corresponds to the operational meanings developed by public policies, which facilitate the measurement of drop-out at the higher education level, as well as the evaluation and monitoring of some variables. In the Colombian case, this definition is given according to the time in which a student was not linked to the HEI, being considered a deserter if he/she has not legalised enrolment in two consecutive academic periods, and if he/she has not graduated or dropped out (Ministry of National Education, 2009). This article falls into the latter category, as it facilitates time-dependent counts, allowing the economic effects of the phenomenon to be modelled and assessed.

Recognising drop-out is a multifactorial circumstance and based on the nature of the objective of this article, its study is based on an economistic approach which seeks to understand which socio-economic variables influence students' decision to end their education process early, as well as the effects of this decision on higher education stakeholders. In this respect, the preference of various authors for investigating the socio-economic context of the student, the identification and treatment of this type of variable as presented in the studies developed by Rodríguez-Hernández et al. (2020), Palacio Sprockel et al. (2020), Adrogue and García (2018), De Clercq et al. (2017), Erola et al. (2016), among others. This same situation is present in the study of dropout in rural higher education, as evidenced in the works of (Cook et al., 2021; Mncube et al., 2021; Guzmán et al., 2021b; Castleman and Meyer, 2020; Ramírez et al., 2020; Lewine et al., 2019; Muñoz, 2013; De Hart and Venter, 2013; Qu, 2009).

However, the literature concerning the economic effects of drop-out for higher education stakeholders has not been widely addressed, especially from the perspective of public policies on access, retention and timely graduation. Thus, Herbaut and Geven (2020) indicated that in recent years this type of financial consequences have received increasing, but still insufficient, attention. Studies have shown that this type of policy has the capacity to reduce the drop-out rate and increase the graduation rate in the medium term, representing a higher level of indebtedness for students and their families, as well as a lower stranded cost for HEIs. However, from the approach of these policies it has also been observed that in the long term they lose the capacity to reduce this rate once the expected result of the implementation of public policies of access to higher education based on credit has been achieved (Mayer et al., 2015). In the case of HEIs, research has quantified the stranded costs of drop-out and the effects they have on their substantive functions (e.g.: Barragán and Rodríguez, 2015). Finally, the economic effects of this phenomenon on states have been linked to its potential to mitigate the improvement in the income of the population (Cristia and Pulido 2020) and its inability to increase productivity (Atchoarena et al., 2005; McMahon, 2010), lacking an analysis of higher education access policies that are implemented for specific educational populations.

Based on this theoretical framework, the economic effects of drop-out on students and their families, HEIs and the state are presented below in the context of public policies on access to higher education.

Economic Effects of Drop-Out on the Student and Family

Human Capital Theory, consolidated by Becker (1962), suggests that the student and his family are rational actors who base their decision to invest in education on comparing the costs (e.g. tuition values, possible sunk costs, etc.) and the monetary benefits (e.g. wages, rental income, etc.) of higher educational achievement (Marginson, 2019). The student and his or her

family will make the decision to continue their education according to the short, medium and long term economic benefits for them (Marginson, 2019; Didenko, 2015 cited by; Gruzina et al., 2021). Thus, they will make a joint decision to enter higher education, comparing the cost of tuition fees at HEIs, the possibilities of financing with their own resources (Qu, 2009) or the possibility of financing with public or private entities (Nizar and Nazir, 2020; Suhendra, 2020). In this way, of the total number of applicants (high school graduates), only those students who have the financial capacity or who perceive some benefit or a better opportunity cost of higher education in the terms expressed in the Human Capital Theory will be admitted (Chen and DesJardins, 2008; Chen and DesJardins, 2010; Özdoğan, 2021).

In other words, it is understood that the more academic periods a student spends in higher education, the greater the investment made, and consequently in the event of the student dropping out, the higher the investment will be if the student decides to interrupt the process due to the influence of individual variables, (Arias-Velandia et al., 2018; Behr et al., 2020), socioeconomics (Contreras, 2018; Palacio Sprockel et al., 2020; Schmitt et al., 2020), academics (Guzmán, et al., 2020; Heidrich et al., 2018) and institutional variables (Armstrong et al., 2018; Choi and Kim, 2018), as well as the higher the stranded cost will be for the student or the student's family (Larroucau, 2016; Laaser, 2018). In addition, by resorting to credits originating in public policies, the dropout student and his or her family will incur interest payments, which represents an increase in these costs (Moreno et al., 2019). Due to the existence of drop-outs, it is expected that the number of students enrolled in HEIs in this cohort will decrease (Barragán and González, 2017). Finally, the lack of timely graduation of students represents a major stranded cost when students drop out of school (OECD, 2017).

However, the literature has shown the impact caused by the COVID-19 pandemic on the graduation rate of rural high school graduates, represented in a lower number of students with this academic level and triggering a social crisis (Chatterji and Li, 2021; United Nations, 2021) as a result of not being able to attend classes and not having access to adequate Information and Communication Technologies to ensure their training process (Expósito and Marsollier, 2020; Mncube et al., 2021). On the other hand, COVID-19 has decreased the rate of access to higher education, due to the high costs that the educational level represents for the student and his family, as a result of the economic crisis and the social emergency, since they cannot cover the tuition and other costs associated with the educational level either with their own resources or with credits (Potra et al., 2021; United Nations, 2021). In addition, COVID-19 has led to a decrease in student retention in higher education, which implies a higher drop-out rate (Cruz et al., 2020; Alyoussef, 2021; Guzmán et al., 2021b; Delnoij et al., 2021; López-Aguilar and Álvarez-Pérez, 2021; Teuber et al., 2021).

Economic Effects of Drop-Out in HEIs

As in the case of students and their families, drop-out at the higher education level has a direct impact on the finances of HEIs by generating economic instability, especially in those that depend on tuition fees (private and mixed economy HEIs), and in the case of public HEIs, dropping out is seen as a waste of public funds (Choudhary and Hammayun, 2015; Esteban et al., 2017; Becerra et al., 2020).

In this sense, HEIs with a high drop-out rate have high opportunity costs, as they lose out on tuition fees for a number of periods not taken (Barragán and Rodríguez, 2015; Améstica-Rivas et al., 2020). Thus, it is presumed that the more academic periods a student attends, the lower the opportunity cost for HEIs will be. The quantification of the opportunity cost to HEIs resulting from dropping out has been of great interest in developing countries in view of the difficulties faced by institutions in ensuring their sustainability, particularly in developing countries. An example of this is the work developed by Bernal (2018) in which this cost was estimated for a Colombian HEI for the period 2011 to 2014, which amounted to 9,430,866,735 pesos (equivalent to USD 2,468,177), or the work developed by Améstica-Rivas et al. (2020) who estimated that the opportunity cost for Chilean HEIs was USD 23,000,000 for those students who had scholarship credits.

In addition to calculating this opportunity cost, the literature recognises that the higher the drop-out rate, the more difficulties HEIs face in the development of their substantive functions (teaching, research and social outreach), since they have fewer resources available for hiring teachers, training them, developing research projects, disseminating their results and managing links with the external sector, among other things (Voelkle and Sander, 2008). Consequently, the opportunity costs of student drop-out have a direct impact on the quality conditions of the programmes, as well as on the reputation of HEIs, leading to a decrease in the access rate to HEIs (Ortiz and Dehon, 2013; Basilaia and Kvavadze, 2020).

In contrast to the stranded cost of untimely graduation for the student and his/her family, for HEIs this becomes an unconsidered income which, although not directly related in the literature, can to some extent reduce the opportunity cost and the difficulties of drop-out in the substantive functions.

Economic Effects of Drop-Out for the State

In the case of the state, the economic effects of drop-out have been addressed in two ways. The first concerns the consequences on the economy in the short, medium and long term, this being the main line, where studies have indicated the loss of income and purchasing power by the student population who drop-out, which results in lower productivity for the State represented in a stagnation or decrease in Gross Domestic Product (Chetty et al., 2020; Hanushek and Woessmann, 2020); and the second, which concerns the monetary quantification of the drop-out in which this article is focused.

Thus, in the case of this second stream, previous research recognises that states, when they assume student fees, especially in public HEIs, assume a stranded cost (Choudhary and Hammayun, 2015), as stated by the World Bank (2020) " (. . .) students who do not graduate on time (or at all) when they receive public funding consume valuable fiscal resources, which in many cases are not recoverable" (p. 14). On the other hand, and based on the educational credit policy to facilitate access to higher

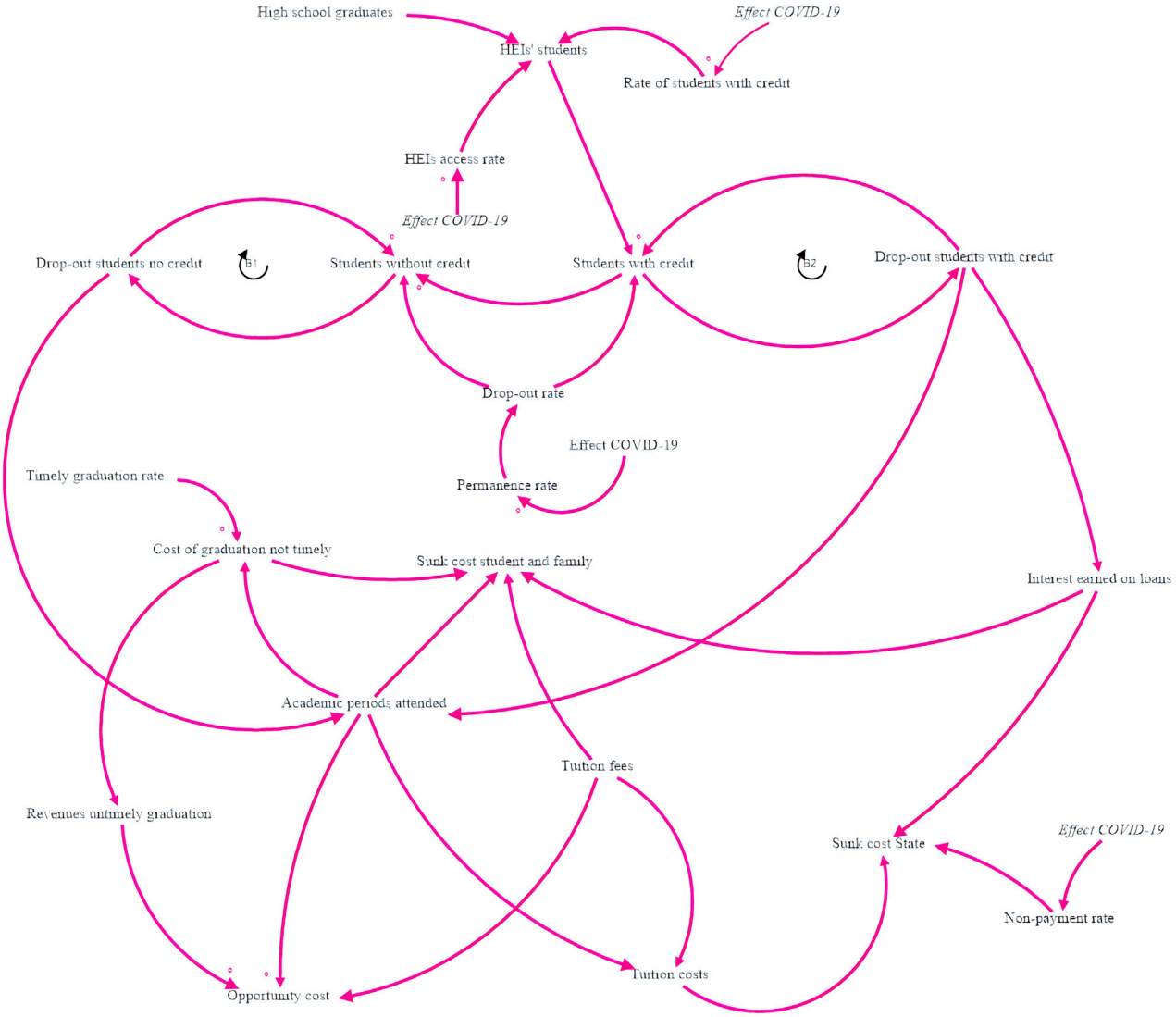

FIGURE 1 | Causal Loop Diagram. Note: B indicates that it is a balance loop. For the purposes of this diagram, positive relationships have no loadings on the connectors.

education, the states that implement it accept the risk of non-payment by students and their families (Moreno et al., 2019), which leads them to accept such a loss of resources, implying a de-financing of state programmes to grant credits (Améstica-Rivas et al., 2020; López-Aguilar and Álvarez-Pérez, 2021).

Proposed Dynamic Model

Based on the economic effects of drop-out for the student and family, HEIs and the state, as described in the preceding sections, a Causal Loop Diagram or dynamic hypothesis was designed (see **Figure 1**), in which the existing relationships between the variables of the system are synthesised.

High school graduates who are the potential population for admission to higher education undergo the admission process and, once accepted by a HEI, may choose to pay their tuition fees by means of a loan or use their own and their family's resources. Hence, two causal loops are formed. The first one (B1), relates students who did not have access to credits, who are affected by a drop-out rate which, being high, will represent a higher number of non-credit drop-outs and consequently a lower number of students. The second (B2) represents credit drop-outs who, like non-credit students, are affected by a drop-out rate, resulting in an increase in credit drop-outs. The higher the drop-out rate in either case, the lower the retention rate and the higher the stranded cost for the student and his/her family. The higher the number of academic periods completed, the higher the stranded cost due to the impact of variables such as the cost of untimely graduation, tuition fees and interest on credits.

As far as the opportunity cost of HEIs is concerned, this is determined by the cost of untimely graduation, given that the higher the number of academic periods taken in addition to

those established in the study plan, the lower the cost will be, generating unforeseen income for the HEI, provided that they are private. In the case of public HEIs, the cost of untimely graduation represents a detriment to the state. On the other hand, the earlier students drop-out, i.e. the earlier they have completed fewer academic terms, the higher the opportunity cost.

In the case of the stranded cost of the state, this will be the result of the value of the tuition fees of students who drop out of public HEIs and the rate of non-payment of credits granted in the framework of public policies for access to higher education. Finally, COVID-19 influences multiple variables that cause the behaviour of the system to vary, such as the number of new entrants, the survival rate and the drop-out rate, among others, thus intensifying the economic effects of drop-out on the actors in the higher education system.

METHODOLOGY

In order to fulfil the objective of this article, and to operationalise the proposed model (**Figure 1**), System Dynamics was used as the main modelling and simulation technique. This technique is borrowed from control theory, more specifically, from feedback systems and is distinguished by its ability to deal with nonlinearity, time delay, and multi-loop structures of complex and dynamic systems (Bala et al., 2017). Thus, System Dynamics allows us to analyse the structure of a system, the interactions between its elements and the behaviours derived from these interactions as a function of time (t) (Forrester, 2013).

That said, for the formal construction of the model, the procedure suggested by Bala et al. (2017) was followed, which consists of four stages. The first corresponded to the construction of the flows and levels diagram, understood as the physical structure of the system, in which the levels represent its condition for a defined t, and the flows are the changes resulting from the interaction of multiple variables that modify the initial condition of the system. This diagram, apart from representing the structure, reproduces the system of differential equations, thus achieving the simulation of the dynamic behaviour. The second structured the system of differential equations that represent the cause-effect relationships of the variables. The third established the parameters, assigning numerical values or equations with particular values to the variables of the model. These parameters allow the plausible behaviours of the system to be generated. The fourth, tested the consistency of the model, with the objective of verifying that the results obtained by the simulation of the model represented the behaviour of the system.

In the case of stage three, we used historical data from the National Higher Education Information System (SNIES), the System for the Prevention of Drop-out in Higher Education (SPADIES) and the MEN. In the case of SNIES, information related to undergraduate programmes (technical, technologist and professional) taught in rural areas was extracted, as well as the evolution of first semester enrolments in these programmes and the annual cost of enrolments. In total, the 20 training programmes with the highest number of enrolled students from rural areas for the year 2019 were included, being 25% technical training, 25% technological training and 50% vocational training (see **Supplementary Material Table S1**). From SPADIES, we extracted the number of students per training programme who accessed a credit with ICETEX (2021) in the medium and long-term modality and the survival rate of each of the training programmes; this rate represents the proportion of students in each semester who remain enrolled (Ministry of National Education, 2009). Finally, from the studies developed by the MEN, the impact of COVID-19 at the higher education level was determined. The period of observation of the data was from 2015 to 2020, whose history was crucial for the estimation of parameters and validation of the model proposed in this article in terms of structure and behaviour.

With the model and data, the model was run to assess the economic effects of rural student drop-out on higher education stakeholders. To this end, the simulations described in **Table 1** were carried out.

Finally, the computational work on the model and the simulations were implemented in Stella Architect Software version 1.9.5. The following model settings were taken into account: $t_i = 0$, $t_f = 18$, $\Delta t = 1$, units of t in academic periods and Euler as the selected integration method. The t_i represented year 2015 first semester and the t_f year 2024 first semester as well.

RESULTS

In accordance with the methodology, the following presents firstly the formal construction of the model, and secondly the results of the simulation scenarios.

Forrester Diagram and Mathematical Model

Based on the dynamic hypotheses (see **Figure 1**), the Forrester diagram and the mathematical model were designed considering the flow, level and auxiliary variables necessary to replicate the drop-out phenomenon (see **Supplementary Material S2**). With the design of the diagram and the base model presented below, the corresponding adaptations were made to run the simulations, since the training programmes in the sample have different numbers of academic periods that students must complete to graduate (see Guzmán et al., 2021b; Guzmán et al., 2021c; Guzmán et al., 2021d). Thus, the base model was divided into five subsystems.

Subsystem One

The first subsystem corresponded to the behaviour of enrolment, retention, dropout and graduation of rural students at the higher education level. This starts with first semester enrolment, which is affected by the number of available bachelor graduates in the catchment area of the HEI and the first semester enrolment rate. Subsequently, enrolled students must make a decision at the end of each academic period whether to continue their education or drop out, and this is repeated until the group of students

TABLE 1 | Computer simulations.

Code	Simulation
SIM-1	Baseline behaviour of the model with initial parameters
SIM-2	System behaviour in the absence of the COVID-19 pandemic
SIM-3	Consolidation of the public policy of tuition fee waivers in public HEIs as a result of the social crisis resulting from COVID-19

graduates, thus forming the group of graduates. The equations describing the behaviour of this subsystem are presented below. It should be noted that, for all subsystems, N symbolically represents the semester the student is studying in a specific t, and n the number of academic periods to be simulated.

$$B_t = (B_{t-1} + BRG - G)\,dt$$

$$EMN_t = [EMN_{t-1} + (EMN \times (TSN - ECOVID_D)) - (EMN \times (TDN + ECOVID_D))]\,dt$$

$$EDN_t = [EDN_{t-1} + (EMN \times (TDN + ECOVID_D))]\,dt$$

$$G_t = [G_{t-1} + (EMN \times TSN)]\,dt$$

$$TD_t = \sum_{t=0}^{n} EDN_t\,dt$$

The previous set of equations operates as long as the technical condition of non-negativity are found $ECOVID_D$, in other words, $ECOVID_D \geq 0$. For the case of FN and the development of the simulations, 0.01 was taken as the value resulting from the estimates of the Ministry of National Education.

$$ECOVID_{Dt}\begin{cases} ECOVID_D = 0\ \ dt & si\ ECOVID_D = 0 \\ ECOVID_D - FN\,dt & si\ ECOVID_D > 0 \end{cases}$$

On the other hand, by not considering academic periods prior to the observation period $EM1_t$, This is understood as the academic period in which incoming students join, so this is not defined in terms of EMN_t, but as presented below. It should be noted that, $EM1_t$ is directly affected by the absence or presence of the effect of COVID-19, it should be noted that negative values in the $ECOVID_A$ variables mean that the HEIs increased the number of students when comparing the years 2019 and 2020 so FN adds, otherwise, if positive, they denote a decrease in the number of students, so FN substracts.

$$EM1_t = [EM1_{t-1} + ENI - (EMN \times TSN) - (EMN \times TDN)]\,dt$$

$$ENI_t = \begin{cases} ENI_{t-1}\,dt & si\ ECOVID_A = 0 \\ [ENI_{t-1} - (ENI \times ECOVID_A)]dt & si\ ECOVID_A \neq 0 \end{cases}$$

$$ECOVID_{At} = \left\{ -\left(\frac{\sum EMN_{2020}}{\sum EMN_{2019}}\right) - 1 \right\} \pm FN\,dt$$

Subsystem Two

The second sub-system represented the enrolment, retention, dropout and graduation of rural students in one of the state programmes with respect to the financing of enrolment with educational credits. Recognising that each country has particular policies, a synthesis of the mathematical model that can be adjusted to different varieties of educational credits is presented, which, in the case of Colombia, are categorised as long and medium term.

$$EMNTC_t = [EMNTC_{t-1} + (EMNTC \times (TSN - ECOVID_D)) - (EMNTC \times (TDN + ECOVID_D))]\,dt$$

$$EDNTC_t = [EDNTC_t + (EMNTC \times (TDN + ECOVID_D))]\,dt$$

$$GTC_t = [GTC_t + (EMNTC \times TSN)]\,dt$$

$$TDTC_t = \sum_{t=0}^{n} EDNTC_t\,dt$$

As long as the provided technical conditions of non-negativity are found, $ECOVID_D \geq 0$.

$$ECOVID_{Dt}\begin{cases} ECOVID_D = 0\ \ dt & si\ ECOVID_D = 0 \\ ECOVID_D - FN\,dt & si\ ECOVID_D > 0 \end{cases}$$

Now, for the observation period $EM1TC_t$, as it does not take into account previous academic periods and this is the period in which new students join, it has been defined as follows.

$$EM1TC_t = [EM1TC_{t-1} + (EM1TC \times TTC) - (EMN \times TSN) - (EMN \times TDN)]\,dt$$

Subsystem Three

The third sub-system describes the economic effects of dropout for HEIs. It is divided into three sectors. The first sector corresponds to the opportunity cost for HEIs, where the higher the number of dropouts in the first academic terms, whether credit or non-credit students, the higher the opportunity cost. For the quantification of this cost a time lag was used, recognising that once a student drops out, it is in the next academic term that the financial impact will materialise. This is represented in the following set of equations.

$$CON_t = f\ (x_t,\ x_{t-\tau},\ t)\,dt; t \geq t_0$$

$$x = CON_{t-1} + (EDN \times MATN)$$

$$COT_t = \sum_{t=0}^{n} CON_t\,dt$$

The second sector corresponds to the benefits or additional income resulting from untimely graduation, these are only quantified when part of the student population attends more academic periods than those established by the training programme; for the purposes of this study, only two additional academic periods were considered, although the model is adjustable to as many periods as required. The equations for this sector are described below.

$$BON_t = [BON_{t-1} + (EGT \times MATN)]\,dt$$

$$BOT_t = \sum_{t=0}^{n} BON_t \, dt$$

The third sector of this subsystem quantifies the financial effects of drop-out for HEIs. In this case C_IES_t takes negative values, it means that for a specific t the unanticipated revenue from untimely graduation was greater than the associated cost of drop-out. This is expressed as follows.

$$C\_IES_t = [COT_t - BOT_t] \, dt$$

4.1.4 Subsystem Four

The fourth sub-system refers to the financial effects of drop-out for the student and his/her family. This represents the stranded cost which is the result of the cumulative value of tuition fees paid by dropouts, the interest generated by educational credits and the cost of untimely graduation. This is shown in the following set of equations.

$$CHN_t = \begin{cases} [(EDN_t \times MATN) + BON_t + INT_t] \, dt & T\_IES = 0 \\ 0 & T\_IES = 1 \end{cases}$$

$$INT_t = [(EDNTC_t \times MATN) \times Ti_t] \, dt$$

$$CHT_t = \sum_{t=0}^{n} CHN_t \, dt$$

Subsystem Five

The fifth sub-system represents the financial effects for the state. In this case, a portion of dropouts will not be able to cover the debts of their educational credits, and this portion is likely to increase due to the effects of COVID-19. Furthermore, in the case of public HEIs where the state bears the cost of tuition fees, drop-out represents an additional cost. This is described by the following set of equations.

$$CEN_t = \{[((EDNTC_t \times MATN) + INT_t) \times (Tnp + ECOVID_E)] + (EDN_t \times MATN \times T\_IES)\} dt$$

$$CET_t = \sum_{t=0}^{n} CEN_t \, dt$$

The above set of equations operates, as long as the provided technical conditions of non-negativity for $ECOVID_E \geq 0$, and binary assignment for the case of T_IES_t are found as follows

$$ECOVID_{Et} \begin{cases} ECOVID_E = 0 \;\; dt & si \; ECOVID_E = 0 \\ ECOVID_E - FN \;\; dt & si \; ECOVID_E > 0 \end{cases}$$

$$T\_IES_t \begin{cases} T\_IES = 0 \\ T\_IES = 1 \end{cases}$$

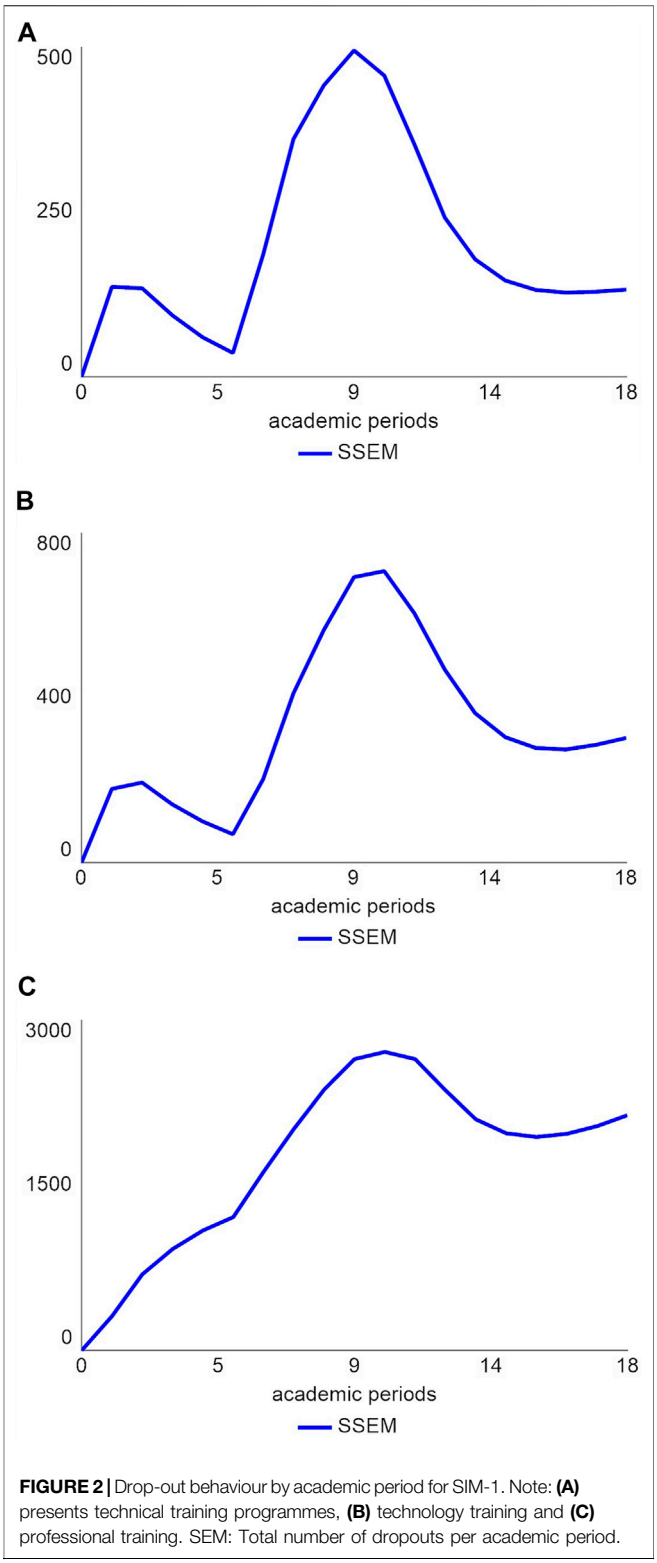

FIGURE 2 | Drop-out behaviour by academic period for SIM-1. Note: **(A)** presents technical training programmes, **(B)** technology training and **(C)** professional training. SEM: Total number of dropouts per academic period.

Operationalisation Results of the Model and Simulations

With regard to the simulations, in the case of SIM-1, which reflected the reference mode, as for example the behaviour of the system under the initial parameters, it was found that in the case of the technical training programmes from the second semester of 2019, 2019-2 ($t = 9$), and prior to COVID-19, there was a decrease in the number of students enrolled from 496 to 396 students for the period 2020-1 ($t = 10$) and 330 for 2020-2, according to the developed prospective scenario, the five

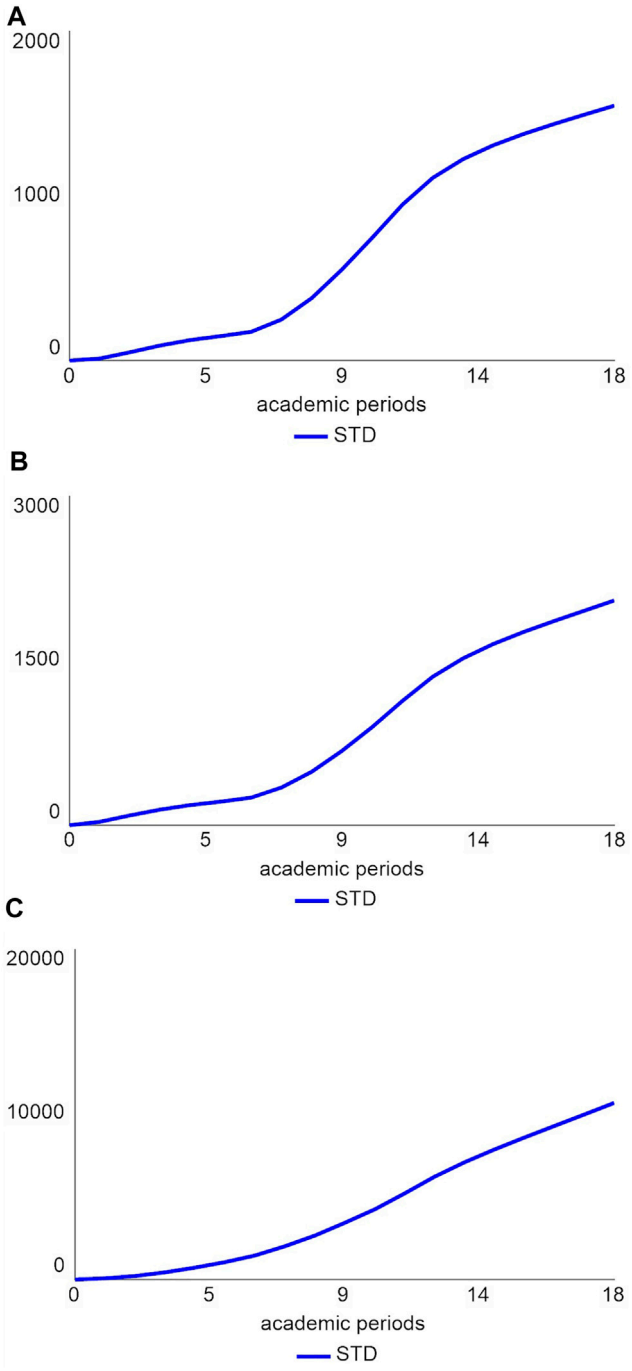

FIGURE 3 | Drop-out behaviour for SIM-1. Note: **(A)** presents technical training programmes, **(B)** technological training and **(C)** professional training. STD: Total number of dropouts per *t*.

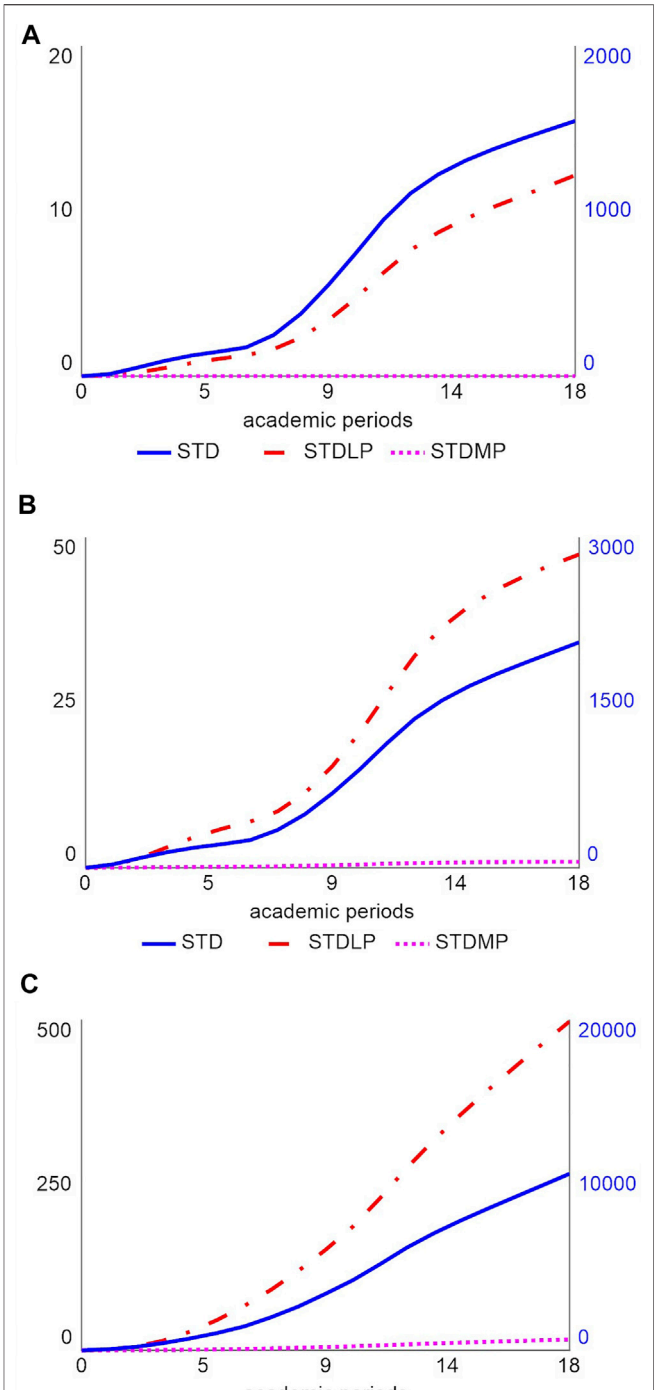

FIGURE 4 | Drop-out behaviour by type of academic credit for SIM-1. Note: **(A)** presents technical training programmes, **(B)** technological training and **(C)** professional training. STD: Total number of dropouts per *t*. STDLP: Total number of dropouts with long-term credits per *t*. STDMP: Total number of dropouts with medium-term credits per *t*.

training programmes in the sample are expected to have 312 students enrolled for the period 2024-1 ($t = 18$). In the case of technological and vocational training programmes, the decrease in students began with the onset of the pandemic. Thus, in the case of the former, 709 students were enrolled at $t = 10$ and 606 were enrolled at $t = 11$; in the case of the latter, 2,720 students were enrolled at $t = 10$ and $t = 11$ 2,650. Now in relation to the prospect, of the number of enrolments for the period 2024-1 for the technological programmes ($n = 5$) it was estimated that

there will be 303 students enrolled and for the vocational programmes ($n = 10$) 2,140. **Figure 2** shows the enrolment behaviour for the three types of training programmes. In addition, **Supplementary Material Figure S1** shows the enrolment behaviour for each of the academic periods by type of programme.

In terms of student drop-out rates for the technical, technological and vocational training programmes in the sample, before the start of the pandemic there were 747, 330 and 4,250 drop-outs respectively (see **Figure 3**), as a result of the effect of COVID-19, it was estimated that for the period 2024-1 ($t = 18$), 803 students enrolled in technical training programmes, 1,720 in technological training and 6,450 in vocational training will drop out, which represents an increase in the total number of dropouts of 7.4%, 421.12% and 151%, respectively. In the **Supplementary Material Figure S2** presents the drop-out behaviour for each of the academic periods by type of programme.

However, with regard to the number of students with academic credits who drop out, it is characterised by being low in comparison with the number of total dropouts from the training programmes under study, which can be explained to a large extent by the low rate of access to educational credits by the rural population. In this sense, the simulation for $t = 18$, allowed to establish that for technical training programmes $12.2 \approx 13$ students will have dropped out with educational credits, technological $48.4 \approx 49$ and professional $515.4 \approx 516$. **Figure 4** shows the comparison between the number of drop-outs from training programmes and those who accessed an academic credit.

Regarding the economic effects of drop-out for the actors in the education system, the simulation showed that for the five technical training programmes for the period 2019-2 ($t = 9$), it means that before the start of the pandemic, they had a drop-out cost of 494,000,000 Colombian pesos (USD 130,768.37), students and their families had a stranded cost of 694,000,000 Colombian pesos (USD 183,711.03), and the state had a non-payment cost of nearly 69,300,000 Colombian pesos (USD 18,344.63). It was also estimated that by the year 2024-1 ($t = 18$) the total cost of drop-out for the training programmes will be 7,590,000,000,000 Colombian pesos (USD 2,009,173.95), for the family and the student 7,560,000,000,000 Colombian pesos (USD 2,001,232.55), and for the State 1,380,000,000 Colombian pesos (USD 365,304.35).

In the case of the five technological training programmes, the drop-out costs for t = 9 were 1,280,000,000 Colombian pesos (USD 338,833.02), for the students and their families 1,600,000,000 pesos (USD 423,541.28), and for the state 128,000,000 Colombian pesos (USD 33,883.30). In turn, for this same type of programme for $t = 18$ it was calculated that the cost of the drop-out phenomenon will be 13,500,000,000 Colombian pesos (USD 3,573,629.55), for students and families 13,600,000,000 Colombian pesos (USD 3,600,100.88), and for the State 2,470,000,000 million Colombian pesos (USD 2,470,000,000 million).

For the ten professional training programmes, the drop-out costs for $t = 9$ were 1,850,000,000,000 pesos (USD 489,719.60), for students and their families 2,750,000,000 Colombian pesos (USD 727,961.58), and for the state 141,000,000 (USD 37,324.58). From the simulation for $t = 18$ it was determined that the drop-out costs will be close to 25,000,000,000,000 Colombian pesos

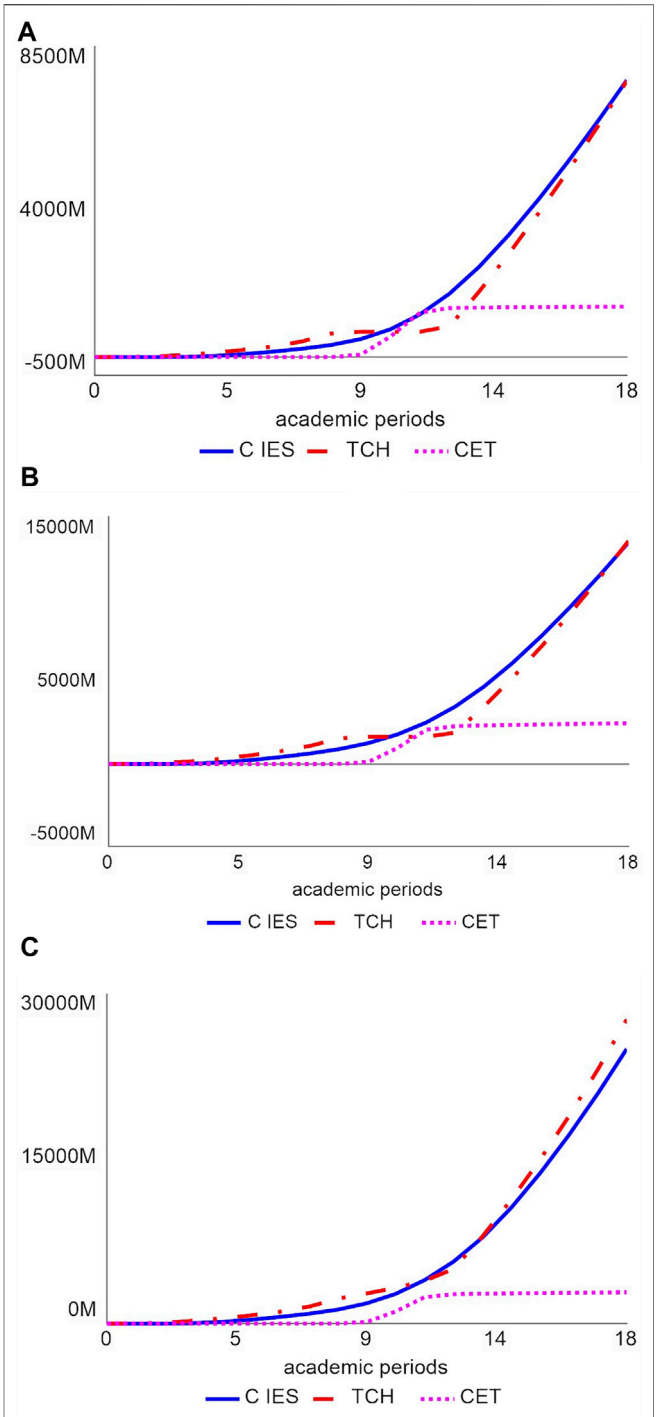

FIGURE 5 | Behaviour of the economic effects of drop-out for SIM-1. Note: **(A)** presents technical training programmes, (B) technological training and **(C)** professional training. C IES: Total cost for the training programmes under study per *t*. THC: Stranded cost for the family per *t*. CET: Total cost for the State per *t*.

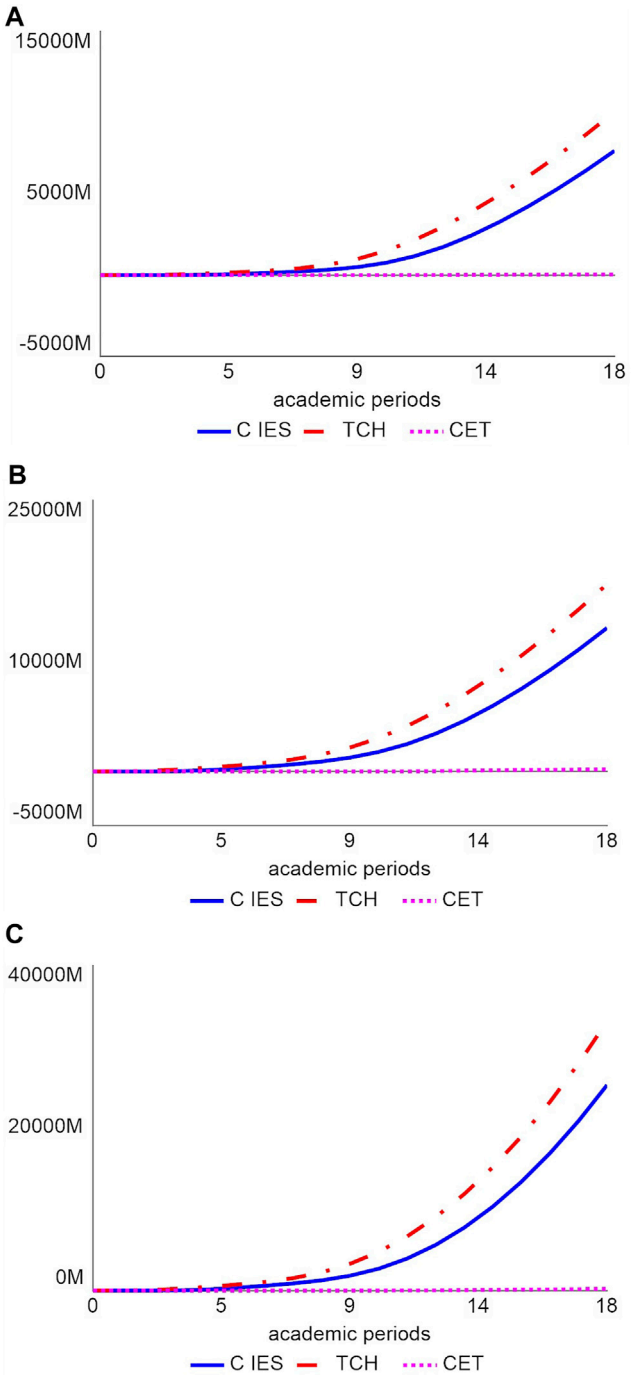

FIGURE 6 | Behaviour of the economic effects of drop-out for SIM-2. Note: **(A)** presents technical training programmes, **(B)** technological training and **(C)** professional training. C IES: Total cost for the training programmes under study per *t*. THC: Stranded cost for the family per *t*. CET: Total cost for the State per *t*.

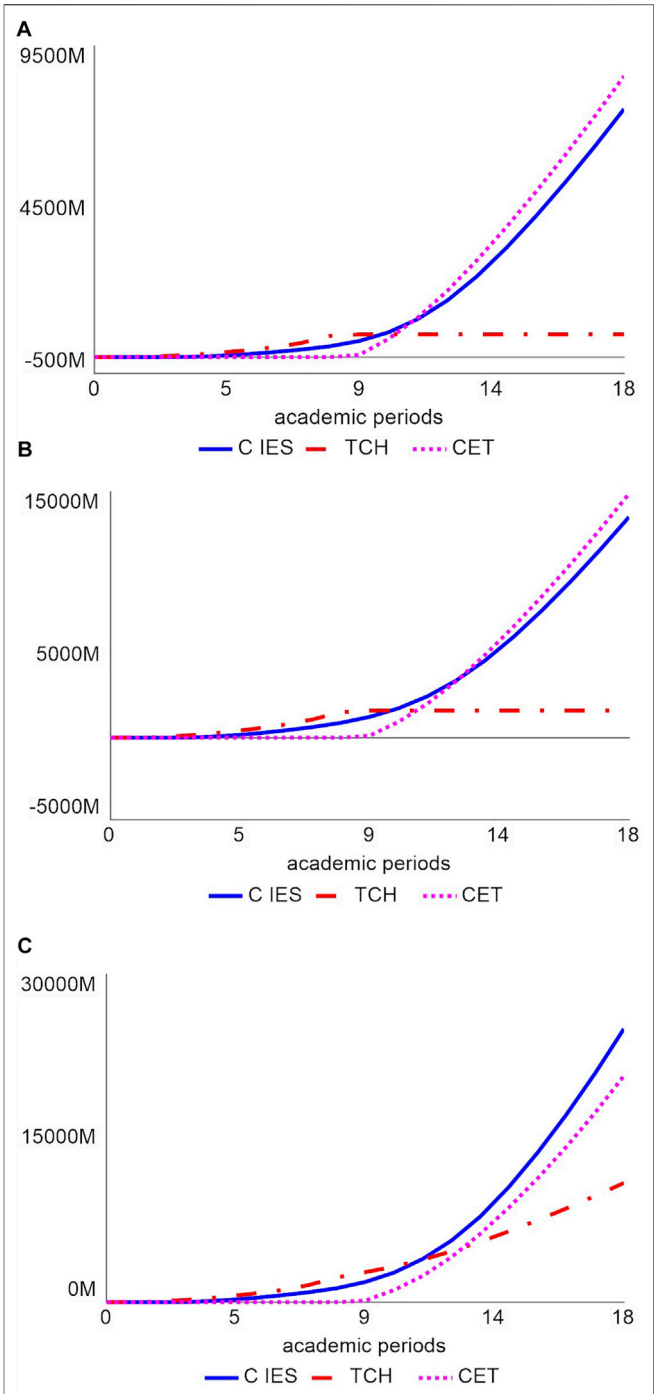

FIGURE 7 | Behaviour of the economic effects of drop-out for SIM-3. Note: **(A)** presents technical training programmes, **(B)** technological training and **(C)** professional training. C IES: Total cost for the training programmes under study per *t*. THC: Stranded cost for the family per *t*. CET: Total cost for the State per *t*.

(USD 6,617,832.50) for the professional training programmes, 27,700,000,000 Colombian pesos (USD 7,332,558.41) for the students and their families, and 2,850,000,000 Colombian pesos (USD 754,432.91) for the state. **Figure 5** shows the behaviour of the system in terms of economic effects. It should be noted that for the interval from $t = 9$ to $t = 11$ the Colombian state implemented the tuition fee exemption plan in

public HEIs (called "*Matricula Cero*"), hence for each type of programme there is an increase in the cost to the state.

SIM-2 assessed the possible economic effects of drop-out in the absence of COVID-19 and changes in the state's higher education access policies; firstly, it was determined that the number of drop-outs for the training programmes in the sample would increase, since in the absence of the pandemic there would not be a decrease in enrolments. Thus, for the five technical training programmes, the number of dropouts for $t = 18$ de 1,680; for the five technological training programmes it would be 2,140; and for the ten vocational training programmes it would be 10,900. That stated, in relation to the results obtained in SIM-1, the cost for HEIs would be similar, given that the additional income of HEIs from untimely graduation also increases. Thus, for technical training programmes, for $t = 18$, this cost would be 7,650,000,000 Colombian pesos (USD 2,030,254.78), for technological programmes it would be 13,200,000,000 Colombian pesos (USD 3,503,184.71) and for university training programmes it would be 25,300,000,000 Colombian pesos (USD 6,714,437.37).

On the other hand, in the absence of tuition fee exemption policies in public HEIs, the cost of drop-out should be assumed by the student and his or her family. Given the above for $t = 18$ the stranded cost for students and their families in technical programmes would be 10,000,000,000 Colombian pesos (USD 2,653,927.81), in technological programmes it would be 17,300,000,000 Colombian pesos (USD 4,591,295.12) and in vocational programmes it would be 33,100,000,000 Colombian pesos (USD 8,784,501.06). **Figure 6** shows the economic effects for actors at the higher education level.

Finally, in relation to SIM-3, this sought to evaluate the economic effects of the new policies of access to higher education implemented in the framework of COVID-19, which for the Colombian case has included the financing of the academic periods of students in public universities by generating the exemption of tuition fees. Thus in this simulation for the periods from $t = 13$ to $t = 18$ this free policy was extended. The results of this simulation show that the implementation of such policies changes the stranded cost from the student and his or her family to the state. In this sense, for the case of the technical training programmes in the sample, the cost of drop-out for the State would be 8,590,000,000,000 Colombian pesos (USD 2,279,723.99), in technological training it would be 14,900,000,000 Colombian pesos (USD 3,954,352.44) and in vocational training it would be 20,700,000,000,000 Colombian pesos (USD 5,493,630.57); for the student and his/her family the stranded cost would be 694,000,000,000 Colombian pesos (USD 184,182.59), 1,660,000,000,000 Colombian pesos (USD 440,552.02) and 10,900,000,000,000 Colombian pesos (USD 2,892,781.32), respectively. **Figure 7** shows the results of the simulation in terms of costs for the actors in the education system.

5 DISCUSSION AND CONCLUSION

As presented in the results section, the objective of this article was achieved, which was to model the economic effects of rural student drop-out at the higher education level for students and families, HEIs and the state, based on public policies for access to higher education, in the pandemic and post-pandemic scenario. However, it is necessary to recognise that the present study raises a new perspective on the phenomenon of drop-out and COVID-19, which had not been widely explored before this article, such as the economic effects for higher education actors, thus complementing previous studies that have analysed this relationship, such as those developed by Teuber et al. (2021), Cruz et al. (2020), Delnoij et al. (2021), Alyoussef (2021) and Cameron-Standerford et al. (2020).

The development of the model for the evaluation of the economic effects of drop-out was based on an integrative vision, distinguishing it from previous models that analysed these effects individually for each actor in the system, such as the works by World Bank, (2020), Bernal (2018), Barragán and Rodríguez (2015). On the other hand, this model makes it possible to link the consequences of COVID-19 on the rates of access to higher education, survival, drop-out and non-payment of educational credits. In addition to the above, the proposed model, based on System Dynamics, made it possible to understand and predict the economic effects of drop-out in terms of time t, brought about by the implementation, modification and elimination of public policies for access to higher education for the actors at this level of education. Although the article focused on rural areas, because of the intrinsic value of education for the development of these areas, especially in developing countries (Herbaut and Geven, 2020; Guzmán et al., 2021a; United Nations, 2021), the model is useful for any student population, HEI or state, as it seeks to represent the behaviour of the education level system.

With regard to the economic effects of drop-out in rural populations, it became evident that prior to the pandemic, in the case of Colombia, and more specifically of the training programmes in the sample, students and their families assumed a considerably high stranded cost, especially when, on average and according to UNDP statistics (2021), 50% of this population lived in monetary poverty and 27.9% in extreme poverty, with monthly incomes of less than 199,828 pesos (USD 53.17). However, during the pandemic and with the prospective scenarios after the pandemic, the financial relief achieved by public policies of temporary tuition fee waivers is insufficient, given that by 2024 the stranded cost for students and their families is estimated to be higher than the cost assumed by HEIs and the state. In the case of HEIs, COVID-19 has represented an exponential increase in opportunity cost in rural areas. Consequently, the pandemic has the singularity of directly affecting the development of the substantive functions of training programmes, due to the decrease in first-time enrolments and the increase in drop-out rates, which is in line with (Basilaia and Kvavadze, 2020). For the State, prior to the pandemic, the cost incurred was limited to non-payment of loans, however, the student population of the sampled programmes does not typically make use of educational loans so the non-payment rate may be high and not have a major impact on the credit-based student tuition funding programmes.

In the scenario in which COVID-19 had not occurred and affected the level of education in rural areas, the economic effects of drop-out would have intensified for students and their families, as well as for HEIs, because enrolment and its rates would have remained high for training programmes. Finally, for the simulation of the implementation of policies not based on educational credit but on tuition fees, the cost for the student and his or her family would be significantly reduced, as it would be assumed by the state.

Consequently, this article highlights the shortcomings of public policies on access to higher education for the rural student population, both in the pandemic and post-pandemic scenarios, as they do not have the capacity to mitigate the drop-out phenomenon, which contrasts with the results of (Mayer et al., 2015). For this reason, it is necessary to continue delving into the reasons why rural students drop-out, since socio-economic variables related to tuition fees do not fully explain the dropping out and high drop-out rates among this student population, and the policies developed by Western countries are insufficient to transmit the intrinsic and extrinsic benefits of the educational level, as stated by Guzmán et al (2021b).

Thus, the limitations of the study, such as the sample size of the training programmes and policies analysed, must be acknowledged. Finally, the academic community is invited to consider the model as a reference, to adjust and adapt it to learn about other economic effects on diverse student populations. On the other hand, decision-makers in the development of public policies for access, retention and timely graduation of higher education students in rural areas are urged to foresee the effects that the simulations presented with the proposed model will have on the different actors at the educational level.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: https://doi.org/10.6084/m9.figshare.16944235.v1.

AUTHOR CONTRIBUTIONS

AGR and SBM contributed to conception and design of the study. AGR organized the database. AGR performed quantitative and qualitative analysis. AGR and SBM wrote the first draft of the manuscript. AGR, SBM, and FC-V reviewed and edited. SBM and FC-V supervised both the development of the research and the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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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.2021.812114/full#supplementary-material

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Association Between Self-Regulation of Learning, Forced Labor Insertion, Technological Barriers, and Dropout Intention in Chile

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Early dropout and retention of students are critical problems in both secondary and higher education. Existing models that predict the intention to drop out require the incorporation of complex variables strongly related to student success, such as self-regulated learning. Moreover, new possible predictors have emerged in the context of a pandemic. This study set out to validate scales that measure the phases of self-regulation of learning in Chilean secondary school students and determine the association between self-regulation, forced labor insertion, technological barrier, and intention to quit during COVID-19. An instrumental design was carried out, where 251 students participated, and a cross-sectional predictive design with a sample of 171. Results showed adequate psychometric properties in assessment scales for self-regulation. Furthermore, the logistic regression model carried out to predict the dropout intention was significant. The final model showed that external causal attributions, planning self-evaluation, forced labor insertion, and technological barriers were significant predictors, achieving a success rate of 84.8%. In conclusion, although many factors are considered in dropout intention models, this study incorporated self-regulation skills that can be promoted in students and systematically integrated into school programs to help reduce dropout rates in secondary education, therefore contributing to a successful transition to higher education.

Keywords: intention to drop, self-regulation of learning, psychometric properties, secondary school, pandemic (COVID19)

INTRODUCTION

Permanent school dropout before completing formal academic studies is a critical problem in the educational systems of many countries, both at the secondary and higher education levels (Cambron et al., 2017). The transition to university requires the deployment of personal competencies, such as self-regulation, in order to adapt and face the new academic demands (van Rooij et al., 2018; Lobos et al., 2021). Compared to secondary school activities, university activities are less continuous, schedules are more flexible, there is less external control, relationships between teachers and students

are more distant, academic demands are more complex, and there is greater heterogeneity among classmates (Sáez et al., 2018).

Currently, researchers agree that the reasons for dropping out do not necessarily arise during the years of higher education. At this educational stage, the strategies deployed to prevent dropout could be late and are considered remedial. Therefore, it is a priority to understand dropout triggers and variables that influence this phenomenon during secondary education, in order to deploy preventive strategies at this educational level (Csók et al., 2020). Dropout rates are considered a quality indicator among educational institutions, due to their high individual and social costs (Antúnez et al., 2016). Socially, it reduces the chance for economic success, considering that we are living in a so-called knowledge society. The possibilities for a country to flourish economically are related to the educational level of its inhabitants. Individually, it affects psychological and physical health in a negative way. As well, it is related to fewer job opportunities, lower wages, increased substance abuse, increased likelihood of having legal or family problems in the future, and higher chance to depend on social assistance or other public assistance programs throughout life (Adelman and Szekely, 2016; Gaxiola et al., 2019; Koc et al., 2020).

The decision to drop out is preceded by the intention to leave. Dropout intention refers to all the thoughts related to the interruption of the permanence in the training cycle, which would lead otherwise to a completion degree (López-Angulo et al., 2021). Although some students drop out from high school without planning to return, in many cases students are involved in an ambivalent process that includes periods of disengagement and reengagement. Their intention to drop out is latent and is therefore a process. This process opens the chance to prevent their permanent disengagement from the school system (Cambron et al., 2017). One of the main priorities of the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2017) is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for everyone.

COVID-19 has generated an unprecedented situation in schools that puts this objective at risk. Students' permanence in the educational system has been negatively affected by technological barriers and forced labor insertion. Both factors are linked to socioeconomic conditions. The use of Information and Communication Technologies (ICT) has tried to minimize the risks of contagion, ensuring the continuity of the learning process. Nevertheless, this has led to the highlighting of social differences regarding the resources available for each family to meet the demands of synchronous classes, increasing exponentially the gaps between students (Tsolou et al., 2021).

The forced labor insertion of adolescents has been an alternative to financially support their families (Arenas et al., 2020). Empirical research has shown that when secondary school students drop out without completing their training and obtaining a degree, the chance of accessing elementary occupations that involve the performance of simple and routine tasks and the use of hand tools increases (Mussida et al., 2019). Forced labor insertion and technological barriers are socioeconomic factors that exclude and marginalize students both socially and educationally. Therefore, they are considered triggers for the intention to leave school prematurely, greatly increasing school dropout rates during pandemic (Mussida et al., 2019; Auger et al., 2020). Although literature considers individual and environmental factors in dropout, Tinto (Tinto, 1975) considered studies abandonment as an individual failure in a certain educational performance. Accordingly with this individual approach, dropout has been associated with a dysfunctional self-regulation of learning (hereinafter SRL) in the student (Bernardo et al., 2019; Bäulke et al., 2021). This means that abandonment of studies is also driven by a lack of cognitive skills (de la Fuente-Arias 2017; Bäulke et al., 2021).

SRL is a cognitive motivational learning system. It is based on a holistic view of the student development, including skills, knowledge, motivations, beliefs, and behaviors related to academic performance. The SRL includes different elements, such as planning an academic task, persistence in the face of frustrating results, and the adjustment of strategies to achieve success. Self-regulation approach represents autonomous, permanent, and effective ways of academic learning (Sáez-Delgado et al., 2021). The classic definition of SRL (Zimmerman, 2000) includes self-generated thoughts, feelings, and actions that are planned and cyclically adapted by the student to achieve personal learning objectives in a three-phase mechanism: (a) disposition, consisting in relevant activities for task analysis, goal setting, and planning; (b) performance, meaning that the task is performed and completed with monitored performance progress; and (c) assessment, which includes results evaluation and reflection (Panadero, 2017).

Researchers have suggested that SRL is related to high academic performance, enhancing the deployment of behaviors oriented to studies completion (Meyers et al., 2013; Cambron et al., 2017). Systematic (regular) cognitive work is critical for success, requiring self-regulatory processes that include study skills such as perseverance and various learning strategies (Meyers et al., 2013). Although there is plenty of theoretical and empirical evidence that supports the role of the SRL in academic performance success (Gaxiola et al., 2019; Romero et al., 2019), there is a lack of empirical evidence establishing associative links between self-regulation and dropout intention in secondary education. One of the possible explanations is the lack of valid and reliable instrument to assess self-regulation phases. A systematic review reported that available assessment instruments of this competence are validated mainly in Europe, having scarce evidence of validation in Latin America (López-Angulo et al., 2020). Also, they focus on the motivational components of self-regulation, excluding the other dimensions of the construct.

Two objectives where set for this research:

1) validate self-regulation phases scale in Chilean students of secondary education;
2) determine the association between self-regulation of learning, job placement, technological barriers, and intention to drop out in Chilean schoolchildren during COVID-19.

MATERIALS AND METHODS

Design

This research was carried out under a quantitative approach in two stages: (1) instrumental design and (2) cross-sectional predictive design.

Participants

The sample was non-probabilistic due to accessibility, including a total of 331 secondary school students from two cities in the Biobío region from Chile. The sample of the first stage (psychometric objective) of this study consisted of 251 students, where 189 (75.3%) were men and 62 (24.7%) were women with a mean age of 16.01 (SD = 1.37) years. The sample of the second stage of this study (association between variables objective) consisted of a total of 171 students, where 111 (64.9%) were men and 60 (35.1%) were women with a mean age of 15.96 (SD = 1.41) years. Inclusion criteria considered secondary school students attending Municipal Administration-dependent educational establishments. Additionally, schools had technical–professional and scientific–humanistic modes of teaching.

The sample of this study belongs to the E-D-C3 socioeconomic classification, which means that the monthly family income is below $600,000 Chilean pesos (751.29 USD as of September 29, 2021). The vulnerability index provided by the JUNAEB (National Board of School Aid and Scholarships; an organization that provides food aid and scholarships to students with the highest vulnerability index in the country) classifies these schools in a 98.7% index.

Instruments

Self-regulation of learning

Self-regulation of learning was assessed with the Scales used to measure the phases of self-regulation of learning, whose version in Spanish was validated in high school students in Ecuador (Sáez-Delgado et al., 2021). It consists of five scales whose internal consistency has been adequate in previous studies ($\alpha > 0.70$; $\Omega > 0.70$). (1) The Disposition for Study Strategies Scale measures the frequency of strategies used to analyze tasks, set objectives, and plan studies. It is one-dimensional and is formed by seven items. An item example is "I make a schedule to organize my study time." It uses a seven-point Likert type scale, where one means "never" and 7 "always." Each item heading/slogan is "before you start to study or perform an academic task, how often." (2) The Self-efficacy Scale for Willingness to Study assesses students' beliefs about their ability to use study preparation strategies. It is one-dimensional and is formed by seven items. An example of an item is "Have a list of academic tasks to do." It uses an 11-point Likert-type scale where 0 means "not sure at all" and 10 means "very sure." The heading for each item is "Before I start studying, to what extent do I think I am capable of." (3) The Execution Scale assesses the frequency of monitoring, cognitive, and help-seeking strategies that the student deploys during their performance on a task. It is formed by two subscales: the cognitive and metacognitive strategies subscale and the seek for help subscale. The cognitive and metacognitive strategies subscale is formed by 14 items. An item example is "I check my study progress." The seek for help subscale is formed by three items. An item example is "I know where to find people that can help me." It uses a seven-point Likert-type scale where 1 means "never" and 7 means "always". The heading for each item is "When I am studying or executing an academic task." (4) The Scale of Causal Attributions assesses beliefs about internal and external factors related to poor performance. It is formed by two subscales: a subscale about causal failure attributions related to effort and ability and a subscale of causal failure attributions related to external factors. The subscale about causal failure attributions related to effort and ability is formed by three items. An item example is "My study disorganization." The subscale of causal attributions of failure related to external factors has five items. An item example is "The lack of motivation of the teacher." It uses an 11-point Likert-type scale where 0 is "I don't think that is so" and 10 is "I'm pretty certain that it is so." The heading for each item is: "To what extent I believe that the reason of my performance failure is due to." (5) The Self-Assessment Study and Learning Scale measures the frequency of assessment and reflection strategies over the achieved results in any academic task. It is one-dimensional and has 14 items. An item example is: "I evaluate if I met my personal learning challenges." It uses a seven-point Likert-type scale where one means "never" and seven means "always." The heading for each item is "When I finish my study or an academic assignment, how often I check if."

The psychometric study about the properties of the Scales that measure the phases of self-regulation of learning in secondary school students in Chile is presented in the results that respond to the first objective of this research.

Dropout intention

A systematic review on abandonment intention revealed that no research used a full scale to assess this variable. Studies used related constructs although the majority created questions (Sáez-Delgado et al., 2020a). For this research, the abandonment intention construct will be understood as the estimated probability of permanently suspending studies by the student. This refers to the informed intention of students to abandon their formal academic training, considered as an early warning sign of real dropout (Bean and Metzner, 1985). To assess this variable, we elaborated a question with a dichotomous answer (yes/no): Related to the current pandemic situation, have you had the intention of dropping out from studies?

Forced labor insertion

For this research, the construct of forced labor insertion will be understood as any economic activity carried out by students who have not completed their training in secondary school (ILO, 2017). To assess this variable, we elaborated a question with a dichotomous answer (yes/no): Related to the current pandemic situation, have you worked to contribute economically to your family income?

Technological barriers

The Technological Barriers construct will be understood as the technological difficulties that the student has for its access or use (Dinc, 2019). To assess this variable, we elaborated the following question with a dichotomous answer (yes/no): Do you have a computer or other technological device with internet access that allows you to participate in synchronous lessons?

Procedures

For the first stage of the study, three steps were followed: (1) content validation through expert judges, (2) validation of the instrument's response format through cognitive interviews, and

TABLE 1 | CFA model estimations of the five Scales of ARA.

	Scales	X^2	Df	RMSEA	(90% CI)	SRMR	CFI	TLI
1	Willingness to study	8.473*	13	0.000	0.000–.040	0.020	1.000	1.000
2	Self-efficacy for willingness to study	27.565*	13	0.067	0.031–.102	0.040	0.969	0.951
3	Execution/performance	207.561*	104	0.063	0.051–.076	0.037	0.925	0.914
4	Causal attributions	28.661*	13	0.070	0.035–.104	0.047	0.974	0.958
5	Study and learning self-assessment	88.465*	43	0.065	0.046–.085	0.028	0.951	0.937

*Df = degrees of freedom of the model; RMSEA, mean square error of approximation (90% CI) = 90% confidence interval for RMSEA; SRMR, standardized mean square error of approximation; CFI, comparative adjustment index; TLI, Tucker–Lewis index; *p <0 .05.*

(3) validation of the dimensional structure through confirmatory factor analysis. A content validation protocol was drawn up and sent to seven expert judges, intentionally selected in base of their academic career, five of them with a doctoral degree and two with a master's degree, all with at least one publication on the SRL topic. They were invited to collaborate in the validation process and informed about the research objectives through an email. Voluntarily they agreed to participate, completing an assigned form with an assessment of each scale item.

The assessment consisted of the item meets or does not meet the criteria of clarity, relevance, sufficiency, and coherence with their respective dimension. The Kappa index was 0.96, which indicates a high degree of agreement among the judges; therefore, no modifications were necessary. Afterward, seven cognitive interviews were carried out with secondary school students. They were selected to identify any comprehension problems in the items, thereby contributing to the scale's response validity. Participants of these interviews signed the respective ethical consents. The results showed that the students understood all the instructions and the meaning of the items; therefore, no modifications were made. Finally, authorization was requested from the school directors, previously invited to participate in the study. Informed consents were requested to the parents of the students invited to the research. Due to the social distancing restrictions resulting from the health crisis imposed by the COVID-19 pandemic, all consents were applied using technological tools. An informed assent was requested from the students, which was included in the first section of the link sent through the SurveyMonkey tool. Only in the case of those who agreed to participate was the instrument displayed to be completed. The second part of the study, which involved a new data collection, followed all the ethical guidelines adapted to the possibilities provided by technological tools.

Data analysis

A confirmatory factor analysis (CFA) was carried out to meet the first objective of this research. It was performed over the five scales that assess all SRL phases. To assess the goodness of fit, the following indices were selected: root mean square error of approximation (RMSEA) with a 90% confidence interval (CI), comparative fit index (CFI), and Tucker–Lewis index (TLI), considering the following criteria: (a) CFI or TLI above 0.90 and (b) RMSEA less than 0.07 (Wang and Wang, 2019). Analysis was carried out in Mplus Version 8.6 software. Prediction analysis, corresponding to the second objective of this study, involved a binary logistic regression model because the variable abandonment intention was answered in a dichotomous way (YES/NO). To assess the model, the likelihood ratio was used. This test calculates the significance of the difference in residuals between the model of interest and the null model. To determine the individual significance of each predictor introduced in a logistic regression model, the Z statistic and the Wald chi-test were used.

RESULTS

First objective results: self-regulation of learning scales CFA

Results show that the five scales adjustment indices met the adequate criteria suggested in the literature RMSEA ≤ 0.07; CFI and TLI > 0.92 and SRMR <0.08 (Hair et al., 2014). Although chi square is significant, the sensitivity of this test to large sample sizes is well known (>200) (Kline, 2011), see **Table 1**.

In some scales, the relative adjustment indicators showed, in the first solution, not optimal indices according to the literature. To respecify the model, the modification indices (MI) were revised. In the willingness to study scale, pairs of residues were found between item 7 "I identify the academic tasks I will carry out first" and item 3 "I tidy up the materials I need to study" (IM = 25,104). These items refer to the way students organize themselves. In the self-efficacy scale for willingness to study, pairs of residues were found between item 7 "Find a comfortable place to study (light, t°, ventilation)" and item 5 "Choose a place to study without distractions" (MI = 24,548). These items refer to the environmental conditions for a proper study. In the execution/performance scale, pairs of residuals were found between item 9 "I write down my doubts to ask the teacher" and item 10 "I meet the study objectives" (MI = 15,572). These items refer to the monitoring of study and learning. In the study and learning self-assessment scale, pairs of residuals were found between item 3 "I performed the tasks at the established times" and item 4 "I evaluate if I met the academic requirements set by the teacher" (IM = 17,568). These items refer to the self-assessment of compliance with the established planning.

As is shown in **Table 2**, four scales were univariate. The scale of willingness to study and self-efficacy for willingness to study

TABLE 2 | Scales to assess self-regulation of learning phases with Likert scales 1 to 7

Escala de disposición al estudio (study willingness scale)								
Item	**En una escala de 1 a 7 donde 1 es nunca y 7 es siempre, responda. Con qué frecuencia, antes de empezar a estudiar o realizar una tarea académica (on a scale of 1–7 where 1 is never and 7 is always, please answer. How often, before you start studying or executing an academic assignment)**							
1	Establezco objetivos académicos a corto plazo (diario, semanal) (I set short term academic goals (daily, weekly)	1	2	3	4	5	6	7
2	Establezco objetivos académicos a largo plazo (mensual, semestral) (I set long term academic goals (monthly, annually)	1	2	3	4	5	6	7
3	Ordeno los materiales para el estudio (I tidy up study materials)	1	2	3	4	5	6	7
4	Hago un horario para organizar mi tiempo de estudio (I elaborate a schedule to organize my study time)	1	2	3	4	5	6	7
5	Planifico el tiempo que voy a dedicar a cada actividad (I plan the amount of time I will use for each activity)	1	2	3	4	5	6	7
6	Tengo una lista con las tareas académicas por hacer (I have a list of academic tasks to do)	1	2	3	4	5	6	7
7	Identifico que tareas académicas realizare primero (I identify the academic tasks I will do first)	1	2	3	4	5	6	7
Escala de ejecución/desempeño (monitoreo, estrategias cognitivas y búsqueda de ayuda) (Execution/performance scale. Monitoring, cognitive and help seeking strategies)								
Item	**En una escala de 1 a 7 donde 1 es nunca y 7 es siempre, responda: Cuando estoy estudiando o realizando una tarea académica (On a scale of 1–7 where 1 is never and 7 is always, please answer: When i am studying or executing an academic task)**							
1	Lo hago de acuerdo a un horario establecido por mí (I do it based on a Schedule established by myself)	1	2	3	4	5	6	7
2	Evalúo si estoy aprendiendo durante el estudio (I evaluate if I´m learning during the study)	1	2	3	4	5	6	7
3	Tengo claro a que compañeros pedirle ayuda si fuera necesario (I know which classmates I can ask for help, if necessary)	1	2	3	4	5	6	7
4	Si no comprendo lo que leo, busco una forma para solucionarlo (If I don't understand what I read, I try to find a way to solve it)	1	2	3	4	5	6	7
5	Sé dónde encontrar a personas que me puedan ayudar (I know where to seek people that can help me)	1	2	3	4	5	6	7
6	Identifico los contenidos que no entiendo bien (I identifiy the topics I don't understand well)	1	2	3	4	5	6	7
7	Memorizo palabras clave para recordarme conceptos importantes (I memorice key words to be able to remember important concepts later)	1	2	3	4	5	6	7
8	Anoto las dudas para preguntar al profesor (I write down my doubts to ask the teacher later)	1	2	3	4	5	6	7
9	Cumplo con los objetivos de estudio (I meet the study goals)	1	2	3	4	5	6	7
10	Reviso el progreso de mi estudio (I check my study progress)	1	2	3	4	5	6	7
11	Hago resúmenes de las ideas principales (I summarize main ideas)	1	2	3	4	5	6	7
12	Reviso si mi planificación de estudio requiere modificación (I check if my study plan needs to be modified)	1	2	3	4	5	6	7
13	Reviso si mi procedimiento/estrategia de estudio es efectiva para aprender (I check if my study procedure/strategy is effective for learning)	1	2	3	4	5	6	7
14	Repito las ideas claves para memorizarlas (I repeat key ideas to be able to memorize them)	1	2	3	4	5	6	7
15	Si no estoy seguro de algún material o contenido pregunto a mis compañeros (If I´m not sure of some material or content, I ask my classmates)	1	2	3	4	5	6	7
16	Cuando estudio reúno información de diferentes fuentes (When I study, I gather information of different sources)	1	2	3	4	5	6	7
Escala de autoevaluación de la planificación del estudio y el aprendizaje (Study and learning planning Self-Assessment Scale)								
Ítem	**En una escala donde 1 es "nunca" y 7 es "siempre", responda. Con qué frecuencia cuando termino mi estudio o una tarea académica reviso si: (On a scale where 1 is "never" and 7 is "always," answer. When I finish my study or an academic assignment, how often do I check if)**							
1	Cumplí con mis objetivos propuestos (I fulfilled the objectives I set)	1	2	3	4	5	6	7
2	Evalúo si completé mis desafíos personales de aprendizaje (I assess whether I completed my personal learning challenges)	1	2	3	4	5	6	7
3	Realicé las tareas en los horarios establecidos (I performed the tasks at the established times)	1	2	3	4	5	6	7
4	Evalúo si alcancé las exigencias académicas establecidas por el profesor (I assess if I have reached the academic requirements established by the teacher)	1	2	3	4	5	6	7
5	Reviso si logré los aprendizajes esperados por el profesor (I check if I achieved the learning goals expected by the teacher)	1	2	3	4	5	6	7
6	Mi planificación fue efectiva (My planning was effective)	1	2	3	4	5	6	7
7	Reviso si logré mis objetivos personales de aprendizaje (I check if I have achieved my personal learning goals)	1	2	3	4	5	6	7
8	Reviso si comprendí los conceptos claves (I check if I understood the key concepts)	1	2	3	4	5	6	7
9	Evalúo si aprendí los contenidos centrales (I assess if I learned the main topics)	1	2	3	4	5	6	7
10	Requiero aumentar mi tiempo de estudio la próxima vez (I need to increase my study time next time)	1	2	3	4	5	6	7
11	Reviso si avancé en relación con mi conocimiento previo (I check if I advanced in relation to my previous knowledge)	1	2	3	4	5	6	7

resulted in seven items each. The first one refers to how students prepare to be ready for study, and the second one refers to the beliefs related to their competencies to be ready to study successfully. The Execution/Performance scale was made up of 16 items related to monitoring, cognitive, and help-seeking strategies performed during the task execution. Item three of the original scale was eliminated, and the factors were joined, resulting in a one-dimensional scale, coherent with the literature. The study and learning self-assessment scales were made up of 11 items, referring to self-assessment strategies for study planning and learning. Items 5, 9, and 11 of the original scale were eliminated. The scale of causal attributions was made up with seven items, and the confirmed factorial structure was of two related factors. Item two of the original scale was eliminated due

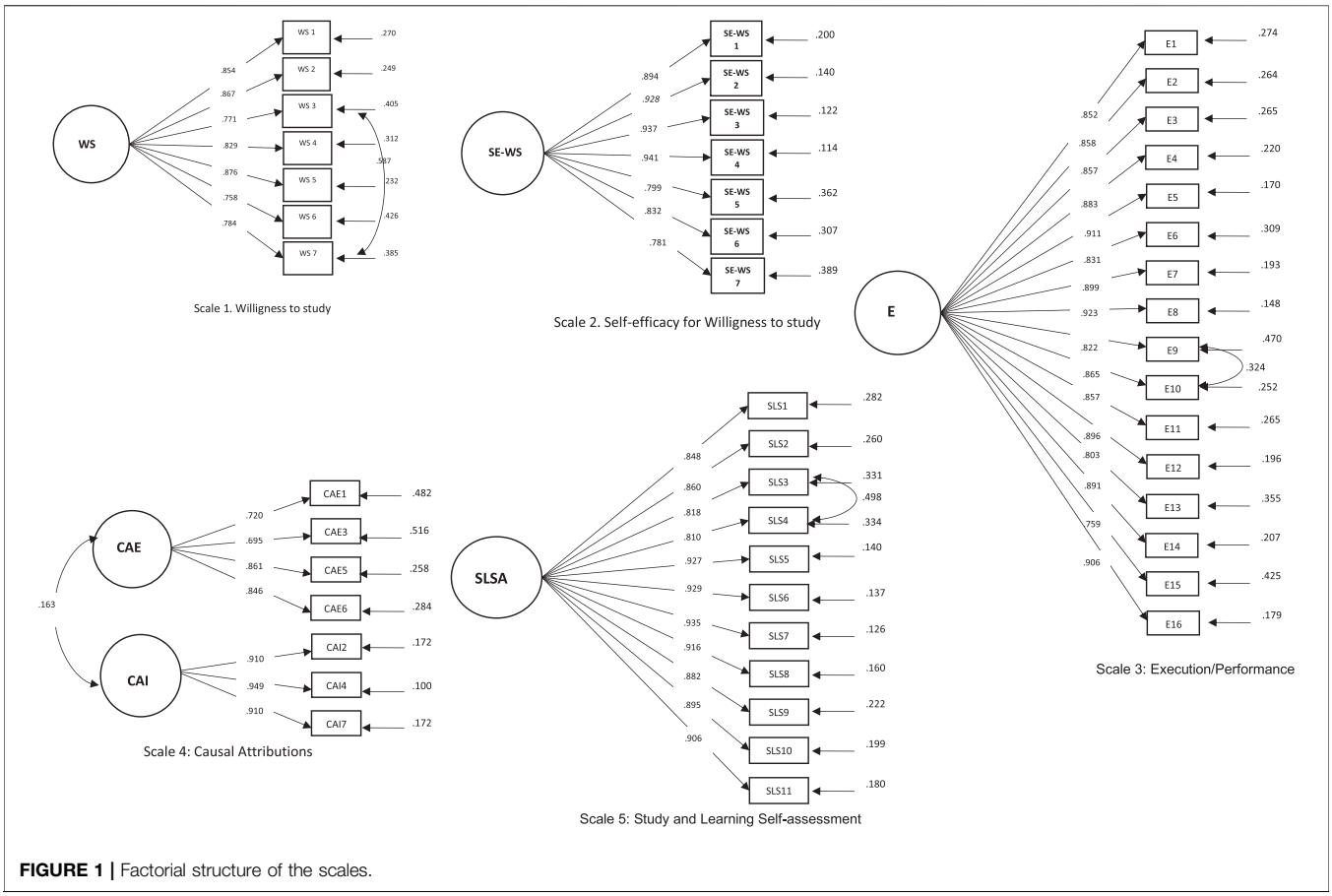

FIGURE 1 | Factorial structure of the scales.

to a load less than 0.40. The five confirmed scales and their respective items add up to a total of 48 items that assess factors related to self-regulation of learning. All the scales showed high loads in relation to the factor they belong to and were significant (see **Figure 1**). Compared to the original scale, four items were eliminated since their factor loadings turned out to be less than 0.40.

The final version of the scales is presented in **Tables 2**, **3**. **Table 2** contains the Likert-format scales from one to seven points, while **Table 3** contains the Likert-format scales from 0 to 10 points.

Second objective results: association between variables

A logistic regression model was carried out to predict the probability of dropout intention. The predictor variables were sex, score average, forced labor insertion, technological barriers, willingness to study, self-efficacy for willingness to study, execution/performance, external and internal causal attributions, and self-evaluation of study planning and learning.

As is shown in **Table 4**, the model was significant $X^2 = 58.039$, $p < 0.001$, so we can assume that the prediction improves compared to the null model.

However, some variables are not significant. Each non-significant variable was eliminated step by step. The final model resulting from the prediction of dropout intention included external causal attributions, self-evaluation of study planning and learning, forced labor insertion, and technological barriers as predictors. **Table 5** shows the coefficients of the logistic regression, the Wald test, and the odds ratio for each predictor. The odds ratio of forced labor insertion indicates that, keeping the other variables constant, students who are working are 6.8 times more likely to present the intention to abandon their studies.

With a 0.5 threshold, the model predicts 83.0% of the cases correctly, but when we consider only those with forced dropout intention (yes), it was right in 19 of the 39 cases (48.7%) (in **Table 6**. For the confusion matrix (threshold at 0.45), we can observe that by adjusting the threshold to 0.45, the prediction of the model is improved to 84.8% of the cases correctly. By considering only the dropout intention (yes), 24 of the 39 cases (61.5%) improved. Graphically this is shown in **Figure 2**.

DISCUSSION

The objectives of this research were (1) to validate the scale of self-regulation phases in Chilean secondary school students and (2) to

TABLE 3 | Scales to assess self-regulation of learning phases with Likert scales 0–10.

Escala de Autoeficacia para la disposición al estudio (willingness to study self-efficacy scale)											
Ítem	**En una escala donde cero es nada seguro y 10 es muy seguro responda. Antes de empezar a estudiar, en qué medida creo que soy capaz de (on a scale where zero is not sure at all and 10 is very sure, answer. Before you start studying, to what extent do I think I´m are capable of)**										
1	Hacer un horario de estudio (Make a study schedule)	0	1	2	3	4	5	6	7	8	9	10
2	Tener una lista de tareas académicas por hacer (Have an academic tasks to do list)	0	1	2	3	4	5	6	7	8	9	10
3	Establecer objetivos de estudio a corto plazo (diario, semanal) (Set short term study goals (daily, weekly)	0	1	2	3	4	5	6	7	8	9	10
4	Establecer objetivos de estudio a largo plazo (mensual, semestral) (Set long term study goals (monthly, biannually)	0	1	2	3	4	5	6	7	8	9	10
5	Elegir un lugar para estudiar sin distracciones (Choose a place to study without distractions)	0	1	2	3	4	5	6	7	8	9	10
6	Tener todos los materiales necesarios para estudiar (Have all the necessary materials to study)	0	1	2	3	4	5	6	7	8	9	10
7	Encontrar un lugar cómodo para estudiar (luz, t°, ventilación) (Find a comfortable place to study (light, t °, ventilation)	0	1	2	3	4	5	6	7	8	9	10
Escala de Atribuciones Causales (Causal Attributions Scale)											
Ítem	**En una escala donde cero es "no creo que sea así" y 10 es "creo con mucha certeza que es así", responda. En qué medida creo que la causa del fracaso en mi desempeño se debe a (On a scale where zero is "I don't think that is so" and 10 is "I think with great certainty that it is so," answer. To what extent do I believe that the cause of my performance failure is due to)**										
1	La desmotivación del profesor (Teacher demotivation)	0	1	2	3	4	5	6	7	8	9	10
2	Mi falta de esfuerzo en el estudio (My lack of effort in studying)	0	1	2	3	4	5	6	7	8	9	10
3	La falta de apoyo de mis amigos (Lack of friends support)	0	1	2	3	4	5	6	7	8	9	10
4	La falta dedicación al estudio (Lack of dedication to study)	0	1	2	3	4	5	6	7	8	9	10
5	La despreocupación del profesor (The teachers unconcern)	0	1	2	3	4	5	6	7	8	9	10
6	Que el profesor me tiene mala (The teacher doesn´t like me)	0	1	2	3	4	5	6	7	8	9	10
7	Mi desorganización del estudio (My study desorganization)	0	1	2	3	4	5	6	7	8	9	10

TABLE 4 | Model significance.

Model	**Deviance**	**AIC**	**BIC**	***df***	X^2	***p***	**McFadden R^2**
H_0	183.631	185.631	188.773	170	54.145	<0.001	0.295
H_1	129.487	139.487	155.195	166			

TABLE 5 | Significance of the variables for the model.

Variables independientes	**β**	**EE**	**X^2w**	**p**	**Odds ratio**
External causal attributions	0.176	0.064	7.5	0.0063**	1.192
Self-Asessment of study planning and learning	−0.601	0.179	11.2	0.0008***	0.548
Forced Labour Insertion	1.919	0.506	14.4	0.0001***	6.814
Technological Barriers	1.236	0.451	7.5	0.0061**	3.442

**p < *.01;* ***p < *.001.*

determine the association between self-regulation of learning, forced labor insertion, technological barrier, and intention to quit during COVID-19. The results obtained are then discussed, and the limitations and finally the practical implications of the study are presented.

A study that systematized SRL assessment instruments revealed the scarcity of available scales to be used in Latin America. The few alternatives in Spanish language where strongly criticized since they focus on only one or two of SRL phases, but they do not consider the complexity of the construct (López-Angulo et al., 2020). Therefore, the result of this study responds to the goal of having instruments that fully measure the construct of SRL based on the classical theoretical models of this research topic. Moreover, it makes available valid and reliable scales to measure the phases of SRL in Chile (Morelli et al., 2021).

TABLE 6 | Significance of the variables for the model.

Observed	**Predicted**	
	1	**2**
1	121	11
2	15	24

1, don't have dropout intention; 2, they have dropout intention.

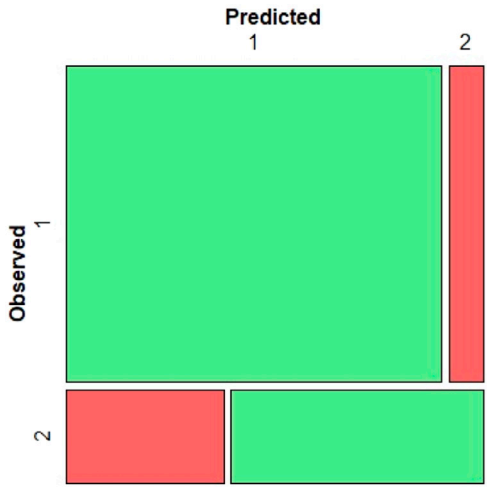

FIGURE 2 | Graph of the confusion variable (threshold a 0.45).

Self-regulation of learning is considered a protective variable of school dropout (Gaxiola et al., 2019); therefore, a proper assessment could help the identification of the specific components for the promotion of skills and development of this competence in the educational context. Although the importance of the SRL is recognized in specialized literature in the achievement of successful performances and meeting educational demands (Meyers et al., 2013; Gaxiola et al., 2019), there is a lack of studies oriented to predict dropout intention integrating SRL among other possible predictor variables in secondary education. The lack of instruments with adequate psychometric properties has stopped the development of studies that assess all SRL phases with different purposes and research scope. This research contributed with an instrument developed as the first objective, taking care of the respective validity evidence in the Chilean context. Subsequently, it was possible to test a composite predictive model of dropout intention by integrating SRL with external causal attributions, self-evaluation of planning, forced labor insertion, and technological barriers, which were significant in predicting dropout intention to quit. The results of this model also showed that the probability of dropping out is higher (6.8 times more) if the student is currently working.

The findings of this research are consistent with previous research. A study carried out with 192 high school students in Mexico aimed to predict the risk of school dropout. The resulting model included as predictor variables the dimension of study planning related to study habits, and self-efficacy for learning, related to self-regulation, explained 37.0% of the phenomenon (Hernández-Jácquez and Montes-Ramos, 2020). Another study of 808 Seattle students showed that students who presented self-regulation difficulties during school were linked to a lower chance of completing their studies. The results support that a low level of self-regulation is a risk factor for obtaining a diploma in secondary education and consequently dropping out of studies (Cambron et al., 2017).

Other similar studies have highlighted the importance of the SRL variable in understanding the dropout phenomenon. An investigation with 781 secondary school students in Luxembourg compared students based on their school results, forming a group that continued their studies and another that were facing school dropouts (potential dropouts versus potential school finishers) (Cahuc et al., 2021). The results showed that self-regulation variables that differentiated the two groups were perseverance in effort and some learning strategies. At other academic levels, it is also possible to find consistency of the present findings. For example, an investigation carried out in the Massive Open Online Courses evaluated SRL strategies to measure their effect over the dropout prediction and showed in their findings that SRL strategies have a very high predictive power (Moreno-Marcos et al., 2020).

Another significant variable in the predictive model of dropout intention was the technological barrier. In Latin America, connectivity in secondary school education has been precarious and uneven since before the pandemic (Sáez-Delgado et al., 2020b). The current scenario imposed by the health crisis led educational institutions to propose solutions that deepened social inequalities and injustices orienting to provide an immediate response, instead of a deep and effective solution. In this way, the access and daily use of ICT revealed a status of access to education and particularly in access to quality education, a basic human right, where the uneven distribution shows a critical inequality (Lusquiño, 2020).

Finally, the model also revealed that forced labor insertion predicts dropout intention. Prior to the pandemic, the research had pointed to this variable as a consequence of precarious economic family situations that triggered the forced labor insertion in order to satisfy the needs of the family group, putting at risk the permanence of high school students in the formal educational system (de Witte and Rogge, 2013). Other studies have considered variables measured before entering to the University, that is, data from secondary education, to understand the process of higher education transition in terms of success and intention to drop out (Lassibille and Navarro, 2008; Allensworth and Clark, 2020). For example, one study created models to identify factors that influence university performance and identify at-risk students (Nagy and Molontay, 2018), using only data from high school students. The results of the study showed that the variables of secondary education that were included in these models have a remarkable predictive power on university graduation. Moreover, high school performance in humanities showed a large impact on the college performance of engineering students.

Undoubtedly, the results of this research are a relevant contribution, but the study has limitations. Sample size is important to have more representativeness of the population. Also, the use of longitudinal designs is necessary to be able to confirm the associative findings of this study. This would facilitate the understanding of the phenomenon over time and the analysis of its trajectory. Finally, the use of dichotomous questions to measure some of the variables in this study is often a controversial mode of measurement that can be improved.

Despite the limitations described above, the findings of this research are relevant if the indices of inequalities and the violation of rights associated with the dissatisfaction of basic needs are considered, in this case education, which is a universal right. Not only the deficiency but also the existing gaps for the quality of education are highlighted. School dropout rates are considered one of the main educational problems that governments must address internationally, due to their negative impact on both individuals and society. Despite multiple attempts to understand and address this phenomenon, there are many students who continue to abandon their studies prematurely, thus reducing their possibilities for personal, professional, and social advancement, and limiting their contribution to the development and innovation of society in which they live (Antúnez et al., 2016). Researchers are encouraged to continue the development of studies to contribute to a deep understanding of the phenomenon, allowing an effective response to high school dropouts.

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 Comite de Etica de la Universidad Catolica de la Santisima Concepcion. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

Conceptualization, FS-D and YL-A; methodology, FS-D, YL-A, and JM-N; formal analysis, JM-N and FS-D; writing—original draft preparation, FS-D, CO-G, and HG-V; writing—review and editing, BP, CO-G, and HG-V; supervision, FS-D; project administration and funding acquisition, FS-D. All authors have read and agreed to the published version of the manuscript.

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Learning Beliefs, Time on Platform, and Academic Performance During the COVID-19 in University STEM Students

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Due to the closure of universities worldwide because of the COVID-19 pandemic, teaching methods were suddenly transformed to an emergency remote teaching (ERT) modality. Due to the practical nature of STEM courses, students cannot participate in activities in which manipulating objects is necessary for accomplishing learning objectives. In this study, we analyze the relation among STEM students learning beliefs at the beginning of ERT (T1) with their Learning Management systems (LMS) time-on-task and their final academic performance (T2) during the first semester of ERT. We used a prospective longitudinal design. 2063 students (32.3% females) from a university in Chile participated, where the academic year starts in March and finishes in December 2020. We assessed their learning and performance beliefs through an online questionnaire answered at the beginning of the academic period (T1). Then, using learning analytics, time invested in the CANVAS LMS and the academic performance achieved by students at the end of the semester (T2) were assessed. The results show that students mainly stated negative beliefs about learning opportunities during ERT ($n = 1{,}396$; 67.7%). In addition, 48.5% ($n = 1{,}000$) of students stated beliefs of "medium" academic performance for the first semester (T1). Students with lower learning beliefs at T1 spent less time in the LMS during the semester and had a lower academic performance at T2 than students who had higher learning beliefs at T1. The implications of these findings on the role of instructors and institutions of higher education are discussed.

Keywords: learning beliefs, learning analytics, university students, higher education, COVID-19

INTRODUCTION

It is expected that the demand for professionals in STEM careers will increase in the coming years (Avendaño Rodríguez and Magaña Medina, 2018; UNESCO, 2019). Furthermore, the World Economic Forum held in 2020 revealed that critical thinking and collaboration are highly demanded competencies and that this need will keep increasing. These aspects, along with other skills, such as foundation literacy and character qualities, are 21st-century skills.

Developing these abilities in students and professionals implies the need for implementing active learning teaching strategies in STEM areas (Soler and Dadlani, 2020). Active learning strategies consider students the main responsible for their education by realizing meaningful activities in which the teacher acts as a facilitator or guide during the learning process (Hernández-De-Menéndez et al., 2019).

In this context, research on how to improve STEM students' teaching and learning is relevant (Hou et al., 2021). However, today, STEM students have undergone a transformation in their learning experiences due to the COVID-19 pandemic (Cannon et al., 2021). The sudden change of teaching modality that all students worldwide suffered due to the pandemic is known as emergency remote teaching (ERT; Bozkurt and Sharma, 2020; Bustamante, 2020). This denomination is because the conditions of online education created during COVID-19 were not planned as expected in other scenarios (Pappas and Giannakos, 2021). Therefore, the improvisation and ingenuity of many instructors, who were not prepared for such a drastic change of teaching modality, prevailed (Hodges et al., 2020; Lobos Peña et al., 2021).

Studies conducted during the ERT period identified that: (a) students fear facing many difficulties while working online and believe that their instructors could not help them enough (Akcil and Bastas, 2020), (b) students show higher motivation for online learning when they perceived greater usefulness and ease in virtual learning tools, so the thoroughness in the choice and planning of resources and activities is crucial (Cicha et al., 2021), and (c) students were more satisfied with online education when they perceived less impact of the pandemic on the preparation and adaptation to the virtual format of their educational institutions (Gonçalves et al., 2020). As valuable as the ERT is, accelerating the implementation of teaching processes caused the loss of several critical elements for its effectiveness (Hodges et al., 2020). Therefore, if not guaranteed, the ERT leads to a modality in which the aim is to replicate face-to-face strategies instead of taking advantage of the resources and benefits of online learning systems. The effectiveness of online education lies heavily in the careful design and preparation of learning resources, activities, and assessments following an instructional design that is appropriate to the course.

Learning Beliefs

Self-efficacy beliefs in the context of online learning refer to students' beliefs regarding being able to execute, successfully, the tasks and activities presented in the virtual learning environment (Cai et al., 2017; Al-Rahmi et al., 2018); for example, believing in their ability to use the learning management system of their institution. In addition, these technological tools respond to educational processes and the capacity to deploy self-regulated learning that requires greater autonomy, clear goals, among other capabilities involved (Carter et al., 2020; Qetesh et al., 2020). In an online learning context, students report low perceptions of learning (Chen et al., 2018) and low levels of academic self-efficacy (Casanova et al., 2018; Gopal et al., 2021) when the courses do not follow an instructional design specifically created for online courses.

Systematic reviews of the literature indicate that beliefs about student learning can impact academic performance and dropout rates (Richardson et al., 2012; Honicke and Jaclyn, 2016). If self-efficacy is low, student engagement and performance will be low (Van der Houwen et al., 2010; Valle et al., 2015; Borzone, 2017), whereas dropout intention will be higher (Casanova et al., 2018). In the context of the pandemic, instructors and students expressed low learning beliefs about virtual education at the beginning of the academic period in two longitudinal investigations. As a result, students had little confidence in online education's opportunities regarding the quality of teaching processes, learning materials and activities, and collaborative work with peers and instructors (Camfield et al., 2021; Lobos Peña et al., 2021). Conversely, students obtain better academic performance and are more satisfied with the teaching and learning processes when their learning beliefs are higher (Kostagiolas et al., 2019).

Research of students' self-efficacy beliefs and behavior in online education is incipient. Despite this, there are already few reports indicating that students who believe they will perform better in an online modality will interact more with learning activities and resources in virtual environments (Ifenthaler, 2020; Ifenthaler and Yau, 2020). In this same area, self-efficacy beliefs have been specified around academic achievement in technology-mediated learning experiences.

Learning Analytics: Time on Platform

Learning analytics is defined as the process of measuring, collecting, analyzing, and reporting data about learners and their contexts to promote learning by considering elements, such as data, data analysis, and intervention measures generated from them (Romero and Ventura, 2020). Concerning the students, the use of analytics allows the integration of information, such as their behavior during the teaching and learning process, their past or current academic performance, sociodemographic information, among others (Zilvinskis and Willis, 2019). These data allow for statistical analysis and predictive models that facilitate the early detection of students at possible risk of failure (Larrabee Sønderlund et al., 2019). Furthermore, the user can predict learners' success during a course using various performance indicators with learning analytics. For example, you can use grades from previous courses or learners' current performance. Tracking learner activity in the LMS is also commonly used (Liz-Domínguez et al., 2019).

One of the most studied variables in learning analytics research is the platform time or *time-on-task* invested by students during online education (Ifenthaler and Yau, 2020). For example, considering when an event starts and ends is especially important when defining how long students are actively working in the LMS. The opportunity to extract this kind of information makes learning analytics data to be considered as the digital footprint left by students in the context of an online course, as it allows to estimate the level of involvement and the effort they deploy during their courses (Miller and Soh, 2013; Rojas-Castro, 2017). Moreover, research in the ERT period has indicated that students who believe they will do better in an online modality interact more with virtual environments' learning activities and resources

(Ifenthaler, 2020; Ifenthaler and Yau, 2020). So, reviewing learning analytics becomes relevant for those seeking to develop intentional pedagogical actions to improve educational outcomes. Nevertheless, it is essential to know and analyze the student's interaction with the resources and activities, connection times, and connection moments. These will allow us to understand the final performance better and address low performances or behaviors that lead to it (Zhang et al., 2020).

After the pandemic, universities will likely employ blended learning, which considers quality training with specially designed virtual teaching environments linked to face-to-face teaching to enhance students' educational experience by responding to their needs (McGrath et al., 2021). A blended learning modality will have to incorporate all the knowledge developed by instructors and institutions during the pandemic regarding virtual tools and mix them with the best practices of face-to-face classrooms. Unfortunately, this kind of modality has been scarce in Latin America. Therefore, this paper aims to contribute knowledge supporting virtual tools in STEM undergraduate programs in higher education. In this sense, our objective is to evaluate the relation among STEM students learning beliefs at the beginning of the ERT (T1) with their LMS time-on-task during the first semester of the ERT and their final academic performance (T2).

With this research, our goals are:

1. Describe the learning beliefs of STEM undergraduate students during the COVID-19 pandemic ERT at the beginning of the academic semester (T1).
2. Identify the interaction level with the LMS Canvas after the end of the academic semester (T2) of STEM university students during the ERT
3. Compare the connection time of STEM university students considering variables, such as gender and academic level to which they belong.
4. Analyze the learning beliefs of undergraduate students in the STEM area (T1), considering the student's interaction with the LMS and the academic performance achieved at the end of the semester (T2).

MATERIALS AND METHODS

The method used in this research was in the framework of a simple prospective design (Ato et al., 2013). In **Figure 1**, we describe the measurement timeline.

Participants

Participants were 2063 undergraduate STEM students from a university in Chile, where the academic year starts in March and finishes in December 2020. Gender distribution was 32.3% (664) females and 67.8% (1399) males. The average age was 21.31 years ($SD = 2.64$). The distribution according to STEM areas was: 1485 students from Engineering (71.9%), 315 students from Physical Sciences and Mathematics (15.3%), 185 from Chemical Sciences (9.0%), and 78 students from Biological Sciences (3.8%). Concerning academic level, 641 were 1st-year students (31.1%), and 1,422 were students in higher courses (68.9%).

Measurement Instruments

Learning Beliefs

The institution developed and massively implemented a two-item survey at the beginning of the academic period during the ERT due to the COVID-19 pandemic (T1): (1) I think my learning opportunities in online learning will be, and (2) I think my academic performance will be. The first item had two possible response options (1 = worse than in face-to-face learning, 2 = the same as in face-to-face learning), whereas the second item had three options (1 = low, 2 = medium, 3 = high). Therefore, when we talk about learning beliefs, we refer to the student's beliefs about their opportunities to learn and maintain their academic performance during ERT due to COVID-19.

Time on Learning Management Systems

The institution analyzed the students' time-on-task during the ERT semester. We defined this variable as the time between two interactions (or events associated with a timestamp) LMS CANVAS, with a 10-min threshold. If the user did not perform any action by 10 min, the session is considered finished. Our definition of the time-on-task threshold was based on the evidence described in the literature (Kovanović et al., 2015) and on our researchers' experience. It is important to note that the ways to determine time-on-task in LMS are still under investigation because it depends on the context and characteristics of the data (Godwin et al., 2016).

Academic Performance

We measured participants' grade point average by the average grade obtained over the first semester during the ERT. Each faculty provided this information from the institutional records. In Chile, the grading system is constructed on a scale from 1.0 to 7.0 points. The grades from 6.0 to 7.0 correspond to an academic performance considered as "excellent." The grades from 5.0 to 5.9 are labeled as "good" grades, while 4.0–4.9 are defined as "satisfactory." Last, grades from 1.0 to 3.9 are "unsatisfactory," which means the student failed the course (MINEDUC, 2020).

Procedure

This research was approved by the Ethics Committee of the participating university, confirming the ethical criteria for research with human beings. The informed consent form was presented, describing research goals and characteristics for participation in the study.

The questions on learning beliefs were part of a general questionnaire applied in digital format and sent to the students' institutional e-mails. The reception of responses to this questionnaire was at the beginning of the academic year, during March 2020 (T1). LMS CANVAS platform (John, 2021) supplies the proportion of time in the virtual classroom. In addition, each faculty provide academic performance from the institutional records. We measured these two variables at the end of the first academic semester, during September 2020 (T2).

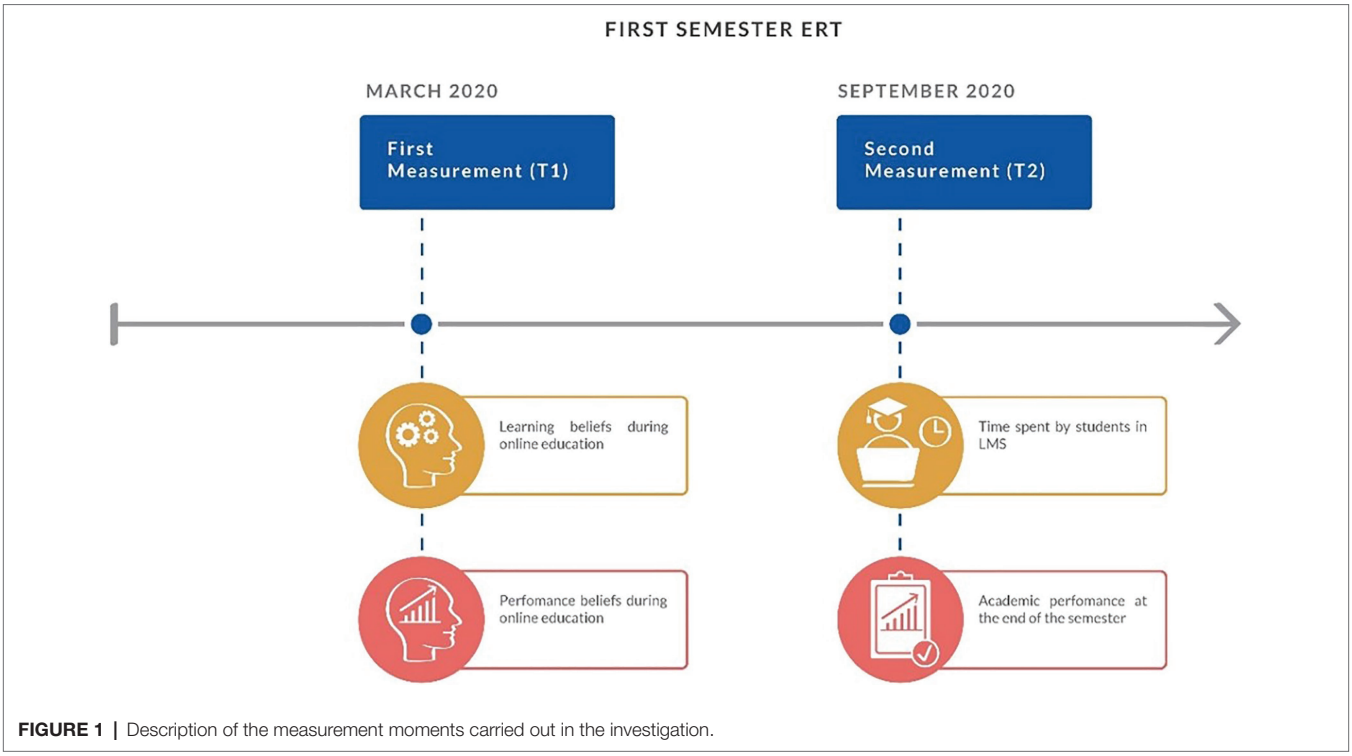

FIGURE 1 | Description of the measurement moments carried out in the investigation.

Assumptions of normality of the data were checked using the Kolmogorov–Smirnov test with Lilliefors modification (Thode, 2002). We applied the Levene test (Fox and Weisberg, 2018) to verify the constant variance between groups (homoscedasticity). Due to the non-normality of data, presence of outliers, and in some cases, absence of homoscedasticity, we performed Yuen's test (Yuen, 1974) for the comparison of two groups and one-way ANOVA test for trimmed means (Wilcox and Tian, 2011) for statistical analyses employing more than two groups. The method proposed by Algina et al. (2005) was employed for the effect size analysis of the results. For data analysis, we used RStudio software version 4.0.3 (2020-10-10).

RESULTS

The goal of this study was to analyze learning beliefs during online education (T1) and their link with the time invested by students in the LMS and with the academic performance achieved at the end of the semester (T2) in the context of the ERT 2020. The findings are presented below.

STEM Students' Beliefs About Online Learning During ERT Context

Regarding undergraduate STEM students' learning beliefs during the ERT for the COVID-19 pandemic (T1), students mainly stated negative beliefs about learning opportunities ($n = 1{,}396$; 67.7%). Only 32.3% ($n = 667$) of participants declared that they believed online education would provide them with good learning. When analyzing the characteristics of students according to their learning beliefs, we found that there were no statistically significant differences according to students' gender and the type of school they came from (public, private, subsidized).

When assessing students' beliefs about their academic performance in the ERT context, 48.5% ($n = 1{,}000$) of participants stated beliefs of "medium" academic performance for the first semester, 30.8% declared beliefs of "high" performance, and 20.7% ($n = 427$) of students stated that they would perform "poorly" in the ERT context. In the case of achievement beliefs, when analyzing the characteristics of the participants in each group, we found that students with higher achievement beliefs [$F(2{,}637.7) = 6.09$, $p = 0.002$] presented higher scores on the mathematics university entrance test or PSU, ($M = 665.23$; $SD = 64.34$) than students with lower achievement beliefs ($M = 638.978$; $SD = 83.79$).

Connection Time in the Virtual Classroom (LMS) by Students During the ERT Context

Students spent an average of 92.87 h ($SD = 81.59$) in the virtual classroom during the entire semester (T2). The time spent by students on the platform was analyzed considering gender. Males spent an average of 94.17 h ($SD = 85.23$) in the virtual classroom, while women spent 90.13 h ($SD = 73.35$). When analyzing differences in the students' connection time according to gender, the results were not statistically significant [$t(820.19) = 0.0006$, $p = 0.999$]. Therefore, there is no distinction in connection time in the LMS between men and women (see **Table 1**).

For the analysis of connection time to the LMS according to academic level (1st-year students regarding students taking

TABLE 1 | Differences in students' platform times as a function of student learning beliefs, gender, and academic year to which they belong.

	Beliefs about online learning during ERT		Yuen test		
	Positive (n = 667)	**Negative (n = 1,396)**	**t**	**p**	**Effect size**
	102.83 (*SD* = 88.46)	88.11 (*SD* = 77.68)	T(690.66) = 3.43	<0.001	0.18
	Academic level				
Connection time to the LMS (hours)	**First-year (n = 641)**	**Upperclassmen (n = 1,422)**	**t**	**p**	**Effect size**
	99.56 (*SD* = 81.23)	89.86 (*SD* = 81.62)	T(806.38) = 3.557	<0.001	0.17
	Gender				
	Women (n = 664)	**Male (n = 1,399)**	**t**	**p**	**Effect size**
	90.13 (*SD* = 73.35)	94.17 (*SD* = 85.23)	T(820.19) = 0.00	0.99	-

SD = standard deviation; n = number of participants.

second through 4th-year courses), we identified 641 (31.1%) freshmen and 1,422 (68.9%) students attending 2nd-year courses or higher. The 1st-year students spent an average of 99.56 h (*SD* = 81.23), whereas senior students 89.86 h (*SD* = 81.62). Statistically significant differences were found [$t(806.38) = 3.557$, $p < 0.001$; ES = 0.17] in connection time to virtual classroom according to the academic year of students (see **Figure 2**). In this case, 1st-year students presented a longer connection time in the LMS than the upper-course students.

Students' Learning Beliefs, Time Spent Online in the Virtual Classroom, and GPA

Learning beliefs were categorized into students who stated positive beliefs regarding their learning and students who declared negative beliefs. Students with positive learning beliefs accessed an average of 102.83 h (*SD* = 88.46) to the LMS. On the other hand, students with negative beliefs accessed an average of 88.11 (*SD* = 77.68) to the LMS. When evaluating connection time on the LMS, we found statistically significant differences between the groups [$t(690.66) = 3.43$, $p < 0.001$, ES = 0.18], observing that students with positive beliefs about learning spended more hours connected to the LMS (see **Table 2**).

We assessed the differences between students' academic performance (T2) and their beliefs about academic performance at the beginning of the semester (T1). Students were organized into three performance belief groups (low, medium, high). Participants who stated "low" performance beliefs obtained an average grade of 5.61 (*SD* = 0.51), while students who declared "medium" performance beliefs obtained on average a mark of 5.72 (*SD* = 0.52). Finally, students stating "high" academic performance beliefs scored on average 5.78 (*SD* = 0.55). We found statistically significant differences between the groups [$F(2,633.45) = 9.4984$, $p < 0.001$]. Students with "low" performance beliefs (T1) obtained lower grades at the end of the semester (T2) than students with "high" ($p < 0.001$) and "medium" performance beliefs ($p < 0.01$; see **Figure 3**).

DISCUSSION

Due to the COVID-19 pandemic, university students around the world had to continue their training remotely. The ERT is characterized as unplanned and temporary since its implementation is associated with an emergency. Therefore, neither educational institutions, students, nor instructors were prepared to carry out educational processes efficiently in this context. This situation had an impact on the students' experiences of their university education. However, it was particularly detrimental to students of majors in STEM due to the practical nature of the courses.

We identified the relationship between the following three variables: learning beliefs, time spent on tasks on the LMS, and academic performance achieved at the end of the semester.

STEM Students' Beliefs About Online Learning During ERT Context

As a result of the present study, more than half of the participants had negative beliefs about online learning during the ERT context. In the published empirical evidence, mixed results were found concerning beliefs about online learning in STEM. For example, an investigation of pharmacy students' experience during the COVID-19 pandemic indicated that 49% of the participants showed a positive attitude toward online learning, and only 34% of the students identified barriers to online learning (Shawaqfeh et al., 2020). Another research with students from various areas of basic sciences found that participants perceived positive online learning experiences and considered that the situation was handled adequately (Almusharraf and Khahro, 2020). However, contrary to the results presented above, another research reports that although students state that online education is a modality responding positively to their needs, they express concerns regarding pedagogical, logistical, and administrative support from their institutions, negatively impacting their beliefs. Moreover, students state that it is difficult to connect with their professors and classmates (Katz et al., 2021; Rivera-Vargas et al., 2021). These findings agree with the results of this study.

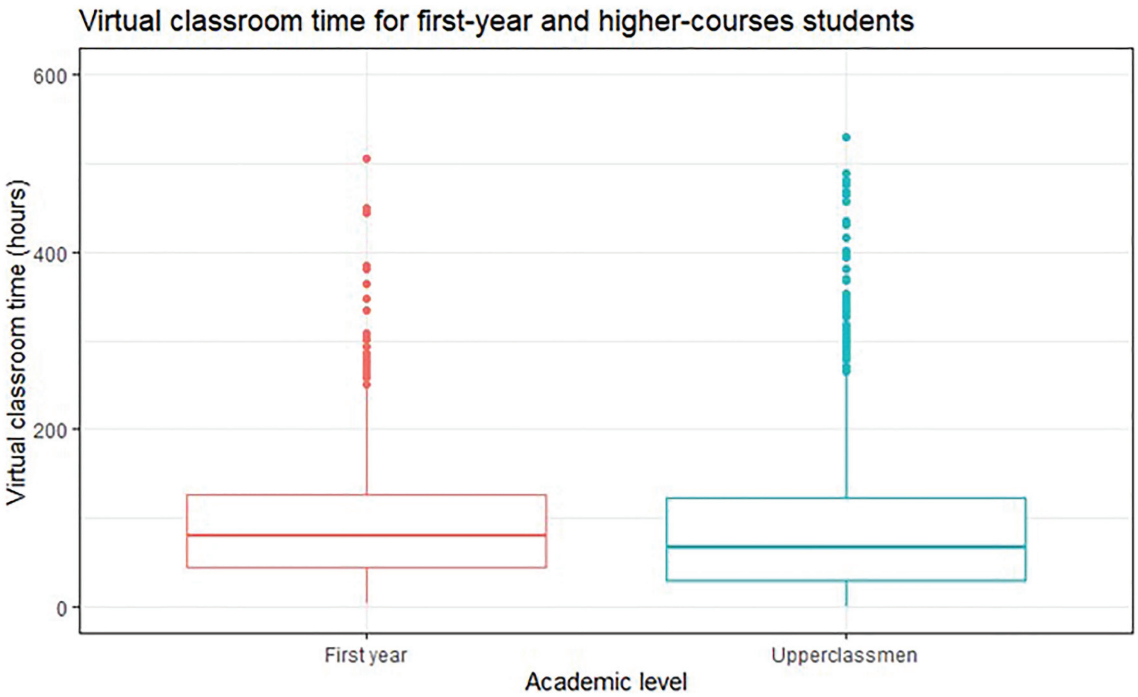

FIGURE 2 | Distribution of students' connection time to the Learning Management systems (LMS) during the emergency remote teaching (ERT) semester according to their academic level.

TABLE 2 | Differences in academic performance obtained by participating students at the end of the semester (T2) as a function of performance beliefs during the ERT (T1).

	Academic performance beliefs			One-way ANOVA on trimmed means		
	High (*n* = 636)	**Medium (*n* = 1,000)**	**Low (*n* = 427)**	***F***	***p***	**Effect size**
Final grade	5.78 (*SD* = 0.55)	5.72 (*SD* = 0.52)	5.61 (*SD* = 0.51)	F(2,633.45) = 9.50	<0.001	0.16

SD = standard deviation; n = number of participants.

In our context, from October 2019 to February 2020, a social movement developed in Chile due to citizens' discontent with the government (Morales Quiroga, 2020). Strikes and marches characterized this movement within the second semester of the 2019 academic year. In this period, educational institutions had to implement the ERT modality due to the social situation. After finishing the second semester of 2019 in ERT modality due to the social movement, students started the first semester of 2020 in ERT modality due to the COVID-19 pandemic (Brunner et al., 2020). In the case of the university students in this research, we believe that the online education experience during the social movement accentuated negative beliefs.

To identify the ERT effects of the COVID-19 pandemic, we differentiated between two groups of STEM students: 1st-year students in 2020 and upper-level students. On the one hand, the latter group of students had a traditional learning experience that allowed them to participate in face-to-face cultural activities, meet peers, and engage in STEM activities, such as laboratory practices. On the other hand, the ERT's effects on the 1st-year students are possibly higher since they did not have face-to-face experiences and all their training has been remote. Concerning academic performance beliefs, a significant number of students stated that they could achieve medium to high performance during the first semester of 2020, i.e., the first ERT semester. This result is similar to one reported by students in other research where they indicate beliefs of having positive or closer to expected results in the ERT scenario (Rager, 2020). This finding could be associated with personal factors of the student, for example, the young people's level of commitment to their university undergraduate programs, and with their self-efficacy beliefs about completing academic assignments from a digital modality, the use of social support sources (peers and family) and the technological resources available to them for the implementation of academic activities (internet or computers).

In the ERT scenario, the student's socio-academic integration process was significantly transformed. Their institutional experiences were developed from virtuality, limiting the development of the young people's academic identity. According to Tinto's theory, students' success resides in their ability to integrate socially and academically into the university (Tinto, 1975). This model proposes that students see themselves as part of the educational institution when they can frequently

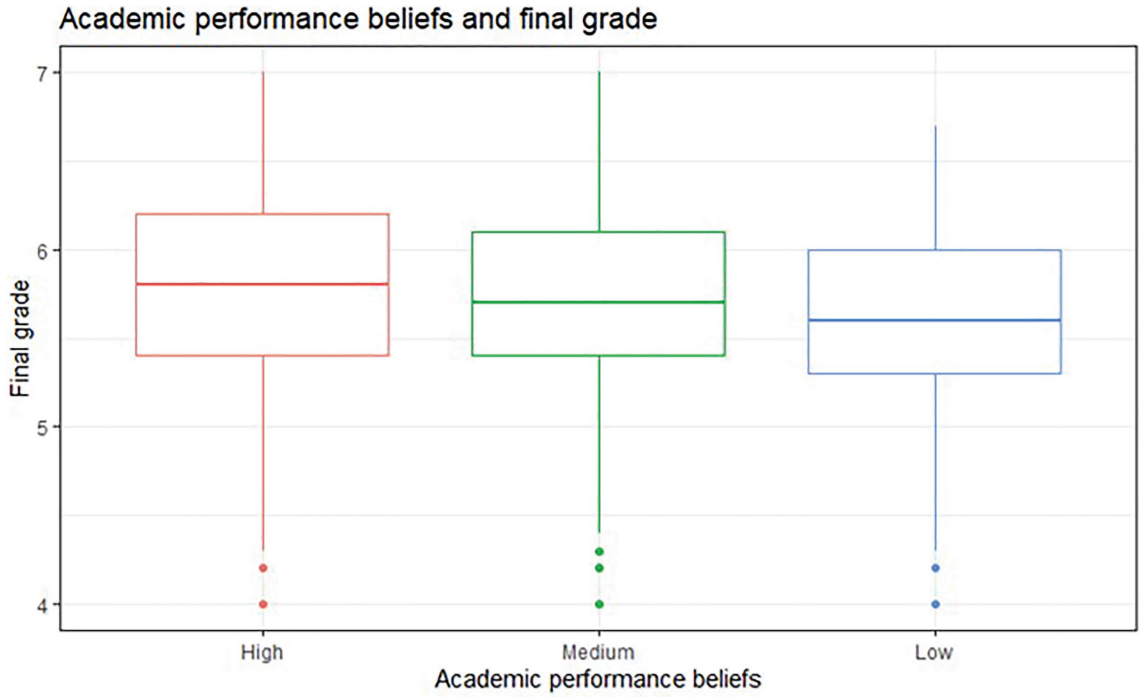

FIGURE 3 | Description of academic performance beliefs (T1) and final grade (T2) from STEM students' during the ERT semester.

interact with peers, instructors, and the university community. This process increases their commitment to the career, benefiting their academic performance and persistence (Tinto, 2017). In this regard, universities should consider implementing programs and policies that benefit the social integration of students during the period of return to higher education institutions due to the control of the COVID-19 pandemic.

Connection Time in the Virtual Classroom (LMS) by Students During the ERT Context

Regarding students' time-on-task in the LMS, we analyzed students, interaction with the platform in their courses in ERT modality. This variable was selected to better understand the students' learning process during this period (Klašnja-Milićević et al., 2017). Our results show that, on average, 1st-year students logged in to the LMS longer than students in higher courses.

Considering that 1st-year students present a higher dropout risk (Bernardo et al., 2015, 2016), we believe these results can be considered positive, especially in STEM students (Jungert et al., 2019). Still, the low perception of learning opportunities and low platform time of STEM students may exacerbate the dropout figures that already existed before the pandemic (Van den Hurk et al., 2019). For such reason, there is a need to strengthen student engagement in the LMS coupled with student satisfaction with the study content and experience (Fleischer et al., 2019). Furthermore, the students' difficulties during the ERT could explain the low beliefs regarding learning opportunities in this period. For this reason, university authorities must reinforce and maintain the mechanisms of consultation and accompaniment for the implementation of online learning.

Students' Initial Learning Beliefs, Time Spent Online in the Virtual Classroom, and GPA

Likewise, we found that low beliefs about learning opportunities and academic performance are related to lower time-on-task and lower academic performance achieved at the end of the semester. This result can be explained from the theoretical approach of student self-efficacy. When students have low beliefs or perceptions of learning ability, they present difficulties regarding their academic performance (Bandura, 2012). In the case of the online setting, when students possess positive beliefs toward learning experiences, they interact to a greater extent with the learning activities and resources in the LMS, leading to higher performance (Ifenthaler, 2020).

Participating students had lower expectations about their learning opportunities, although they believed that the ERT would not affect their academic performance. Based on these findings, research indicates that individual and educational factors affect students' beliefs about virtual learning (Alameri et al., 2020). In this case, uncertainty about how the ERT would unfold, being a new learning experience for instructors and students may have impacted students' beliefs about their learning opportunities. Therefore, we did not identify significant changes in students' performance expectations in the ERT. However, Redondo-Gutiérrez et al. (2017) found that when students' performance expectations relate with taking individual

assessments, they tend to be better than in the case of group assessments (Redondo-Gutiérrez et al., 2017). Regarding assessment during the ERT, students were not clear about the evaluative processes of their learning. One explanation for this result could be that the students believed that assessment processes would be individual due to the ERT. As a result, they believed that their grade would be the result of their performance.

Although institutions' instructional designers and managers understand the difference between ERT and online education, students and instructors usually do not (Chaka, 2020). Only conducting video lectures or leaving the material in repositories is far from representing a successful online educational model. In online education courses, planning and design must follow an instructional model, such as ADDIE or Backward Design (Dean, 2019; Ofosu-Asare et al., 2019). Each learning activity and resource is carefully planned to be implemented through an LMS. Nonetheless, we know that it was necessary to improvise in the ERT period to provide continuity to the educational processes, which resulted in inadequate preparation for both students and instructors. In addition, the uncertainty generated by the crisis could also be reflected in students' negative beliefs about online learning.

Particularly in STEM courses, the perception of low learning may be influenced by the disciplines' characteristics. Usually, students learn to implement the scientific practices through hands-on educational experiences in face-to-face laboratories, especially in chemistry, physics, and biology. Although scientific practices can be taught through academic activities, some require students to touch and manipulate elements and instant interaction with their peers. For example, in physics courses, students should learn to manipulate oscilloscopes; in chemistry courses, they should learn to manipulate reagents; and in biology, they should learn to manipulate microscopes. On the other hand, there are exceptions in which the implementation of virtual rather than face-to-face laboratories should not cause negative effects. An example of this is the computer science courses, in which the laboratories were already performed employing computers, using programming languages, such as Python, R, or Fortran. However, it should not be forgotten that such activities existed before the ERT caused by COVID-19 pandemic. The success in using these instructional strategies, whether in the face-to-face or online modality, lies in the importance of linking it with the possibility of teamwork and the realization of adequate feedback by the teacher on the student's learning.

Given the impossibility of implementing face-to-face laboratory activities for all students, university instructors in STEM faced additional challenges compared to other disciplines. Instructors had to confront an extra challenge to support their students in achieving course learning outcomes: looking for a solution to implement laboratory practices remotely and incorporating active learning techniques (Vogel-Heuser et al., 2020). An option would be implementing simulation-based virtual laboratories where students must modify parameters to see the effects in the experiments (Belford and Moore, 2016). An excellent resource to use is the University of Colorado Boulder's repository of interactive simulations. Simulations include activity proposals containing the HTML iframe code to embed the simulation directly into the LMS (University Colorado Boulder, 2021). Additionally, there are different alternatives to remote laboratories. An example of these is an educational project of the University of Deusto (Orduña et al., 2011; García-Zubía et al., 2018; Orduña et al., 2018).

Another remedial action could be implementing a peer support system by upper-level training students with high learning beliefs to support 1st-year students with low beliefs in online learning processes (Honkimaki and Tynjala, 2018). Moreover, institutions could also implement a remote help desk system where students can send their queries related to ERT. For the latter initiative, the institution needs access to help desk software and staff trained in pedagogical and technological aspects to provide timely and efficient student responses.

A strength of this research is the use of other forms of measurement to reduce the possible bias that could be generated by only using the self-report as a measurement (De las Cuevas Catresana and González de Rivera, 1992). In this study, the application of questionnaires allowed to assess young people's learning and performance beliefs. Also, through learning analytics, we evaluated students' behavior within the LMS during the entire semester and linked it with the academic performance achieved at the end of the period. Employment of learning analytics to assess students' beliefs, especially in 1st-year students, enables early identification of students at dropout risk and provides personalized support before the student withdraws from the university (Honkimaki and Tynjala, 2018; Wong et al., 2018).

This study has some limitations, which are referred to the following aspects: (a) the presence of biases against the actual assessment of students' academic performance, since due to the COVID-19 pandemic, the participating university implemented a series of educational policies that could affect the academic results obtained by the students; (b) the participants in this study belong to a single university, which, although it is one of the largest institutions of higher education in Chile, and with a great variety of disciplines, presents its own contextual characteristics that could affect the results; (c) the use of a single indicator (time-on-task) for the construction of the learning analytics variable is insufficient to cover the variety of behaviors that characterize the student's interaction with the virtual classroom; (d) The measurement of the learning beliefs variable with two items could limit the content validity; and (e) finally, in this investigation it was not possible to identify other variables that could impact the time spent by students in the LMS, such as course design, number of credit hours, among others.

Future research could consider other elements, such as participation in forums, number of activities performed in the LMS, number of resources read and downloaded, among other analytics offered by the LMS (Ifenthaler and Yau, 2020). Also, it would be interesting to study further the effects of course variables (e.g., level, type, design, credit hours), which could impact student academic performance. Investigation along these lines could expand and diversify the sample and conduct similar studies when the pandemic context is overcomed.

This study contributes to the early identification of at-risk students, encouraging pedagogical actions to decrease students' negative beliefs about online learning. In addition, our results

could positively impact the dropout rates found in STEM careers by guiding institutional actions that address beliefs toward online education. These actions are significant given that post-pandemic, it is expected that a large part of Higher Education institutions seeks to promote Blended Learning education within their educational models. All the above consider technological advances, globalization of information, and learning about online education generated during the ERT.

CONCLUSION

Considering the findings, we concluded that most students had negative beliefs about their opportunities to learn through the ERT. These beliefs were equally presented among men and women. We identified that students in their first academic year spended more time connected to the LMS. Additionally, we observed that when students presented positive beliefs about their learning, they spent more hours connected to the LMS.

We found that students with higher achievement beliefs presented higher scores on the mathematics college entrance test (PSU). Thus, we believe that the PSU score intervened in students' future performance beliefs. Similarly, we identified that students with low-performance beliefs at the beginning of the ERT presented lower scores at the end of the ERT semester. The students' beliefs about learning opportunities and performance intervened in the time of interaction with the LMS, affecting the academic achievement. Thus, it is relevant for teachers and institutions to promote beliefs that can relate to positive behaviors in their 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

The studies involving human participants were reviewed and approved by Universidad de Concepción Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KL and FS-D contributed to the design of the study, literature, and writing of the manuscript. RC-R contributed to the design of the study, data analysis, and review of the abstract and manuscript. JM contributed to the data extraction, data analysis, and interpretation of the results. AM contributed to the study's design, interpretation of the results, and the abstract and manuscript review. CB and NC contributed to the interpretation of the results and writing of the manuscript. All authors contributed to the article and approved the submitted version.

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Burnt Out and Dropping Out: A Comparison of the Experiences of Autistic and Non-autistic Students During the COVID-19 Pandemic

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Autistic students are more likely to drop out of university, while facing both challenges and opportunities within university environments. This study compared the experiences of autistic and non-autistic current United Kingdom students, in terms of thoughts about dropping out, burnout, mental health and coping, during the COVID-19 pandemic. Burnout was of particular interest as this is a relatively unexamined phenomenon for autistic students. Seventy autistic and 315 non-autistic students, completed a mixed methods questionnaire with standardized measures of burnout (personal and academic), mental health (depression, stress, and anxiety), and coping styles (adaptive and maladaptive). We also included qualitative questions about dropping out and COVID-19 experiences. We found autistic participants experienced higher rates of burnout and mental health symptoms and were more likely to have thought about dropping out. Reasons given for thinking about dropping out, for both groups, focused on poor mental well-being, doubts about university, and academic challenges. For autistic participants, further analyses did not identify specific predictors of thinking about dropping out, but for non-autistic participants, this was predicted by maladaptive coping styles and academic burnout. Academic and personal burnout predicted one another for autistic students, and age, maladaptive coping, autistic characteristics, stress, and anxiety additionally predicted burnout for non-autistic students. Similarities in experiences during the pandemic were noted, with both groups experiencing negative social implications, difficulties adjusting to emergency online learning, and poorer psychological well-being. Moving forward from COVID-19, universities must find ways to enhance both academic and social support, to enable equal opportunity within Higher Education for autistic students.

Keywords: autism, burnout, mental well-being, university dropout, higher education, COVID-19

INTRODUCTION

Autistic individuals[1] experience differences and difficulties within social interactions and social communication (particularly when interacting with non-autistic individuals; Crompton et al., 2020), differences in sensory processing (Clince et al., 2016), passionate and focused interests (Grove et al., 2018), stimming (self-stimulating) behaviors (Kapp et al., 2019), and preferences for routine or familiarity (Grove et al., 2018). Autistic people can have a wide range of support needs, and each autistic person will experience a different constellation of strengths and challenges. Many autistic people are now deciding to pursue Higher Education. For example, in the United Kingdom in 2019/20, 14,360 students disclosed that they were autistic, compared to 6,845 in 2014/15 (HESA, 2021). However, the actual number of autistic students at university could be much higher, as many choose not to disclose (Knott and Taylor, 2014) or have experienced barriers to diagnosis (Huang et al., 2020). One additional concern is that many autistic students appear to be more likely to drop out of university than their non-autistic peers (Newman et al., 2011; Cage et al., 2020). It is therefore imperative we understand why autistic students might be more likely to drop out, and generally better understand how to improve autistic students' experiences at university.

However, previous research on university completion for autistic students is limited. Cage et al. (2020) conducted a survey of 230 autistic people (mostly from the United Kingdom), of whom 45 had not completed their studies, 151 had graduated and 34 had graduated after several attempts. Those who did not complete reported a poorer academic experience, found the transition to university more challenging and felt less like they fitted in to their university. Cage and Howes (2020) carried out semi-structured interviews with 14 autistic people who had dropped out of university in the United Kingdom, identifying systemic, societal issues that related to the participants' decision to drop out, as well as challenges within the university environment, such as feelings of culture shock, disengagement with their studies, and experiencing a lack of proactive support. Anderson et al. (2020) interviewed 11 autistic students from Australia and New Zealand, of whom three had not completed their degree. The reasons they had withdrawn related to poor mental and physical health, sensory challenges, low motivation for the degree subject, and lack of support. In a study of current United Kingdom autistic students, Gurbuz et al. (2019) reported that more autistic students had considered withdrawing (56%) than non-autistic students (15.3%), but did not explore their reasons for feeling this way in depth. Adding to the limited literature on this topic is important, to better understand the mechanisms underlying dropout for autistic students and to ensure that autistic students are experiencing an equality of opportunity when it comes to Higher Education.

Until recently, there have been few direct comparisons between autistic and non-autistic students in the autism research literature. Comparing may help us better understand aspects of the university environment which particularly affect the experiences of autistic students over their non-autistic peers, and to identify mechanisms contributing to dropping out specifically for these students. Gurbuz et al. (2019) used a mixed methods online survey to compare the experiences of 26 autistic and 158 non-autistic students from the United Kingdom. Autistic students self-reported higher mental health difficulties and more challenges with social aspects of university, which Gurbuz et al. (2019) suggested linked to dropping out intentions. Other studies comparing autistic and non-autistic students have not considered dropping out. For example, Lei and Russell (2021) interviewed 18 autistic and 18 non-autistic students from the United Kingdom about perceptions of their self-determination (their ability to determine their own future and experiences) at university, noting that while there were commonalities, autistic students discussed autistic-specific strengths and more difficulties with transitions. Gillespie-Lynch et al. (2020) compared the writing skills of 25 autistic and 25 non-autistic students in the United States, finding autistic students expressed more writing skill and quality, higher nonverbal intelligence, and more perfectionist attitudes toward writing. These studies indicate there are unique strengths and challenges experienced by autistic students and comparing could help us to identify autistic-specific support versus support that would benefit students more broadly.

It is worth considering autistic students' experiences in relation to the higher prevalence of mental health difficulties in the broader autistic population (Lai et al., 2019), which may contribute to the risk of dropping out for autistic students. For example, Eaves and Ho (2008) found that 77% of young autistic adults had co-occurring mental health conditions, with depression one of most common mental health conditions for autistic people (Gillott and Standen, 2007; Hollocks et al., 2019). Studies have also suggested that anxiety, including social anxiety, is significantly higher in the autistic population than the non-autistic population (Maddox and White, 2015). It is perhaps not unforeseen, then, that autistic students also report experiencing more mental health difficulties (Gurbuz et al., 2019), although there is little research directly measuring and comparing mental health symptoms experienced by autistic and non-autistic students or examining poor mental health as a predictor of dropout intentions.

Indeed, mental health difficulties in the student population (irrespective of whether someone is autistic) have been a concern for several years (Barkham et al., 2019), with the university period viewed as a time of distress (Bewick et al., 2010). Increasing numbers of students report mental health conditions: in the United Kingdom, in 2014/15, 33,500 students disclosed a mental health condition to their university, and in 2019/20 this was 96,490 (HESA, 2021). However, many students can find it difficult to disclose (Woodhead et al., 2020), suggesting numbers could be significantly higher than recorded statistics indicate. Given the high prevalence of mental health difficulties generally among the student population, research aiming to understand this prevalence plus appreciating the intersection between mental health and being autistic could tell us more

[1]Identity first language is used throughout this paper to respect the preferences of the autistic community (Kenny et al., 2016; Bury et al., 2020) and avoid ableist language (Bottema-Beutel et al., 2020).

about what could happen to improve university experiences for these students and to prevent dropout.

One aspect of mental well-being that has not been considered within the university context nor in relation to dropping out for autistic students, to the best of our knowledge, is burnout. Burnout is typically described as a state induced by stress, feeling mentally and physically exhausted, depersonalized, and unaccomplished (Pines and Maslach, 1978). Initially a phenomenon studied within workplace contexts, it has also been considered in relation to student experiences (Fernández-Castillo, 2021). For example, in non-autistic students, Zhang et al. (2007) suggest that burnout is prominent among students due to the high demands of balancing university with other life stressors. In a study of 7,757 university students, Portoghese et al. (2018) found that 34.2% were burned out, and a further 51% were "overextended," meaning that they displayed moderately high levels of exhaustion. Prior research has also indicated that for non-autistic students, burnout can predict dropout intentions (Dyrbye et al., 2010; Marôco et al., 2020; Mostert and Pienaar, 2020) and has been related to suicidal ideation (Dyrbye et al., 2008).

Researchers generally poorly understand the topic of burnout for autistic people, particularly whether there is a specific phenomenon of "autistic burnout." Using thematic analysis, Raymaker et al. (2020) explored how autistic people defined autistic burnout. They characterized autistic burnout as consisting of long-term chronic exhaustion, being less tolerant of stimuli (e.g., sensory stimuli), and loss of skills (e.g., being able to remember things, socialize or regulate emotions). They described autistic burnout as happening due to intense life stressors, inadequate support, and when expectations exceeded abilities. Using a Grounded Delphi study with 23 autistic adults, Higgins et al. (2021) developed a conceptual framework for autistic burnout. Their findings somewhat corroborate Raymaker et al. (2020), with autistic burnout defined as consisting of chronic exhaustion, reduction in daily living skills, interpersonal withdrawal, and increased difficulties with executive functions. Higgins et al. (2021) acknowledge some of the similarities with standard definitions of burnout but argue for distinctions around the cognitive effects and unique drivers of autistic burnout (such as those in relation to sensory sensitivities).

More work is needed to fully understand autistic burnout, particularly within the Higher Education context, and whether it contributes to thoughts about dropping out. In our study, as we compared the experiences of autistic and non-autistic students, a standardized measure of burnout was used rather than an autistic-specific measure [which has only recently been in development (Raymaker et al., 2020)]. We considered both academic burnout (i.e., burnout specifically related to university and academic demands) and personal burnout [i.e., burnout outside of university demands – how physically and psychologically exhausted someone is in general (Kristensen et al., 2005)]. By comparing experiences, this helps us further understand whether autistic burnout should be conceptualized as distinct, while also appreciating that an autistic student could also experience academic burnout in addition to autistic burnout.

Given the discussed prevalence of mental health challenges and risk of burnout within university contexts, for both autistic and non-autistic students, we should also consider how students cope with the stress they experience at university. Coping refers to attempts taken to reduce or prevent stress, harm, or threat (Carver and Connor-Smith, 2010). University can be a stressful environment, where students need to use coping strategies to get by (Böke et al., 2019). Some coping strategies may be considered more adaptive, whereby the means of coping supports positive adaptation to stress (such as seeking social support), or maladaptive, where ultimately unhelpful or potentially harmful strategies are used (such as substance abuse; Brougham et al., 2009; Sirois and Kitner, 2015). Research with students indicates that coping styles can play a role in well-being, for example by maladaptive strategies contributing to poorer well-being (Tran and Lumley, 2019), while more positive well-being is related to greater use of adaptive strategies (Freire et al., 2016). However, there is a significant lack of research exploring the coping strategies of autistic students, with coping only mentioned within a few qualitative studies (Van Hees et al., 2015; Cai and Richdale, 2016). We also do not know how coping strategies may relate to dropping out for autistic students.

Finally, we must consider all the discussed points within the context of a global pandemic, and its associated restrictions, which may have exacerbated challenges for both autistic and non-autistic students. The data for this study were collected during the COVID-19 pandemic, which changed Higher Education in many ways – such as universities shifting rapidly to online teaching and assessments, the loss of social events and connections, and increasing concerns over the job prospects of students (De Man et al., 2021). Research on students during the pandemic indicated high rates of depression and anxiety (Cao et al., 2020; Kaparounaki et al., 2020; Odriozola-González et al., 2020; Savage et al., 2020; Birmingham et al., 2021), with high academic stress, institutional dissatisfaction and fear of catching COVID-19 associated with increased depression (De Man et al., 2021). A study of over 30,000 students from 32 different countries noted emotions around frustration, boredom, and anxiety, with many worried about their future studies and careers, with some inequalities in relation to different socio-demographic characteristics (Aristovnik et al., 2020). Students also experienced increased loneliness during the pandemic lockdowns (Bu et al., 2020).

Research on autistic people's experiences during the pandemic has generally not had a student focus. However, one study in the United States surveyed 76 autistic students (using non-standardized measures), noting particular anxiety around catching or spreading COVID-19, and managing their studies online (Monahan et al., 2021). In qualitative answers, these students also reported concerns over keeping up academically, getting support, and being able to attend and participate in online classes. Other studies have included autistic students in combination with other disabled students: Gin et al. (2021) categorized autistic students alongside students with learning disabilities (although autism is not a learning disability), and found that overall for disabled students, many could not access

accommodations when learning moved online. Soria et al. (2020) grouped autistic students with other students with "neurodevelopmental or cognitive disabilities" (e.g., ADHD), noting that these students were more likely to experience financial difficulties, low feelings of belonging, and felt a lack of support. Soria et al. (2020) also reported that disabled students experienced higher symptoms of depression and anxiety than non-disabled students during the pandemic.

Other studies without a student focus provide some additional insight into the experiences of autistic people generally during the pandemic. Adams et al. (2021) conducted an online survey of 275 autistic adults in the United States 10 weeks into the pandemic, with data available on mental health symptoms pre- and during the pandemic. They found no significant change in mental health symptoms, but higher COVID-related distress was related to increased depression and anxiety during the pandemic. Another United States study found that autistic females, those with a prior mental health diagnosis, and those who knew someone with COVID-19, reported higher levels of psychological distress (Bal et al., 2021). In a sample of 1,044 autistic adults from Belgium, Netherlands, and the United Kingdom, Oomen et al. (2021) found increased depression and anxiety for autistic adults during the pandemic, as well as many missing social contact. Pellicano et al. (2021) interviewed autistic adults, autistic young people, and parents (autistic and non-autistic), mostly from Australia, noting that although lockdowns brought fewer social pressures and reduced masking, many reported a negative impact of not being able to connect with other people, with mental health deteriorating. Together, these studies show the overall negative impact of the pandemic for autistic people, although we do not know much about autistic students' experiences.

Overall, the current exploratory study aimed to examine and compare autistic and non-autistic students' experiences in relation to dropout, burnout, mental health, coping, and the COVID-19 pandemic, using mixed methods. The research questions were:

1. Are there differences in considering dropping out, burnout, coping styles, and mental health between autistic and non-autistic students?
2. Do these variables (poor mental health, greater burnout, and maladaptive coping styles) predict whether autistic and non-autistic students consider dropping out or not?
3. Do these variables predict burnout for autistic and non-autistic students?
4. How has the COVID-19 pandemic affected autistic and non-autistic students?

MATERIALS AND METHODS

Participants

In total, 385 participants from the United Kingdom took part, of which 315 were non-autistic and 70 were autistic. Most participants were undergraduates (88.1%) with 11.6% postgraduate students. 178 were studying a STEM subject, 184 Arts and Humanities, and 23 preferred not to say. We recruited participants online using social media platforms (e.g., Facebook, Reddit, Instagram, and Twitter) by posting the questionnaire link along with a study advert. We also used the University of Stirling's research participation system, which encourages students to participate in research projects in exchange for module credit. Autism-specific groups on social media were also used for recruitment of autistic students. Recruitment took place in November and early December 2020. This coincided with a period of tiered restrictions in Scotland (where local areas had different levels of restrictions imposed), and the vaccine roll-out beginning in December 2020.

For autistic participants, both those with formal diagnoses and those who suspected they were autistic, but were not formally diagnosed, were included, due to barriers to diagnosis (Huang et al., 2020). 32 participants were formally diagnosed and 38 were self-identifying. People not fitting the stereotypical view of "autism" are less likely to be diagnosed, particularly females (Lockwood Estrin et al., 2021), and in our study 76% ($n = 29$) of those self-identifying as autistic were female. All of the autistic participants (formally diagnosed and self-identifying) scored above the cut-off score of 14 on the RAADS-14, a screening tool for autistic characteristics. Due to the COVID-19 pandemic, we were unable to independently verify whether self-identifying autistic participants would meet diagnostic criteria using in-person assessments. Due to the exploratory nature of this study, and the importance of not gatekeeping or invalidating the experiences of those who have self-identified (Lewis, 2016a,b), we retained these participants in the sample. Autistic participants were significantly older than non-autistic participants [autistic mean = 24.16 ($SD = 6.84$); non-autistic mean = 21.35 ($SD = 3.51$), $t(379) = -4.93$, $p < 0.001$]. Other demographic characteristics are noted in **Table 1**, with notably most students being female, Scottish, and White, for both groups.

We also asked participants to self-report mental health conditions. For non-autistic participants, 37.5% ($n = 118$) reported that they had a diagnosed mental health condition, 35.6% ($n = 112$) reported mental health difficulties but no formal diagnosis, and 27% ($n = 85$) reported no mental health conditions. For autistic participants, 68.6% ($n = 48$) had diagnosed mental health conditions, 22.9% ($n = 16$) had suspected mental health conditions, and 8.6% ($n = 6$) had no mental health conditions. Specific self-reported mental health conditions are shown in **Table 1**, with anxiety and depression the most common conditions for both groups.

Ethical approval for this research was obtained *via* the University of Stirling Ethics Delegated Authority. The questionnaire was also reviewed by an autistic person with lived experience of dropping out of university. They provided feedback on the aims of the study and reviewed the questionnaire in full to ensure that it was accessible and respectful. We also discussed the findings and our interpretations of the study with this individual. Due to funding constraints, deeper participatory involvement was unfortunately not possible, as this study was conducted as part of an undergraduate dissertation.

TABLE 1 | Demographic information and participant details for autistic and non-autistic students.

	Non-autistic	Autistic
Gender		
Male	14.3% (*n* = 45)	17.1% (*n* = 12)
Female	85.4% (*n* = 269)	71.4% (*n* = 50)
Other gender identities	–	11.4% (*n* = 8)
Prefer not to say	0.3% (*n* = 1)	–
Ethnicity		
White British	94.0% (*n* = 296)	84.3% (*n* = 59)
Other White background	3.2% (*n* = 10)	8.6% (*n* = 6)
Mixed/multi-ethnic	1.9% (*n* = 6)	4.3% (*n* = 3)
Asian/British Asian	1.0% (*n* = 3)	1.4% (*n* = 1)
Black/African/Caribbean/Black British	–	1.4% (*n* = 1)
Country of study		
Scotland	87.3% (*n* = 275)	61.4% (*n* = 43)
England	10.5% (*n* = 33)	37.1% (*n* = 26)
Northern Ireland	1.3% (*n* = 4)	1.4% (*n* = 1)
Wales	0.3% (*n* = 1)	–
Mental health conditions*		
Anxiety/social anxiety	55.9% (*n* = 176)	77.1% (*n* = 54)
Depression/bipolar	47.6% (*n* = 150)	61.4% (*n* = 43)
Eating disorder	13.7% (*n* = 43)	20.0% (*n* = 14)
Post-Traumatic Stress Disorder	12.1% (*n* = 38)	25.7% (*n* = 18)
Obsessive Compulsive Disorder	6.7% (*n* = 21)	18.6% (*n* = 13)
Personality disorder	6.0% (*n* = 19)	14.3% (*n* = 10)
Substance abuse/Addiction disorder	3.5% (*n* = 11)	18.6% (*n* = 13)
Schizophrenia	0.3% (*n* = 1)	5.7% (*n* = 4)
Other	2.9% (*n* = 9)	2.9% (*n* = 2)
Prefer not to say	1.0% (*n* = 3)	1.4% (*n* = 1)

Participants could select more than one mental health condition.

Feedback, however, indicated that this topic was likely important to the autistic community, that the survey was accessible, and that our interpretations were aligned with the data and their personal experiences, with additional insights provided on the effects of the pandemic for autistic people.

Materials and Procedure

Participants completed an online questionnaire, which was developed in the survey software "Qualtrics." Participants first completed demographic questions including gender, age, and ethnicity, followed by questions about their degree, such as topic and year of study. We next asked questions regarding whether they had an autism diagnosis (or self-identified) and/or mental health conditions. Participants were also asked whether they believed their mental health had deteriorated since the start of their degree (options: yes/no/prefer not to say). Participants then completed the following measures in the order presented below.

Mental Health

The presence of mental health symptoms was examined using the DASS-21 (Lovibond and Lovibond, 1995). There were 21-items related to the symptoms of depression, anxiety, and stress, rated on a 4-point Likert scale [from "did not apply to me at all" (0) to "applied to me very much/most of the time" (3)]. Examples items included statements, such as "I felt that life was meaningless." Answers mapped onto three subscales, with seven items each corresponding to symptoms of depression, anxiety, and stress. Following DASS-21 procedures, the total score for each subscale was calculated by summing the seven items and multiplying by two, with a range of possible scores from 0 to 42, with higher scores indicating higher depressive, anxiety, or stress symptoms. All subscales had very good internal reliability within each group [Stress: Cronbach's $\alpha = 0.83$ (non-autistic), $\alpha = 0.80$ (autistic); anxiety: $\alpha = 0.87$ (non-autistic), $\alpha = 0.85$ (autistic); depression: $\alpha = 0.87$ (non-autistic), and $\alpha = 0.90$ (autistic)]. The DASS-21 has previously been validated for use with autistic adults, indicating that this measure can be used to assess depression, stress, and anxiety with this group (Park et al., 2020).

Burnout

We used the Copenhagen Burnout Inventory (CBI; Kristensen et al., 2005) to measure burnout. Participants rated statements based on how much the statements applied to them over the past year on a 4-point scale, coded in terms of percentages ["Never (0%), Occasionally (25%), Half of the time (50%), most of the time (75%). or all of the time (100%)"]. We used two subscales from the CBI to look at personal burnout (six items) and work-related burnout, which we modified to focus on academic burnout (seven items). For example, items, such as "Is your work emotionally exhausting," were modified to "Is your university work emotionally exhausting." For this study, the subscale of "Client-related burnout" within the CBI was not used as it was deemed irrelevant to the focus of the research. The CBI has been adapted to be used with students before [Campos et al., 2013 (Portugal/Brazil), Sveinsdóttir et al., 2021 (Iceland, nursing students), and Zarobkiewicz et al., 2018 (Poland, medical students)]. For both personal and academic burnout, an average percentage score was calculated, which could range from 0 to 100%, with higher scores indicating a higher degree of burnout. Internal reliability was very good for both personal burnout (non-autistic $\alpha = 0.85$, autistic $\alpha = 0.86$) and academic burnout (non-autistic $\alpha = 0.88$, autistic $\alpha = 0.89$). To the best of our knowledge, this measure has not been used with autistic people before.

Coping Styles

We used the Brief-COPE (Carver, 1997) to measure coping styles. The Brief-COPE consists of 28 items where participants rate how often they use different coping techniques on a 4-point Likert scale [from "I haven't been doing this at all" (1) to "I've been doing this a lot" (4)]. For example, "I've been getting emotional support from others, such as peers, friends, family, or professionals." In this study, some question wording was adapted to refer specifically to a university environment (e.g., "I've been taking actions to try and make my situation *at university* better"). The original measure can be coded into scores for 14 different types of coping, however, we organized scoring into adaptive (16 items) and maladaptive (12 items)

coping styles (Kasi et al., 2012; Choi et al., 2015). Total scores could therefore range from 16 to 64 for adaptive coping and 12 to 48 for maladaptive coping, with higher scores indicating higher use of that coping style. Internal reliability was good for adaptive coping (non-autistic $\alpha = 0.78$, autistic $\alpha = 0.81$) and acceptable for maladaptive coping (non-autistic $\alpha = 0.67$, autistic $\alpha = 0.68$). This measure has previously been validated for use with autistic people (Muniandy et al., 2021).

Autistic Characteristics

Autistic characteristics were measured using the Ritvo Autism Asperger Diagnostic Scale (RAADS-14; Eriksson et al., 2013). The RAADS-14 has 14 items, rated on a 4-point Likert scale [from "This was never true and never described me" (0) to "describes me now and when I was young" (3)]. For example, "Some ordinary textures that do not bother others feel offensive when they touch my skin." Scores could range from 0 to 42, with higher scores indicating greater autistic traits, and a cut-off score above 14 relating to increased likelihood of being autistic. Internal reliability was good (non-autistic $\alpha = 0.80$, autistic $\alpha = 0.75$). A systematic review of screening tools for autism indicated that the RAADS-14 has satisfactory psychometric properties (Baghdadli et al., 2017).

Qualitative Questions

Participants were asked "Have you ever considered dropping out of university? And what is the reason for your answer?" Using answers to this question, participants were coded as either considering dropping out or not. Conventional content analysis was used to analyze the reasons why participants had considered dropping out (Hsieh and Shannon, 2005; see below). We also asked: "In what ways do you feel that the Coronavirus pandemic has affected you most (personally and university-wise)?" Answers to this question were also analyzed using conventional content analysis.

Design and Data Analysis

We used a cross-sectional mixed methods exploratory survey. Quantitative data were analyzed using SPSS version 27. Data were normally distributed, but due to a significant difference in age between the two groups, age was controlled for in all analyses where possible. For our significance threshold, we considered values of $p < 0.005$ as significant, and values between 0.05 and 0.005 as suggestively significant (Ioannidis, 2018). To examine the first research question (differences in dropout, burnout, coping, and mental health), we used chi-square to examine considering dropping out, due to categorical data, and multivariate analysis of covariance (MANCOVA) for all other measures. We used conventional content analysis (Hsieh and Shannon, 2005, see below) to examine the qualitative reasons given for considering dropping out. To examine the second research question (what predicts considering dropping out), two separate binary logistic regressions were used for each group, with considering dropout (yes/no) as the outcome and age, RAADS score, stress, anxiety, depression, adaptive coping, maladaptive coping, personal burnout, and academic burnout as predictors. For the third research question (what predicts burnout), four separate linear regressions were conducted, looking at personal and academic burnout in each group, with the same predictors as above (controlling for each type of burnout in the analyses). The Variance Inflation Factors (VIF) were all below 5, indicating no multicollinearity. Finally, for the fourth research question (COVID-19), qualitative responses were analyzed using conventional content analysis. For all content analyses, all responses were read through several times by two researchers to gain familiarity with the data. Initial codes were identified and discussed between the two individuals, to compare thoughts on the common experiences present in the data. Codes were then refined and organized into categories, naming the categories based on the commonalities expressed in the data. All responses were then categorized accordingly by one researcher.

RESULTS

Descriptive Statistics

When asked if they believed their mental health had deteriorated since the start of their degree, 68.3% ($n = 215$) of non-autistic students said "yes," 30.5% ($n = 96$) said "no" and 1.3% ($n = 4$) preferred not to say. For autistic students, 75.7% ($n = 53$) said "yes," 20.0% ($n = 14$) said "no" and 4.3% ($n = 3$) preferred not to say. Means and standard deviations (*SD*) for all measures are shown in **Table 2**.

Dropping Out

For the non-autistic group, 268 participants answered the question about whether they had considered dropping out – 165 (61.6%) indicated that they had, and 103 (38.4%) had not. For the autistic group, 63 participants answered the question, of which 49 (77.8%) had considered dropping out and 14 had not (22.3%). Chi-square indicated that there was a suggestively significant association between group and considering dropping out, $\chi^2(1) = 5.87$, $p = 0.019$, 2-sided, indicating that autistic students were more likely to have thought about dropping out.

Additionally, 49 autistic and 164 non-autistic participants provided an explanation for why they had thought about dropping out. The reasons given were largely very similar for both groups (**Table 3**). For both, the most frequently cited reason concerned their *mental well-being*, whereby participants

TABLE 2 | Descriptive statistics (mean, *SD*) for each measure for autistic and non-autistic participants.

	Non-autistic mean (*SD*)	Autistic mean (*SD*)
Stress	21.82 (8.61)	26.29 (7.66)
Anxiety	18.40 (9.85)	22.43 (9.19)
Depression	18.63 (9.48)	23.69 (10.12)
Adaptive coping styles	34.71 (7.12)	35.61 (7.65)
Maladaptive coping styles	27.29 (5.28)	27.94 (5.45)
Personal burnout	54.95 (21.03)	63.04 (20.58)
Academic burnout	58.82 (22.35)	65.71 (23.03)
Autistic characteristics	11.09 (8.47)	30.73 (7.47)

TABLE 3 | Number and percentage of responses coded, and example quotes for participants' reasons for considering dropping out.

Category	Autistic group *n* (% of responses)	Autistic group example quote	Non-autistic group *n* (% of responses)	Non-autistic example quote
Mental well-being	23 (32.9%)	"I was struggling a lot with low mood"	74 (33.5%)	"It's just seemed like more stress than it's worth at times"
Doubting it all	17 (24.3%)	"I sometimes feel that maybe I'm just not cut out for it and that I should just accept that"	62 (28.1%)	"I've often felt like I wasn't smart enough to complete my degree"
Academic challenges	11 (15.7%)	"I struggle with the workload, and can't keep up"	44 (19.9%)	"Having multiple deadlines at the same time and not knowing what to prioritise"
Social challenges	7 (10.0%)	"Friendships forming around me and being completely left out for 4 years"	8 (3.62%)	"I was very lonely due to having made no friends"
Lack of support	6 (8.57%)	"I realised in first year that I was not going to receive any really meaningful support from university services and have felt a bit disillusioned since"	13 (5.88%)	"Yes - due to feeling as though I was not getting the support I needed personally when I needed it the most"
Financial reasons	5 (7.14%)	"Yes, out of concern that the financial investment is not worth it"	8 (3.62%)	"Cost of everything (rent, food, bills) being expensive"
COVID-19	1 (1.46%)	"I have been very stressed due to COVID-19"	12 (5.43%)	"I have considered dropping out and reapplying once full-time face to face teaching resumes"

N reflects the number of responses coded, and percentages are the percentage out of total responses. Percentages do not add up to 100 as responses could be coded in multiple categories.

explained how university was having a negative mental impact, including increasing stress, anxiety, and depression. The next most frequent reason centered around *doubting it all*, with participants expressing either self-doubt that they could complete their course, doubts that their chosen course was right for them, or it had not met their expectations. Next, most often participants talked about *academic challenges* in terms of aspects of studying, such as high workloads, deadlines, assessments, or failing modules. Other reasons given, reported within less than 10% of responses for both groups, included *social challenges* (such as difficulties making friends or feeling like they did not fit in), *lack of support* (e.g., from their university support services or from lecturers), *financial reasons* (such as feeling university was becoming financially unviable), and finally reasons related to *COVID-19* (such as the switch to online teaching making studying more challenging).

Mental Health

Using Pillai's Trace, there was a significant main effect of group on mental health, $V = 0.055$, $F(3, 376) = 7.25$, $p < 0.001$. The covariate of age was also significant, $V = 0.050$, $F(3, 376) = 6.60$, $p < 0.001$. Subsequent univariate ANCOVAs showed there was a significant difference for stress [$F(1, 378) = 14.04$, $p < 0.001$, $\eta_p^2 = 0.036$], anxiety [$F(1, 378) = 13.73$, $p < 0.001$, $\eta_p^2 = 0.035$] and depression [$F(1, 378) = 17.64$, $p < 0.001$. $\eta_p^2 = 0.045$], such that autistic participants experienced higher rates of each of these (**Figure 1**). The covariate age only suggestively significantly related to anxiety [$F(1, 378) = 7.69$, $p = 0.006$, $\eta_p^2 = 0.020$], such that anxiety decreased with age.

Coping

For coping styles, Pillai's trace indicated that there was no main effect of group, $V = 0.005$, $F(2, 343) = 0.83$, $p = 0.44$, $\eta_p^2 = 0.005$, indicating no difference in coping styles between the groups. The covariate, age, was also not significant [$V = 0.009$, $F(2, 343) = 1.47$, $p = 0.23$, $\eta_p^2 = 0.009$].

Burnout

For burnout, Pillai's trace indicated a suggestively significant main effect of group, $V = 0.024$, $F(2, 377) = 4.73$, $p = 0.009$. There was also a suggestively significant main effect of the covariate age, $V = 0.016$, $F(2, 377) = 3.06$, $p = 0.048$. Follow-up univariate ANCOVAs indicated there was a significant difference between groups both for personal burnout [$F(1, 378) = 9.19$, $p = 0.003$, $\eta_p^2 = 0.024$] and a suggestively significant difference for academic burnout [$F(1, 378) = 7.29$, $p = 0.007$, $\eta_p^2 = 0.019$], such that both types of burnout were higher for the autistic participants (**Figure 2**). Age was only suggestively significant for academic burnout [$F(1, 378) = 5.19$, $p = 0.023$, $\eta_p^2 = 0.014$], such that younger age related to higher academic burnout.

Predicting Considering Dropout

Binary logistic regression was used to examine predictors of considering dropping out. For autistic participants ($n = 62$), the model was significantly better at predicting the outcome than using the constant alone, $\chi^2(9) = 25.96$, $p = 0.002$. Overall, the model correctly classified 83.9% of participants. However, no individual predictors significantly predicted considering dropping out (**Table 4**).

For non-autistic participants ($n = 265$), the model was significantly better at predicting the outcome than using the constant alone, $\chi^2(9) = 65.37$, $p < 0.001$. Overall, the model correctly classified 73.2% of participants. Greater use of maladaptive coping styles and higher academic burnout related to significantly increased likelihood of considering dropping out, at a suggestively significant threshold (**Table 4**).

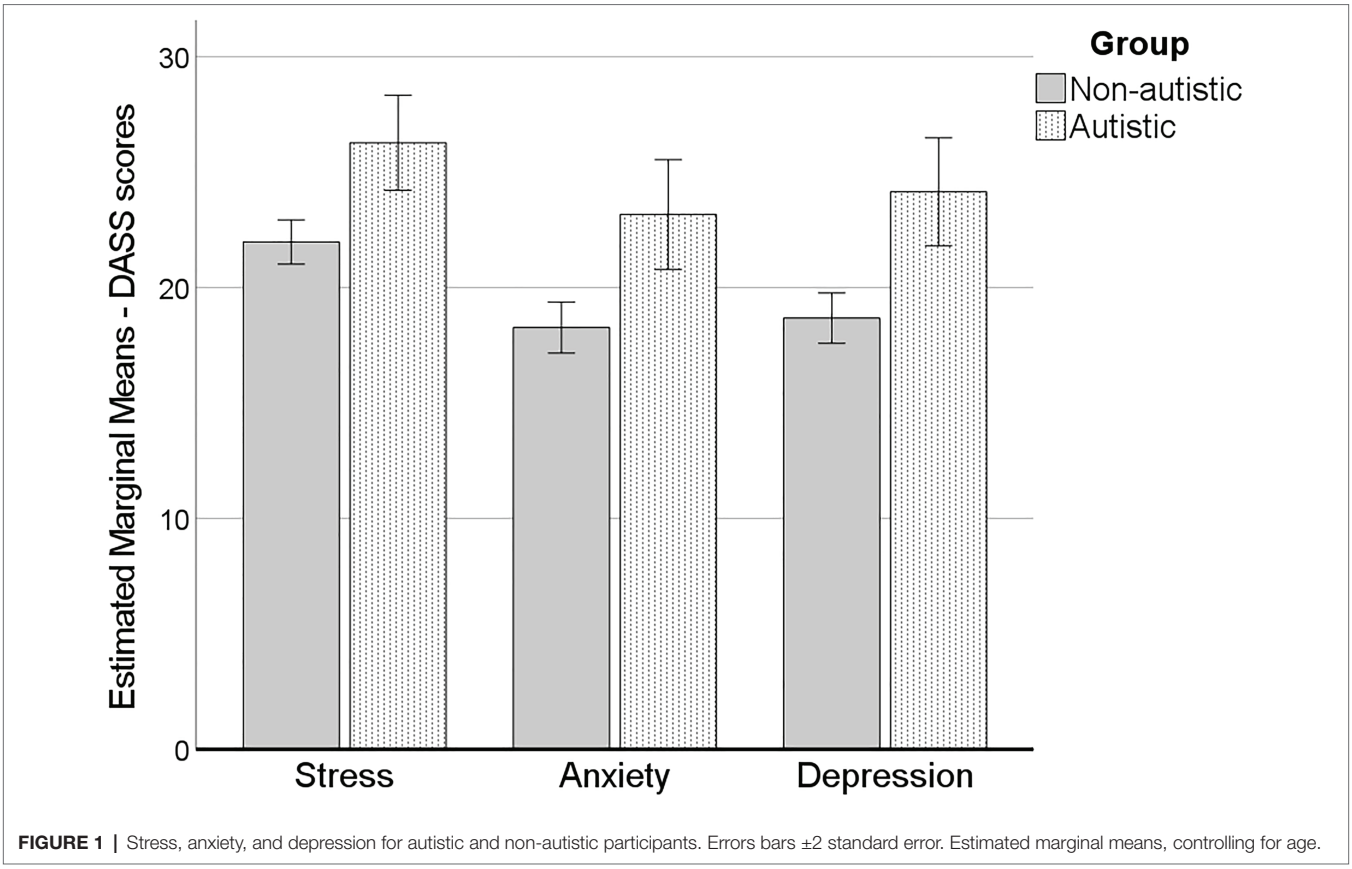

FIGURE 1 | Stress, anxiety, and depression for autistic and non-autistic participants. Errors bars ±2 standard error. Estimated marginal means, controlling for age.

Predicting Burnout

Considering academic burnout, for autistic participants, the model explained 65.7% of the variance and was significant [$F(8, 62) = 15.81$, $p < 0.001$]. However, the only significant predictor of academic burnout was personal burnout (**Table 5**). For non-autistic participants, the model explained 65.8% of the variance and was significant [$F(8, 273) = 66.74$, $p < 0.001$]. Here, greater use of maladaptive coping styles, higher personal burnout, and younger age predicted academic burnout. At a suggestively significant threshold, higher stress and lower anxiety moderately predicted academic burnout (**Table 5**) – these findings are treated with caution.

For personal burnout, the model explained 71.9% of the variance and was significant [$F(8, 62) = 20.83$, $p < 0.001$] for autistic participants. However, as before, the only significant predictor of personal burnout was academic burnout (**Table 6**). For non-autistic participants, the model explained 70.2% of the variance and was also significant [$F(8, 273) = 81.24$, $p < 0.001$]. Higher anxiety, stress, autistic characteristics, and academic burnout all significantly predicted greater personal burnout (**Table 6**).

How Has the COVID-19 Pandemic Affected Autistic and Non-autistic Students?

In total, 62 autistic and 267 non-autistic participants provided responses to our question about how COVID-19 had affected them. Using content analysis, we identified several similarities in the experiences of autistic and non-autistic students during the pandemic (**Table 7**). Most frequently, both groups talked about how the pandemic had led to *social isolation and limited social opportunities*. This category reflected how participants felt socially isolated, missed their friends and family, and felt they were unable to connect with other students on their courses. Next, most often both groups discussed how *online university is harder, overwhelming and unmotivating*. Here, many participants felt the emergency shift to online teaching had made their courses much more difficult and stressful, that they often found it hard to stay motivated and engaged, and ultimately to complete their academic work. The third most cited category for both groups centered on the *negative impact on mental and physical well-being*, with participants talking about how aspects of both mental and physical well-being had become worse during the pandemic, such as increased anxiety and depression. For non-autistic participants, the fourth most mentioned category was *trapped within these same four walls*, whereby they described how they felt physically isolated and hemmed in by having to work and study in the same place. Autistic participants mentioned this category less often, instead, their fourth most cited category was *a lack or loss of support*, where they described the ways the pandemic had resulted in support either being reduced, or not enough support being put in place, particularly from university services. Some of the non-autistic participants also mentioned this category as an issue.

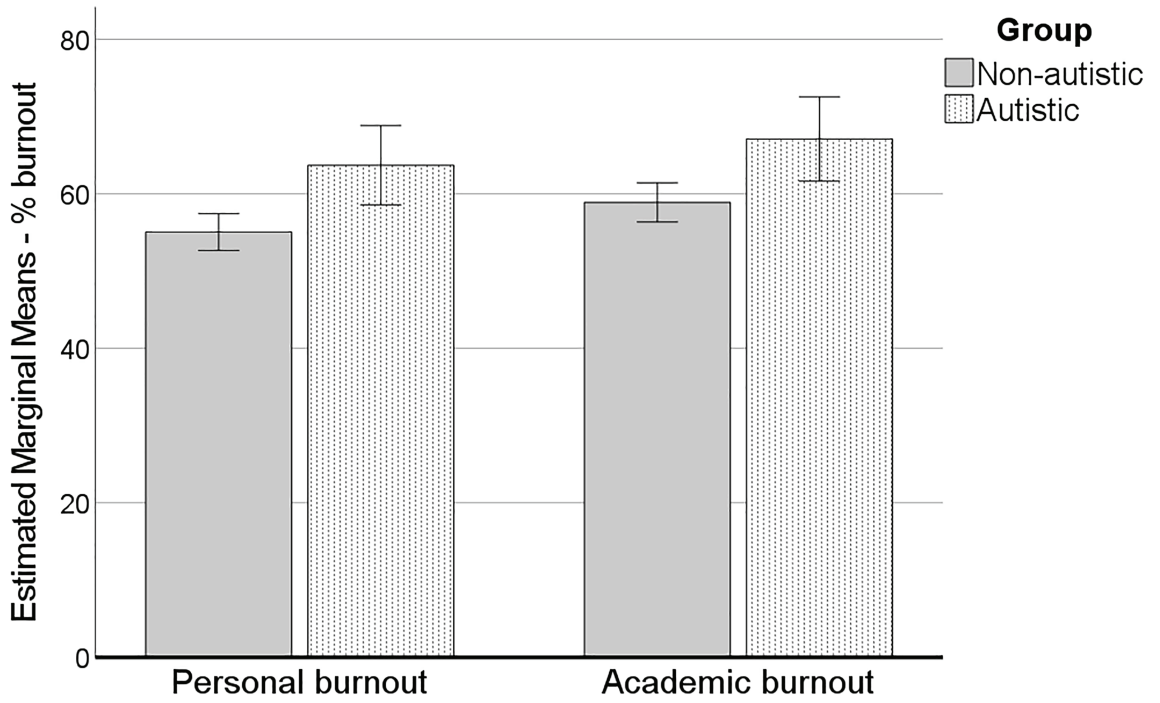

FIGURE 2 | Personal and academic burnout for autistic and non-autistic participants. Errors bars ±2 standard error. Estimated marginal means, controlling for age.

Less than 10% of responses were also coded into other categories, with participants in both groups occasionally talking about *increased uncertainty and worries about the future*, describing how they had struggled with all the uncertainty and changes brought about by the pandemic, and were concerned about how things would pan out in the future, often in terms of their career. Additionally, some participants in both groups talked about *COVID-specific fears and worries*, with the pandemic itself, its associated restrictions, regulations, and the risks of catching or spreading the virus to others, being of significant concern. Only non-autistic students mentioned the *negative financial impact* that the pandemic had had on them. Finally, in both groups some participants noted positive effects – some explained how *online university is good for me*, whereby they found that the changes to teaching were more accessible or enabling for them. Others also talked about *positive opportunities for me personally*, reflecting on how the pandemic had given them time and space to focus on or learn more about themselves.

DISCUSSION

This study aimed to explore autistic and non-autistic students' experiences in relation to dropout, burnout, mental health, coping, within the context of the COVID-19 pandemic and a challenging time for Higher Education. We found that autistic students were more likely to have thought about dropping out and reported higher rates of burnout, anxiety, stress, and depression. However, we did not identify any significant predictors of considering dropping out for autistic students, but greater use of maladaptive coping strategies and higher academic burnout predicted non-autistic students considering dropping out. Looking at the phenomenon of burnout, only the two types of burnout measured predicted one another for autistic students, while there were several predictors for non-autistic students including age, maladaptive coping strategies, autistic traits, stress, and anxiety. From qualitative responses, it was clear that the COVID-19 pandemic had a significant impact on the social and emotional lives of both autistic and non-autistic participants, with many challenges associated with emergency online learning. Altogether, our findings indicate several important implications and avenues for further research.

Given the suggestion that autistic students are more likely to drop out of university, our study adds some further practical and theoretical insight on this topic. Concerningly high numbers of both autistic and non-autistic students reported they had thought about dropping out, with autistic students more likely to report thinking about this (77.8% autistic versus 61.6% non-autistic). Looking at why autistic students may be more likely to consider dropping out, in our quantitative analyses, we did not find any significant predictors for our autistic participants. However, our predictors focused on individual, psychological variables, rather than sociological ones (Behr et al., 2020). We did not measure aspects such as academic skills, transition experiences or fitting in at university, or poor autism acceptance, which past research has indicated may link to dropping out for autistic students (Cage et al., 2020; Cage and Howes, 2020). Further theoretical work is needed which

TABLE 4 | Logistic regression results for autistic and non-autistic groups, analyzing predictors of considering dropping out.

	Wald statistic	B (SE)	*p*	Exp(B)	C.I Exp (B)
Autistic group (n = 62)					
Age	0.31	0.041 (0.074)	0.58	1.04	[0.90–1.21]
RAADS score	1.07	0.061 (0.059)	0.301	1.06	[0.95–1.19]
Stress	1.25	−0.13 (0.11)	0.26	0.88	[0.71–1.10]
Anxiety	0.037	−0.013 (0.069)	0.85	0.99	[0.86–1.13]
Depression	2.09	0.088 (0.061)	0.15	1.09	[0.97–1.23]
Adaptive coping	1.68	−0.098 (0.075)	0.20	0.91	[0.78–1.05]
Maladaptive coping	1.45	0.18 (0.15)	0.23	1.20	[0.89–1.61]
Personal burnout	2.99	0.076 (0.044)	0.084	1.08	[0.99–1.18]
Academic burnout	0.000	0.000 (0.031)	0.99	1.00	[0.94–1.06]
Non-autistic group (n = 265)					
Age	1.096	0.047 (0.045)	0.30	1.05	[0.96–1.14]
RAADS score	1.93	0.029 (0.021)	0.16	1.03	[0.99–1.07]
Stress	0.066	−0.008 (0.031)	0.80	0.99	[0.93–1.05]
Anxiety	0.350	0.012 (0.021)	0.55	1.01	[0.97–1.06]
Depression	0.43	0.013 (0.021)	0.51	1.01	[0.97–1.06]
Adaptive coping	0.002	−0.001 (0.022)	0.97	0.99	[0.96–1.04]
Maladaptive coping	6.88	0.095 (0.036)	0.009**	1.10	[1.02–1.18]
Personal burnout	0.078	0.004 (0.013)	0.78	1.004	[0.98–1.03]
Academic burnout	5.81	0.027 (0.011)	0.016**	1.03	[1.01–1.05]

*B (SE) = unstandardized beta coefficient, standard error; Exp (B) = odds ratio; C.I Exp (B) = 95% confidence intervals for odds ratio. Autistic group Cox and Snell R square = 0.34, Nagelkerke R square = 0.53; non-autistic group Cox and Snell R square = 0.22, Nagelkerke R square = 0.30. **p = 0.005–0.05 considered suggestively significant.*

considers the role of the wider ecosystem around the student when it comes to dropping out, as has been outlined for autistic students graduating from university (Vincent and Fabri, 2020).

Some further practical insight can be drawn from our qualitative analysis of the reasons for thinking about dropping out, where interestingly there was little difference between the reasons given by autistic and non-autistic students. Instead, the most frequently cited reasons for both groups were difficulties related to poor mental well-being, doubting themselves and/or their course, and academic challenges. These qualitative findings support calls for universities to promote positive well-being *via* high-quality support services and trained staff (Hill et al., 2020), who know how to support *both* autistic students and those with mental health difficulties and to develop students' self-efficacy and self-confidence *via* supportive networks throughout universities (Wilcox et al., 2005). Further qualitative work would be beneficial to further explore autistic students' thoughts about dropping out in-depth, as well as more comprehensive quantitative work to model student dropout, taking into account both individual and societal variables (Behr et al., 2020).

Burnout is a variable which has been little explored in relation to autistic students' experiences at university, despite burnout being a theoretically important variable in autistic peoples' well-being (Higgins et al., 2021). Although burnout did not predict thoughts about dropping out for the autistic participants, overall burnout was significantly higher for this group. As there is limited research on burnout for autistic people, our study adds further evidence concerning this phenomenon among autistic students and we suggest this should be an area of high priority for further research. Looking at predictors of burnout, for autistic students, we found only each type of burnout (personal and academic) predicted each another. This finding implies that each form of burnout feeds into one another and captures an overall construct of burnout – if someone is generally exhausted, they also feel exhausted with academic life, and vice versa. Additionally, since we could identify predictors of burnout for the non-autistic group but not the autistic group, this suggests there is theoretical validity in considering a specific experience of autistic burnout (Raymaker et al., 2020; Higgins et al., 2021). Unmeasured variables unique to autistic burnout may play a greater role than those measured in the current study. Further, among our non-autistic students, we found that greater autistic characteristics predicted personal burnout. The fact that autistic characteristics predicted burnout may indicate that those with autistic traits may invest energy into masking these or experience some stigma associated with their traits, linking to depleted mental resources and more burnout. More work is clearly needed in this area, including validating measures of burnout (academic, personal, and autistic) and understanding practical ways of mitigating the effects of burnout.

In addition to high burnout levels, we also found that autistic participants reported higher rates of depression, anxiety, and stress, which has important practical implications. This finding fits with the extant literature on autistic mental health more generally, which shows higher prevalence (e.g., Lai et al., 2019), and corroborates Gurbuz et al.'s (2019) findings which indicated higher mental health difficulties for autistic students, but did not use validated measures of symptoms. Higher quality mental health support for autistic students is clearly needed, ideally designed *with* and *for* autistic students, rather than simply adapting non-autistic supports (Gunin et al., 2021). Our findings on coping styles could also provide insight on how autistic students could be supported to cope with mental health difficulties. Interestingly, we found no difference in coping styles between autistic and non-autistic students, which could indicate that there are few differences in the ways these students cope with stress. Alternatively, it could be that we missed some of the different coping strategies used by autistic people (Muniandy et al., 2021) – in an interview study, Anderson et al. (2020) identified "working hard," "part-time enrolment," "extended breaks," "changing discipline," and "camouflaging" as strategies former autistic students had used to cope at university. Given the high levels of mental health challenges, burnout, and thoughts about dropping out, further research on the coping strategies of autistic students would be useful so that we can better understand how these students can be best supported to cope with the pressures of university life.

In this study, we were also interested in the experiences of our participants within the context of the COVID-19 pandemic, which also provides some important implications for universities as we continue to navigate this pandemic at the time of writing. We looked at experiences qualitatively, noting many similarities between our autistic and non-autistic participants. For all, the

TABLE 5 | Linear regression results for autistic and non-autistic groups, analyzing predictors of academic burnout.

	B	B CI	SE B	β	p	f^2
Autistic group (n = 63)						
Age	−0.087	[−0.65–0.48]	0.28	−0.025	0.76	0.0005
Autistic characteristics	0.039	[−0.47–0.55]	0.25	0.012	0.88	0.0001
Stress	0.39	[−0.44–1.23]	0.41	0.13	0.35	0.005
Anxiety	−0.31	[−0.89–0.26]	0.29	−0.12	0.28	0.007
Depression	0.28	[−0.22–0.77]	0.25	0.12	0.26	0.007
Adaptive coping	−0.38	[−0.87–0.11]	0.25	−0.13	0.13	0.013
Maladaptive coping	0.38	[−0.47–1.24]	0.43	0.090	0.37	0.005
Personal burnout	0.74	[0.47–1.02]	0.14	0.66	<0.001*	0.20
Non-autistic group (n = 274)						
Age	−0.68	[−1.13–-0.24]	0.23	−0.11	0.003*	0.012
Autistic characteristics	−0.14	[−0.34–0.06]	0.10	−0.053	0.17	0.002
Stress	0.35	[0.035–0.67]	0.16	0.13	0.030**	0.006
Anxiety	−0.22	[−0.44–0.00]	0.11	−0.097	0.050**	0.005
Depression	0.11	[−0.11–0.33]	0.11	0.047	0.33	0.001
Adaptive coping	−0.072	[−0.31–0.17]	0.12	−0.023	0.55	0.0004
Maladaptive coping	0.93	[0.56–1.30]	0.19	0.22	<0.001*	0.031
Personal burnout	0.67	[0.55–0.78]	0.056	0.63	<0.001*	0.21

*B unstandardized beta coefficient, B CI confidence intervals at 95% lower and upper bounds, SE B standard error, β standardized beta coefficient, f^2 effect size (0.02 considered small effect, 0.15 medium, 0.35 large). *p < 0.005 considered significant, **p = 0.005–0.05 considered suggestively significant.*

TABLE 6 | Linear regression results for autistic and non-autistic groups, analyzing predictors of personal burnout.

	B	B CI	SE B	β	p	f^2
Autistic group (n = 63)						
Age	0.18	[−0.28–0.63]	0.23	0.055	0.44	0.003
Autistic characteristics	0.26	[−0.15–0.66]	0.20	0.091	0.21	0.007
Stress	0.46	[−0.21–1.12]	0.33	0.17	0.18	0.009
Anxiety	0.32	[−0.14–0.79]	0.23	0.14	0.17	0.009
Depression	0.051	[−0.35–0.45]	0.20	0.026	0.80	0.0003
Adaptive coping	0.15	[−0.26–0.55]	0.20	0.055	0.47	0.002
Maladaptive coping	0.44	[−0.24–1.13]	0.34	0.12	0.20	0.008
Academic burnout	0.49	[0.31–0.66]	0.088	0.54	<0.001*	0.16
Non-autistic group (n = 274)						
Age	0.15	[−0.25–0.55]	0.20	0.026	0.45	0.0006
Autistic characteristics	0.23	[0.058–0.41]	0.089	0.093	0.009**	0.007
Stress	0.55	[0.28–0.82]	0.14	0.22	<0.001*	0.017
Anxiety	0.29	[0.095–0.49]	0.099	0.13	0.004*	0.009
Depression	0.19	[−0.009–0.39]	0.10	0.085	0.061	0.004
Adaptive coping	−0.030	[−0.24–0.18]	0.11	−0.010	0.78	0.00008
Maladaptive coping	−0.19	[−0.53–0.15]	0.17	−0.047	0.28	0.001
Academic burnout	0.52	[0.44–0.61]	0.044	0.55	<0.001*	0.18

*p < 0.005 considered significant, **p = 0.005–0.05 considered suggestively significant.*

most reported challenge related to the social impact of the pandemic – over a quarter of both groups described how social disconnection had negatively affected them. This finding mirrors Pellicano et al.'s (2021) research with Australian autistic people and goes against the stereotyped view that autistic people lack social interest and our findings support counter-arguments to the theoretical proposal that autistic people lack social motivation (Jaswal and Akhtar, 2018). University can offer many social opportunities for autistic people, and while they may face challenges within social environments (Scott and Sedgewick, 2021), we must find ways to enable autistic students to flourish socially in pandemic-adapted universities. Particularly, making the social environment fit for the autistic student, rather than the other way round, is vital (Vincent et al., 2017). For example, societies, clubs, and university events (e.g., "Welcome Week") should consider how they can be accessible to autistic students. This accessibility might be achieved by providing clear information in advance about social events, making sure events are in well-designed sensory spaces or using peer mentoring programs (Cage et al., 2020; Scott and Sedgewick, 2021). Indeed, peer support programs for autistic students have shown promise (Duerksen et al., 2021). Considering the high rates of considering dropping out, burnout, and mental health difficulties noted in this study – including how both groups qualitatively reported

TABLE 7 | Number and percentage of responses coded, and example quotes for participants' responses when asked about how COVID-19 had affected them.

Category	Autistic group *n* (%)	Autistic example quote	Non-autistic group *n* (%)	Non-autistic example quote
Social isolation and limited social opportunities	34 (27.0%)	"I do miss the social aspects of going to uni physically"	126 (26.3%)	"Isolated from friends and family, made it more difficult to meet peers on course/build friendships"
Online university is harder, overwhelming and unmotivating	29 (23.0%)	"Online lectures make it hard to build up motivation to attend and complete personal study"	118 (24.6%)	"I am really struggling to engage and keep up with online learning and my deadlines are making me much more stressed than usual"
Negative impact on mental and physical well-being	16 (12.7%)	"Escalated anxieties and declined mental health significantly"	59 (12.3%)	"Every day is a struggle to keep going, I have to fight to make it each day. Good thing I'm pretty tough with mental health crises at this point"
A lack or loss of support	15 (11.9%)	"The university is not making any efforts to provide accessible teaching or well-being support for students"	34 (7.10%)	"You aren't getting the same support from peers/lecturers online as you would face to face and in person"
Online university is good for me	9 (7.14%)	"Improved situation at university because I work better in my own comfortable surroundings, much easier to get work done rather than becoming distracted/ anxious at university"	22 (4.59%)	"It has actually helped me to attend more classes by being able to do them from home"
Increased uncertainty and worries about the future	8 (6.35%)	"I have also struggled to cope with the uncertainty and transition to employment"	18 (3.76%)	"I feel bombarded with bad things happening in the world and realistically how much does my degree that doesn't have a career attached matter."
Positive opportunities for me personally	7 (5.56%)	"I've had more time for me through the summer and been able to manage my interactions with others far more"	25 (5.22%)	"Been able to focus on myself and get myself fit and healthy again and learn how to control emotions"
COVID-specific fears and worries	6 (4.76%)	"I am finding it almost impossible to complete work during the pandemic because I have the extra stress of worrying about the pandemic"	14 (2.92%)	"There's the fear of doing something wrong without knowing or passing on an illness you didn't know you had."
Trapped within these same four walls	2 (1.59%)	"Can't really go out and feel isolated"	56 (11.7%)	"Studying, eating, sleeping and chilling all in the same place is difficult - there is no escape from the environment you study."
Negative financial impact	0	n/a	7 (1.46%)	"It has changed my financial situation drastically which has made living costs very difficult to cover"

N reflects the number of responses coded, and percentages are the percentage out of total responses. Percentages do not add up to 100 as responses could be coded in multiple categories.

the negative impact the pandemic had had on their mental well-being – social support could be a crucial factor (Mostert and Pienaar, 2020), which needs further investigation.

Additionally, around a quarter of participants in both groups mentioned not being satisfied with the provision of emergency online teaching at their university. Our participants commonly reported finding academic work harder, less motivating, and overwhelming. These findings support other research with autistic and non-autistic students during the pandemic (Aristovnik et al., 2020; De Man et al., 2021; Gin et al., 2021; Monahan et al., 2021). In the United Kingdom, the shift to emergency online teaching happened quickly, and studies of United Kingdom academic staff indicated that many viewed the shift as negative, detrimental both to staff well-being and academia itself (Watermeyer et al., 2021). Indeed, a survey of students in Switzerland indicated that the difficulties lecturers had in adapting suddenly to online teaching was contributing to stress for the students (Lischer et al., 2021). In our study, a few participants (in both groups) reported that they found online learning was a positive experience for them, and their experience may depend on how the participants' respective universities shifted their teaching online.

It is important to bear in mind that universities had to switch to online teaching rapidly, and therefore the emergency online provision is not equivalent to a true "flipped classroom" model, which would effectively utilize asynchronous online learning combined with synchronous "in class" engagement. In theory, online learning *should* be more accessible, and this "flipped classroom" should promote more active learning, help students to engage with material, and encourage greater collaboration between students (Flores et al., 2016). Moving forward, academic staff should consider guidelines on how to effectively teach online, and the opportunities that shifting online could offer in the long term (Nordmann et al., 2020).

Finally, our findings from our non-autistic participants also have additional implications. For these students, considering dropping out was predicted by higher rates of maladaptive coping and academic burnout. Past research has found similar relationships between coping, burnout, and dropping out, with maladaptive coping strategies linking to burnout, and then burnout having a knock-on effect on dropout intention (Marôco et al., 2020). Marôco et al. (2020) suggest actions to promote student engagement and reduce burnout, such as by reducing the volume of assessments, increasing social support, and considering guided interventions. Interestingly, we found that academic burnout was also predicted by more maladaptive coping for non-autistic participants. This finding has been noted elsewhere (Vizoso et al., 2019), and these coping strategies may not present the individual with solutions to the stress they are experiencing, but exacerbate it, thus increasing burnout (Alarcon et al., 2011). Maladaptive coping styles can feed into poor mental health, so interventions focused on promoting and guiding adaptive coping styles may be useful (Tran and Lumley, 2019). University support services could consider offering such interventions to potentially help mitigate dropout and reduce burnout.

Limitations and Future Directions

This study is limited by a non-generalizable sample, with the views of female, White, Scottish students contributing to the majority of the data. Our sample of autistic students was also relatively small and underpowered ($n = 70$), but larger than previous studies which have directly compared autistic and non-autistic students (e.g., Gurbuz et al., 2019). Due to this small sample size, we were not able to explore the relationships with demographic or student variables, such as whether there were differences between genders, ethnicities, country of study, level of study, or year. Further, many of our autistic students were self-identifying rather than formally diagnosed. However, all self-identifying participants scored highly on the measure of autistic traits, and people who self-identify are often subject to stigma and disbelief, particularly if they do not fit the stereotypic view of "autism" (Lewis, 2017; Leedham et al., 2020). Of note is that the majority of our self-identifying autistic participants were female, and they are likely to experience barriers to accessing diagnosis based on gendered assumptions about autistic people (Leedham et al., 2020). It is important too to consider how not having or struggling to access a diagnosis could impact support and university experiences. Indeed, in interviews with autistic people who dropped out of university, many explained how they had not received their diagnosis until after university, but wished that they had known earlier (Cage and Howes, 2020). Further research could examine the experiences of those who self-identify in more detail to examine whether this may be a group at particular risk of dropping out.

We also do not have pre-pandemic data, and all findings must be considered within the context of the pandemic. For example, without pre-pandemic data, it is difficult to assess whether mental well-being had worsened for either group – although other United Kingdom studies with non-autistic students suggest this has happened (Savage et al., 2020), and research with autistic people (non-students) suggest mental health worsened dependent on COVID-related distress (Adams et al., 2021). Longitudinal, follow-up data would be useful in monitoring how students' experiences pan out. Additionally, we only considered a small set of variables, and have undoubtedly missed critical contextual and nuanced analysis, including being able to examine interactions between variables due to the small sample size for autistic students. Nonetheless, our findings add to the limited comparative literature on autistic students' experiences and highlight the continued need to improve the quality of support provided.

Additionally, we found much higher thoughts about dropping out compared to previous studies, for example, Gurbuz et al. (2019), who found 56% autistic students (total $n = 26$) had considered dropping out compared to only 15.3% of non-autistic students (total $n = 158$) – compared to 77.8% of autistic and 61.6% non-autistic in our slightly larger sample. There may be several explanations for our higher rate which reflect limitations in our study: our sample is not representative, and the survey may have particularly attracted non-autistic students with mental health conditions who wished to share their experiences, and who may be more likely to think about dropping out, in part due to systemic failures of universities in supporting students with mental health difficulties (O'Keeffe, 2013). Further, we broadly asked whether our participants had "ever thought about dropping out." Many students may have *thought* about dropping out but may not act on those thoughts. Our study thus may not have accurately captured the intent. Nonetheless, our study supports findings that indicate autistic students are more likely to drop out of university (e.g., Newman et al., 2011), and a *thought* about dropping out could easily build to eventually deciding to withdraw from university. Finally, our analysis of predictors of dropping out is underpowered due to the small number of autistic students who said that they had *not* thought about dropping out, and this underpowering may have contributed to us being unable to identify specific predictors. Despite these limitations, we believe it is important not to invalidate our participants' experiences, especially given the challenges they qualitatively described in terms of their mental well-being.

Conclusion

Our study highlights how our autistic participants were more likely to have thought about dropping out, alongside higher burnout and greater anxiety, depression, and stress. Most often, autistic students mentioned low mental well-being as the reason they were thinking about dropping out. Future work should focus on promoting positive well-being, and actions taken to do this could alleviate some of the other issues mentioned in this study. For example, accessible, high-quality support services, training academic staff (particularly about mental health, autism, and effective online teaching strategies), and reviewing how learning and teaching can support rather than burnout students, could all help create universities where well-being is prioritized. Additionally, our findings related to COVID-19 show the value of social aspects of university, for *all* students. Opportunities to connect with other students must be designed with (neuro)diversity in mind – for example, having social events in calm sensory environments, focusing on shared interests and passions, or developing peer mentoring or "buddying" schemes. As we look toward the future, universities must concentrate on creating inclusive, accessible, and supportive environments.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, on reasonable request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Stirling General University Ethics Panel Delegated Authority. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

EM conceived of the study, collected the data, and contributed to subsequent drafts. EC helped to design the project, conducted the data analyses, and wrote the draft of the manuscript. All authors approved the final version.

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Expectations and Experiences With Online Education During the COVID-19 Pandemic in University Students

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Due to COVID-19, university students continued their academic training remotely. To assess the effects of emergency remote teaching (ERT), we evaluated the expectations and, subsequently, the experiences of university students about online education. This study employed a simple prospective design as its method. We assessed the expectations of 1,904 students from different discipline areas (1,106 women and 798 men; age M = 21.56; SD = 3.07) during the beginning of the first semester, March 2020 (T1), and their experiences at the end of the same academic period, September 2020 (T2). We used convenience non-probability sampling. Participants responded to the questionnaire on Expectations toward virtual education in higher education for students and the questionnaire on virtual education experiences in higher education. The results showed that students' responses reflected low expectations regarding peer relationships and comparison with face-to-face education (T1). This perception was maintained during the evaluation of experiences (T2). Students reported positive experiences regarding online teaching and learning, online assessment, and their self-efficacy beliefs at T2. Statistically significant differences between measurements were found, with the expertise presenting higher averages than expectations. Furthermore, differences by gender were identified, reporting a positive change in the scores of women. In addition, results reflected differences according to the disciplinary area, showing Social Sciences and Medical and Health Sciences students a more significant size effect. Findings regarding the empirical evidence and the implications for future teaching scenarios in Higher Education are discussed.

Keywords: COVID-19, higher education, university student, online teaching and learning, student self-efficacy

INTRODUCTION

Higher education institutions had to face the challenge of providing continuity to the educational process remotely due to the COVID-19 pandemic. This scenario implied a drastic transformation without the possibility of preparation, having both teachers and students quickly develop online education competencies (Hattar et al., 2021). Emergency remote teaching (ERT) is the name given to this instructional response (Bustamante, 2020; Hodges et al., 2020). ERT applies to any unexpected and urgent transition to online instruction due to a disaster. Given its nature, one of the characteristics of ERT is the lack of time and skills of instructors to adequately prepare and implement their course syllabus in a virtual format (Hodges et al., 2020). Thus, ERT differs significantly from online teaching, in which the focus is on delivering a quality learning experience following a predefined instructional design (Miramontes Arteaga et al., 2019).

Currently, online courses are created using an instructional design, such as ADDIE, and implemented through Learning Management Systems (LMS), like Canvas. In these courses, designers and teachers apply technological and pedagogical innovations to obtain high-quality standards. In this teaching modality, educational experiences occur synchronously and asynchronously using multiple devices to access the internet. Therefore, students can interact with teachers, content, and peers from wherever they are (Singh and Thurman, 2019). It requires stable digital infrastructure and platforms. Thus, its implementation demands many resources and a carefully designed plan to deliver a quality experience (Mousa et al., 2020). As necessary and valuable as ERT is, its design does not necessarily consider the critical elements of quality online education (Hodges et al., 2020). Despite the advances in online education in many higher education institutions worldwide, universities, in general, were not prepared for the necessary, mandatory, and abrupt change at the onset of the COVID-19 pandemic (Maier et al., 2020).

Quality online teaching considers evaluating course characteristics, including the design of learning materials, the virtual environment, and the alignment of curricular components with learning outcomes. It also considers aspects related to the interaction experience of students with their peers and teachers (Rodrigues et al., 2019).

Literature Review

Due to the COVID-19 pandemic, students' expectations about how their academic year would unfold were rapidly modified and adjusted. This is relevant due to empirical evidence that supports that student expectations are predictors of academic success (Paechter et al., 2010; Alhabeeb and Rowley, 2018; Wei and Chou, 2020). Student expectations can be defined as the beliefs that students hold about successfully coping with academic responsibilities. From the perspective of the expectancy-value theory (Wigfield and Eccles, 2000), students have beliefs about their ability and success in meeting academic demands. These beliefs can be impacted by the subjective perception of the value of the academic activity to the student (Valle et al., 2015). The expectancy-value theory is widely used to understand how psychological and contextual factors enhance student engagement and learning outcomes (Chiu et al., 2021). Furthermore, expectations also impact student attitudes about the ways of learning (Fernández Jiménez et al., 2017). It has been reported that students' perceptions regarding online learning modalities are related to their learning success (Nur Agung et al., 2020). Therefore, expectations and experiences of university students regarding online learning courses during the pandemic could translate into opportunities or obstacles in the sense of moving closer or further away from a practical online education experience in the future (Rodrigues et al., 2019; Pham and Ho, 2020).

Several studies have reported a variety of results regarding the expectations and subsequent experience of university students. For example, descriptive research conducted with 1612 undergraduates from 59 on-site Spanish universities says that students consider that the institutions did not adapt adequately to the ERT scenario (84%), especially regarding teaching methods and the implementation of assessments (64.5%). Furthermore, they state that the adopted institutional measures were not sufficient, affecting their academic performance (88.5%) during this period. In terms of experience, in the same research, students were not satisfied with virtual education, especially regarding courses' assessment (Villa et al., 2020). These results relate to another study that reported that students would not repeat this experience due to the absence of interaction with teachers, excess of tasks, and the accelerated pace for learning (Imsa-ard, 2020; Suárez et al., 2021).

Consistent with the above, another study indicates that students perceived an overload in their academic responsibilities due to excessive activities and assignments, which made the process more exhausting (Rahiem, 2020). Moreover, another research from the pandemic experience indicates that young people reported a low perception of quality and quantity in their learning during ERT regarding the strategies implemented by their universities, which did not meet their expectations (31.3%) (Almomani et al., 2021). Additionally, researchers found that, unlike men, women perceived greater satisfaction with the strategies implemented by universities (66%), were more committed to delivering their assignments (70.6%), and were more optimistic about the assessment process implemented by teachers in their courses (70.2%) (Almomani et al., 2021). Another research concludes that online teaching during the COVID-19 pandemic was only possible when online learning had a robust digital infrastructure and a learning system designed for that purpose; otherwise, it was an attempt to replicate face-to-face teaching in the virtual environment (Abdulrahim and Mabrouk, 2020).

Despite the emergency scenario caused by the pandemic, not all studies reported negative experiences (Abdulrahim and Mabrouk, 2020; Sepulveda-Escobar and Morrison, 2020). During ERT training, students from various institutions worldwide (N = 30,383) claimed to be satisfied with the support provided by their instructors and institutions. In this case, specific

sociodemographic characteristics such as gender, academic area, and other elements of the students favorably impacted these beliefs (Aristovnik et al., 2020). Students positively assessed the actions implemented by the universities' Information and Communication Technologies Departments (Shehzadi et al., 2020). In addition, they thoroughly evaluated the online platforms used since they allowed them to perform their tasks efficiently and quickly, having fun while studying (Maier et al., 2020). It is important to note that some authors report differences in experiences according to the scientific disciplines to which students belong (Vladova et al., 2021a).

Regarding social aspects, it seems that students were not satisfied with the preparation of teachers during the ERT modality due to difficulties in the interaction with their teachers and peers (Alqurshi, 2020; Hamdan et al., 2021). This aspect is consistent with other research highlighting the importance of interaction between instructors and students in the online education experience (Sun, 2016; Bao, 2020).

Due to ERT, a negative effect on students' self-efficacy beliefs about online education has been reported at the individual level (Aldhahi et al., 2021), while others found no changes (Talsma et al., 2021). Self-efficacy is a relevant element regarding students' academic satisfaction and performance (Cervantes Arreola et al., 2018; Hamdan et al., 2021). When students believe in successfully facing the challenges of online education, they display a series of mechanisms to favor a more efficient and effective coping of their learning process. Consequently, beliefs conversion during the ERT may play an essential role in post-pandemic online learning.

In the context of the COVID-19, the academic, social, and individual experiences during ERT affect the perception of online education, which could impact the implementation of this modality in Higher Education in the future.

The Present Study

The empirical evidence described highlights the importance of assessing students' experience during the ERT, especially the quality of the learning experience, the integration of teaching approaches, the design, the application of assessment tools, and how the relationship between students and their teachers is fostered (Sun, 2016; Alqurshi, 2020; Aristovnik et al., 2020; Bao, 2020; Rahiem, 2020; Van Heuvelen et al., 2020; Villa et al., 2020; Almomani et al., 2021; Suárez et al., 2021). These aspects will provide vital information for the design and implementation of effective online learning processes that respond to the needs of students and universities in this context in the future.

This study focuses on the importance of learning about students' expectations and experiences during the implementation of the ERT for the COVID-19 pandemic. Specifically, we inquire on how students' expectations and experiences can affect their academic, social, and personal aspects to provide evidence to support actions for the transition to face-to-face and blended learning. In this context, this research aims to analyze the expectations and experiences of students in a traditional university in the south of Chile at a general level and in consideration of the participants' gender and disciplinary area.

Based on the above and the heterogeneity of students' experiences reported in the literature, we describe the following hypotheses:

H_1. There will be changes in the experiences to the expectations of university students during ERT due to the COVID-19 pandemic.

H_2. Differences will be found between men and women regarding university students' expectations and experience scores during the ERT due to the COVID-19 pandemic.

H_3. Differences in university students' expectations and experience scores will be observed according to disciplinary areas during ERT due to the COVID-19 pandemic.

MATERIALS AND METHODS

A simple *ex post facto* longitudinal quantitative research design was used. Researchers find it impossible to manipulate the independent variable in *ex post* facto studies, describing the associations between variables. It is simply longitudinal since two measurements were performed, starting by measuring the expectation (March 2020; T1) and then the experience (September 2020; T2) of the students with online education during the ERT, to subsequently study the relationships found between the variables (Montero and León, 2007).

Participants

A total of 1,904 students belonging to a traditional Chilean university participated, of which 1106 (58.1%) were women, and 798 (41.9%) were men, with mean age $M = 21.56$ ($SD = 3.07$). On the other hand, 635 (33.35%) of the participants were in their first academic year. According to their undergraduate program, students' classification according to the areas of the Organization for Economic Co-operation and Development (OECD) is presented in **Table 1**.

Instruments

Expectations Toward Virtual Education

The Expectations toward Virtual Education in Higher Education for Students (CEEVESE) questionnaire aims to know higher education students' expectations about virtual education during ERT. It consists of 28 items distributed in six dimensions about

TABLE 1 | Distribution of students by gender and disciplinary area.

OECD area	Men	Women
Agricultural sciences	50	91
Medical and health sciences	126	290
Natural sciences	154	158
Social sciences	147	362
Humanities	10	51
Engineering and technology	310	155
Totals by gender	797	1107
Total, sample	1904	

virtual education. The items were elaborated based on available scientific literature and evaluated employing expert judgment (Lobos et al., 2022). **Table 2** describes the dimensions that constitute the scale.

A Likert scale with five response options (1 = Strongly disagree to 5 = Strongly agree) was employed. The average of each dimension and the full scale was analyzed, in which scores higher than 3 indicate positive expectations. Previous studies have examined the factorial structure of the scale, finding an adequate adjustment of the 6 factors [$X^2(335) = 5354.88, p < 0.001$, CFI:0.961; TLI:0.956; SRMR:0.041; RMSEA:0.06]. The reliability analysis of the responses was: peer relationship α = 0.894, online learning α = 0.922; online teaching α = 0.907; self-efficacy for online learning α = 0.882, online assessment α = 0.787; comparison with face-to-face education α = 0.779; full scale: α = 0.954 (Lobos et al., 2022).

Experience in Virtual Education

The Virtual Education Experiences in Higher Education for Students (EEEL) questionnaire adapts the CEEVESE (Lobos et al., under review[1]). Its purpose is to learn about the experiences of higher education students with virtual education during ERT. It consists of the same 28 items of the CEEVESE but presented in the past tense, using again a Likert scale of 5 response options (1 = Strongly disagree to 5 = Strongly agree). For their interpretation, the averages of each dimension and the full scale were analyzed. In both cases, the presence of scores above 3 points reflects a positive student experience. The items' distribution corresponds with the six original dimensions.

The factorial structure of this version confirmed an adequate adjustment of the 6 factors [$X^2(333) = 3599.92$, $p < 0.001$, CFI: 0.966; TLI: 0.961; SRMR: 0.036; RMSEA: 0.059]. Reliability analysis of the responses by dimensions was as follows: peer relationship α = 0.869, online learning α = 0.883; online teaching α = 0.876; self-efficacy for online learning α = 0.872, online assessment α = 0.753; comparison with face-to-face education α = 0.671; full scale: α = 0.931 (Lobos et al., under review, see text footnote 1).

[1]Lobos, K., Cobo-Rendon, R., Cisternas, N., Aslan, J., and López Angulo, Y. (under review). *Experiences With Online Education of College Students During Emergency Remote Education Due to COVID-19.*

Procedure

This research was endorsed by the Ethics Committee of the participating university, corroborating the ethical criteria for research with human beings. The expectations and experience instruments were applied in digital format and sent to the students' institutional emails on a single occasion. For the two measurement moments (T1 and T2), the questionnaires were available for 3 weeks at the beginning of March 2020 and at the end of September 2020. Students responded after reading and signing an informed consent form. A convenience non-probability sampling was used. The participants were students who were enrolled in a course during the first semester of 2020. To track the students, the enrollment number and e-mail address of each participant were compared. Only students presenting both measurements were included.

Analysis Plan

We performed a descriptive analysis of the variables. Verification of the assumption of normality for the dimensions and total scales in both measurements (T1 and T2) was made using the Kolmogorov-Smirnov test with the Lilliefors modification (Thode, 2002). Analyzed data did not have a normal distribution ($p < 0.001$). Despite this, the Student's *t*-test for paired samples was performed to evaluate the differences in the T1 and T2 scores due to the sample size.

The assumptions were verified using the mixed ANOVA tests to assess the effects between groups on gender and OECD areas versus the intra-group effect (changes between expectations and experience). No extreme outliers were found. Levene's test was analyzed, finding no significant result ($p > 0.05$). The homogeneity of covariance of the between-subjects factor (gender-OECD area) using Box's *M* test was also evaluated, with a not statistically significant result ($p > 0.001$). Therefore, no violation of the homogeneity of covariances assumption is assumed. Verification of the sphericity assumption was automatic since the Greenhouse-Geisser sphericity correction was applied to violating assumption factors during the ANOVA test calculation.

The size effect was analyzed considering the cutoffs by Cárdenas Castro and Arancibia Martini (2014), in which scores >0.14 are considered large, 0.06 medium, and 0.01 small. The data analysis was performed with R Studio software version 4.0.3 (2020-10-10) (R Core Team, 2020).

TABLE 2 | Description of the dimensions of the CEEVESE questionnaire.

Dimension(number of items)	Description
Peer relationship(6 items)	Expectations assessment about the student's ability to interact with peers online.
Online learning(5 items)	Expectations assessment regarding learning support provided by online resources.
Online teaching(8 items)	Evaluation of students' expectations about the university's commitment and teachers' abilities such as their delivery of courses as planned, attention to the learning process, and ability to use the virtual classroom tools.
Self-efficacy for online learning(5 items)	Assessment of students' beliefs about their perception to meet the challenges of online education.
Online assessment(2 items)	Evaluation of expectations on the design, planning, and implementation of online testing.
Comparison/Contrast with face-to-face education (2 items)	Evaluation on the expectations about student's performance and learning in online education compared to traditional or face-to-face education.

RESULTS

The present research aims to analyze the students' expectations and experiences, considering the gender and disciplinary area of the participants. We presented the results in the context of the research hypotheses described in section "The Present Study."

Differences Between University Students' Expectations and Experiences During Emergency Remote Teaching During the COVID-19 Pandemic

Hypotheses H_1 sought to answer the existence of changes between the expectations and experiences of university students produced by ERT during the COVID-19 pandemic. In the first measurement (T1), the general students' expectations presented an average below 3 points, identifying them as low (M = 2.92, SD = 0.65). The dimension that presented the highest score was self-efficacy for online education (M = 3.42; SD = 0.84), whereas the dimensions that showed the lowest scores were peer relationship (M = 2.1; SD = 0.83) and comparison with face-to-face teaching (M = 1.91; SD = 1.07).

Regarding the measurement of the students' experiences with the ERT after the academic semester (T2), the perception was positive since the score was higher than 3 points (M = 3.18, SD = 0.66). Furthermore, the analysis by dimensions, identify that dimensions' averages of the experiences (T2) were higher than its corresponding dimensions of the questionnaire of expectations (T1). However, despite having improved, the dimensions of peer relationship (M = 2.26, SD = 0.95) and comparison with face-to-face education (M = 2.71, SD = 1.24) remain as negative perceptions, since scores were still lower than 3. **Table 3** shows dimensions' averages and deviations of the scales applied and the assessment of the differences between them.

When performing the comparative analysis between the general expectations of the students (T1) and the experience after the end of the semester (T2), statistically significant differences [$t(1903) = 19$, $p < 0.001$] were found. Hence, students' experience with ERT at the end of the academic period exceeded their expectations. In this sense, results respond positively to the proposed hypothesis, identifying differences in the scores between T1 and T2.

Gender Differences in University Students' Expectations and Experiences of Online Learning During Emergency Remote Teaching

To analyze differences between expectations and experiences considering gender and OECD area, the presence of statistically significant bidirectional interactions was assessed. Subsequently, we performed *post hoc* tests to determine the main effects of gender and OECD area, considering the Bonferroni adjusted p-value.

We examined each dimension independently to answer the hypothesis regarding the existence of differences between expectations and experiences related to undergraduate students' gender during ERT (H_2). The results showed statistically significant bidirectional interactions among gender and the change in scores between expectations and experiences in the following five dimensions: online learning [$F(1,1902) = 19.09$, $p < 0.001$, GES.002]; comparison with face-to-face education [$F(1,1902) = 25.23$, $p < 0.001$, GES.004]; online teaching [$F(1,1902) = 5.31$, $p < 0.001$, GES.0006]; peer relationship [$F(1,1902) = 6.79$, $p < 0.01$]; and self-efficacy for online learning [$F(1,1902) = 4.836$, $p < 0.05$, GES.0006]. In the case of the online assessment dimension, no statistically significant results were observed.

Regarding the main effect of gender, a significant effect for experience, but not for expectations in the following four dimensions was observed online learning: experience [$F(1,1902) = 10.64$, $p < 0.01$, GES.006]. Online teaching: experience [$F(1,1902) = 8.54$, $p < 0.01$, GES.004]. Peer relationship: experience [$F(1,1902) = 6.55$, $p < 0.05$, GES = 0.003] and Self-efficacy for online learning: experience [$F(1,1902) = 5.37$, $p < 0.05$, GES.003].

On the other hand, in the case of comparison with face-to-face education, the results were significant for expectation [$F(1,1902) = 13.06$, $p < 0.001$, GES.007], but not for experience ($p = 0.06$).

The simple main effect of the differences between expectations and experience were also analyzed, observing statistically significant results for women and men in four of the dimensions: online learning, women [$F(1,1106) = 203$, $p < 0.001$ GES = 0.046] and men [$F(1,796) = 42.1$, $p < 0.001$

TABLE 3 | Descriptive and inferential statistics on students' expectations and experiences during the ERT.

Variable	Expectation (T1)		Experience (T2)		*T*-test	
	M	*SD*	*M*	*SD*	*T*	*d*
Online learning	3.14	0.87	3.43	0.83	15.0 (1903) ***	0.34
Comparison with face-to-face education	1.91	1.07	2.71	1.24	26.6 (1903) ***	0.61
Online teaching	3.33	0.76	3.65	0.71	19.4 (1903) ***	0.44
Online assessment	3.01	0.95	3.23	1.02	8.51 (1903) ***	0.20
Peer relationship	2.10	0.83	2.26	0.95	7.86 (1903) ***	0.18
Self-efficacy for online learning	3.42	0.82	3.47	0.88	2.81 (1903) **	0.06
Full scale	2.92	0.65	3.18	0.66	19.0 (1903) ***	0.44

*M = mean; SD = standard deviation; d = size effect; **p < 0.01; ***p < 0.001.*

GES = 0.011]. In the Comparison with face-to-face education, women [$F(1,1106) = 589.63$, $p < 0.001$ GES = 0.15] and men [$F(1,796) = 169.09$, $p < 0.001$ GES = 0.06]. In the Online teaching, women [$F(1,1106) = 264$, $p < 0.001$ GES = 0.06] and the men [$F(1,796) = 117$, $p < 0.001$ GES = 0.03]. In the peer relationship, women [$F(1,1106) = 57.5$, $p < 0.001$ GES = 0.014] and men [$F(1,796) = 10.1$, $p < 0.01$ GES = 0.003].

In the self-efficacy for online learning dimension, statistically significant results were identified only for women [$F(1,1106) = 13.4$, $p < 0.001$ GES = 0.003]. Even though men and women presented higher scores at T2, women showed the most significant change reflecting a positive experience with online education (see **Table 4**).

Figure 1 shows the size effect identified in the measurements considering gender. In the case of women, we found a large-size effect in the dimension of comparison with face-to-face education and a medium-size effect in the online teaching dimension. In the case of men, the analysis outcomes determine only a medium effect size in the dimension of comparison with face-to-face education and a small size effect in the rest of the dimensions.

Differences by Disciplinary Area in the Measurement of Undergraduate Students' Expectations and Experiences of Online Learning During Emergency Remote Teaching

Regarding differences between the scores from expectations and experience of university students during ERT during the COVID-19 pandemic according to disciplinary areas (H_3), the results by dimension are presented below.

For all six dimensions a statistically significant bidirectional interactions among the OECD area and the differences between T1 and T2 scores was found. The results by dimensions are the following: Comparison to face-to-face education [$F(5,1898) = 3.54$, $p < 0.01$, GES = 0.003], online teaching [$F(5,1898) = 6.053$, $p < 0.001$, GES = 0.004], online assessment [$F(5,1898) = 7.33$, $p < 0.001$, GES = 0.006], online learning [$F(5,1898) = 8.686$, $p < 0.001$, GES = 0.006], peer relationship [$F(5,1898) = 3.86$, $p < 0.01$, GES.003], and self-efficacy for online learning [$F(5,1898) = 6.99$, $p < 0.001$, GES = 0.005].

Regarding the main effect of OECD area, a significant effect for experience and for expectations was observed in the following four dimensions: Comparison to face-to-face education: experience [$F(5,1898) = 4.43$, $p < 0.01$, GES.012] and the expectations [$F(5,1898) = 9.26$, $p < 0.001$, GES.024]: online assessment: experience [$F(5,1898) = 4.71$, $p < 0.001$, GES.012] and expectations [$F(5,1898) = 3.52$, $p < 0.01$, GES.01]; online learning: experience [$F(5,1898) = 7.4$, $p < 0.001$, GES.02] and expectations [$F(5,1898) = 9.57$, $p < 0.001$, GES.03]; self-efficacy for online learning: experience [$F(5,1898) = 6.22$, $p < 0.001$, GES.02] and expectations [$F(5,1898) = 5.52$, $p < 0.001$, GES.01].

Regarding online teaching, a significant effect was observed in expectation [$F(5,1898) = 4.65$, $p < 0.001$, GES.01], but not in experience ($p = 1$). On the other hand, for peer relationship, a significant effect was shown for experience [$F(5,1898) = 3.67$, $p < 0.01$, GES.01] but not for expectations ($p = 1$).

We performed Tukey's test to assess the differences between OECD areas in expectations and experience. Concerning expectations, the following dimensions presented significant differences (see **Table 5**). Comparison to face-to-face: Engineering and Technology - Agricultural Sciences $p < 0.01$, Engineering and Technology - Medical and Health Sciences $p < 0.001$, Engineering and Technology - Natural Sciences $p < 0.05$, Engineering and Technology - Social Sciences $p < 0.001$, and Engineering and Technology - Humanities $p < 0.01$. Online teaching: Engineering and Technology - Medical and Health Sciences $p < 0.01$ and Engineering and Technology - Social Sciences $p < 0.001$. Online assessment: Engineering and Technology - Medical and Health Sciences $p < 0.05$. Online learning: Engineering and Technology - Agricultural Sciences $p < 0.01$, Humanities - Medical and Health Sciences $p < 0.01$, Humanities - Natural Sciences $p < 0.05$, Engineering and Technology - Natural Sciences $p < 0.01$, Engineering and Technology - Social Sciences $p < 0.001$, and Engineering and Technology - Humanities $p < 0.001$. Self-efficacy for online learning: Engineering and Technology - Social Sciences $p < 0.001$ and Engineering and Technology - Humanities $p < 0.01$.

In the case of experience, the dimensions that showed significant differences are listed below: Comparison to face-to-face education: Humanities - Agricultural Sciences $p < 0.01$, Humanities - Medical and Health Sciences $p < 0.01$, Humanities -

TABLE 4 | Descriptive data on the expectations and experience of university students considering gender.

	Expectation (T1)				Experience (T2)			
	Women		Men		Women		Men	
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Online learning	3.12	0.85	3.17	0.88	3.48	0.79	3.36	0.89
Comparison with face-to-face education	1.84	1.02	2.02	1.13	2.77	1.22	2.64	1.26
Online teaching	3.34	0.76	3.32	0.75	3.69	0.69	3.59	0.75
Online assessment	3.00	0.96	3.03	0.94	3.23	1.01	3.23	1.04
Peer relationship	2.10	0.81	2.10	0.86	2.31	0.95	2.20	0.94
Self-efficacy for online learning	3.42	0.80	3.41	0.84	3.51	0.83	3.42	0.93
Full scale	2.92	0.64	2.93	0.67	3.23	0.63	3.13	0.68

M and SD represent mean and standard deviation, respectively.

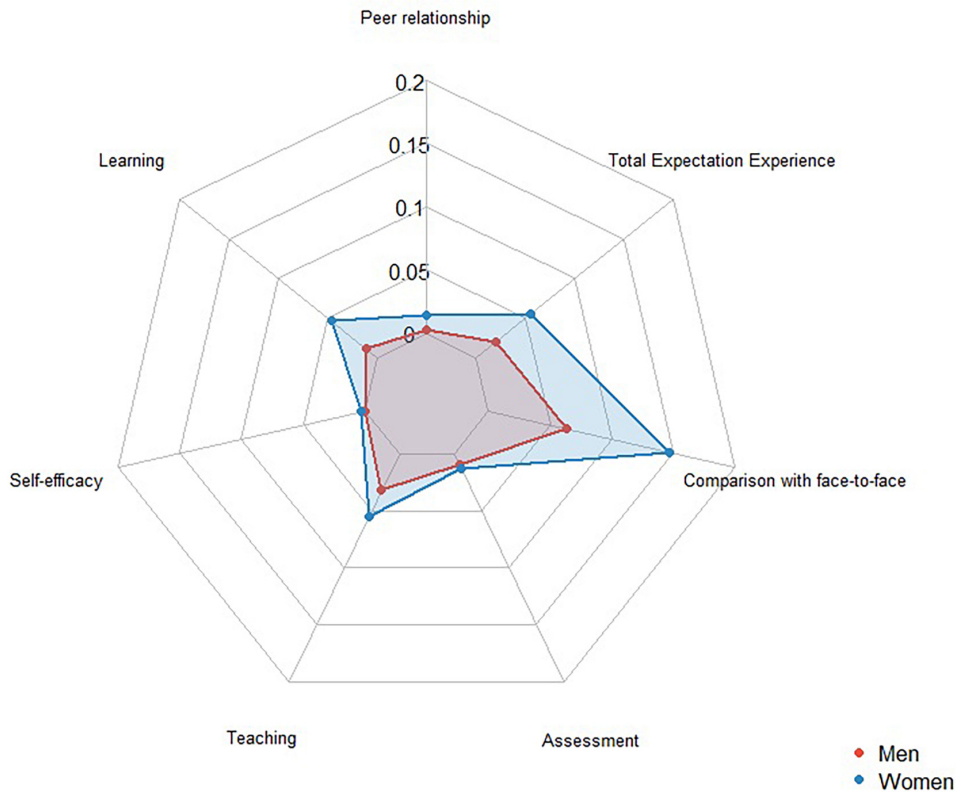

FIGURE 1 | The effect size of the change between expectations and experience according to the gender of the participating student.

Natural Sciences $p < 0.05$, Humanities - Social Sciences $p < 0.05$, and Engineering and Technology - Humanities $p < 0.001$. Online assessment: Medical and Health Sciences - Agricultural Sciences $p < 0.001$ and Social Sciences - Agricultural Sciences $p < 0.05$. Online learning: Medical and Health Sciences - Agricultural Sciences $p < 0.001$, Social Sciences - Agricultural Sciences $p < 0.01$, Engineering and Technology - Agricultural Sciences $p < 0.01$, Natural Sciences - Medical and Health Sciences $p < 0.05$ Humanities - Medical and Health Sciences $p < 0.001$, Humanities - Social Sciences $p < 0.05$, and Engineering and Technology - Humanities $p < 0.05$. Peer relationship: Humanities - Medical and Health Sciences $p < 0.01$ and Humanities - Social Sciences $p < 0.05$. Self-efficacy for online learning: Medical and Health Sciences - Agricultural Sciences $p < 0.01$, Social Sciences - Agricultural Sciences $p < 0.01$, Engineering and Technology - Agricultural Sciences $p < 0.05$, Humanities - Medical and Health Sciences $p < 0.01$, Humanities - Social Sciences $p < 0.01$, and Engineering and Technology - Humanities $p < 0.01$.

Finally, the simple main effect of the differences between expectations and experience for each dimension was analyzed, observing in some cases statistically significant effects for all six OECD areas, while in others only for one (see **Table 5**). The results reflected by the analysis are listed by dimension: Comparison to face-to-face education: Agricultural Sciences [$F(1,140) = 71.71$, $p < 0.001$, GES = 0.16], Medical and Health Sciences [$F(1,415) = 227.33$, $p < 0.001$, GES = 0.14], Natural Sciences [$F(1,311) = 93.81$, $p < 0.001$, GES.08], Social Sciences [$F(1,508) = 247.639$, $p < 0.001$, GES = 0.14], Humanities [$F(1,60) = 11.93$, $p < 0.01$, GES = 0.06], and Engineering and Technology [$F(1,464) = 97.77$, $p < 0.001$, GES = 0.06]. Online teaching: Agricultural Sciences [$F(1,140) = 8.14$, $p < 0.05$, GES = 0.01], Medical and Health Sciences [$F(1,415) = 126$, $p < 0.001$, GES = 0.07], Natural Sciences [$F(1,311) = 58.2$, $p < 0.001$, GES.04], Social Sciences [$F(1,508) = 124$, $p < 0.001$, GES = 0.06], Humanities [$F(1,60) = 23.8$, $p < 0.001$, GES = 0.09], and Engineering and Technology [$F(1,464) = 51.6$, $p < 0.001$, GES = 0.02].

The following differences in the dimension of online assessment between discipline areas were found: Medical and Health Sciences [$F(1,415) = 70.57$, $p < 0.001$, GES = 0.05] and Social Sciences [$F(1,508) = 37.89$, $p < 0.001$, GES = 0.02]. Online learning: Medical and Health Sciences [$F(1,415) = 86.1$, $p < 0.001$, GES = 0.05], Natural Sciences [$F(1,311) = 26.4$, $p < 0.001$, GES.02], Social Sciences [$F(1,508) = 131$, $p < 0.001$, GES = 0.06], Humanities [$F(1,60) = 9.94$, $p < 0.05$, GES = 0.5], and Engineering and Technology [$F(1,464) = 10.8$, $p < 0.01$, GES = 0.006]. Peer relationship: Medical and Health Sciences

TABLE 5 | Descriptive statistics on students' expectations and experience during the ERT according to the disciplinary area.

	Agricultural sciences		Medical and health sciences		Natural sciences		Social sciences		Humanities		Engineering and technology	
Variable	**Expectation**	**Experience**	**Expectation**	**Experience**	**Expectation**	**Experience**	**Expectation**	**Experience**	**Expectation**	**Experience**	**Expectation**	**Experience**
Peer relationship	2.10 (0.76)	2.12 (0.90)	2.10 (0.80)	2.38 (0.93)	2.10 (0.88)	2.21 (0.93)	2.09 (0.83)	2.30 (0.96)	2.07 (0.93)	1.93 (0.81)	2.11 (0.84)	2.24 (0.99)
Online learning	3.04 (0.93)	3.18 (0.89)	3.18 (0.84)	3.56 (0.82)	3.11 (0.86)	3.35 (0.78)	3.03 (0.88)	3.46 (0.84)	2.74 (0.90)	3.10 (0.76)	3.33 (0.82)	3.45 (0.84)
Self-efficacy for online learning	3.40 (0.81)	3.23 (0.91)	3.47 (0.81)	3.55 (0.85)	3.35 (0.85)	3.40 (0.86)	3.32 (0.81)	3.53 (0.87)	3.17 (0.77)	3.10 (0.84)	3.54 (0.79)	3.50 (0.89)
Comparison with face-to-face education	1.79 (0.99)	2.76 (1.25)	1.89 (1.01)	2.79 (1.18)	1.92 (1.12)	2.63 (1.22)	1.76 (0.99)	2.66 (1.21)	1.61 (0.94)	2.11 (1.03)	2.17 (1.16)	2.83 (1.33)
Online teaching	3.40 (0.80)	3.55 (0.76)	3.27 (0.77)	3.68 (0.75)	3.36 (0.74)	3.64 (0.67)	3.26 (0.78)	3.64 (0.73)	3.23 (0.68)	3.62 (0.60)	3.46 (0.71)	3.67 (0.69)
Online assessment	2.94 (0.99)	2.94 (1.08)	2.92 (0.98)	3.36 (0.97)	3.07 (0.93)	3.19 (1.02)	2.97 (0.94)	3.26 (1.03)	2.81 (0.93)	2.98 (1.02)	3.14 (0.93)	3.21 (1.02)
Total scale	2.91 (0.67)	3.02 (0.69)	2.92 (0.64)	3.27 (0.66)	2.92 (0.65)	3.14 (0.61)	2.85 (0.65)	3.20 (0.65)	2.74 (0.66)	2.92 (0.53)	3.05 (0.64)	3.20 (0.67)

Results presentation corresponds to mean and standard deviation, in the form Mean (SD).

[$F(1,415) = 42.1$, $p < 0.001$, GES = 0.024], Social Sciences [$F(1,508) = 27$, $p < 0.001$, GES = 0.014], and Engineering and Technology [$F(1,464) = 9.88$, $p < 0.05$, GES = 0.005]. Self-efficacy for online learning: Social Sciences [$F(1,508) = 29.4$, $p < 0.001$, GES = 0.02].

Figure 2 shows the size effect identified considering the OECD area. In Agricultural Sciences, we found a large-size effect in the dimension of comparison with face-to-face education and a small effect size in the dimensions of online learning, self-efficacy for online learning, online teaching, and the full scale. There were no effects detected in the rest of the dimensions. In Medical and Health Sciences, the analysis outcomes reflected a large-size effect in comparison with face-to-face education and a medium-size effect in the dimensions of online teaching and full scale. In addition, we found a small effect in the dimensions of peer relationship, online learning, and online assessment. In Natural Sciences, we found a medium-size effect in the size of comparison with face-to-face education and a small-size effect in online teaching, online learning, and full scale. No effects on the remaining dimensions were found. In the case of Social Sciences, we found a large-size effect for comparison with face-to-face education, a medium-size effect in the dimensions of online learning, online teaching, and the full scale, and a small-size effect in the rest of the dimensions. The Humanities area presented a medium-size effect in online teaching and comparison with face-to-face education dimensions and a small-size effect in online learning, peer relationship, online evaluation, and full scale. Finally, in Engineering and Technology, a medium-size effect in the dimension of comparison with face-to-face education and a small-size effect in the online teaching, online learning, peer relationship dimensions, and full scale were identified. In the rest of the dimensions, there were no effects detected.

DISCUSSION

Due to the COVID-19 pandemic, the transition to ERT impacted students' expectations and experiences during their professional training. This research aimed to analyze students' expectations and experiences considering the gender and disciplinary area of the participants. Findings are analyzed and discussed in terms of the hypotheses raised in section "The Present Study."

Differences Among University Students' Expectations and Experiences During the Emergency Remote Teaching Produced by the COVID-19 Pandemic

Changes between students' expectations and experiences during ERT were found. Students' expectations at T1 about online education were negative. However, at the end of the academic period, students indicated having a positive experience in most studied dimensions. They only showed a negative experience regarding the relationship with their peers and the comparison with face-to-face.

Several studies during the pandemic point out the lack of confidence toward the different educational actors and online

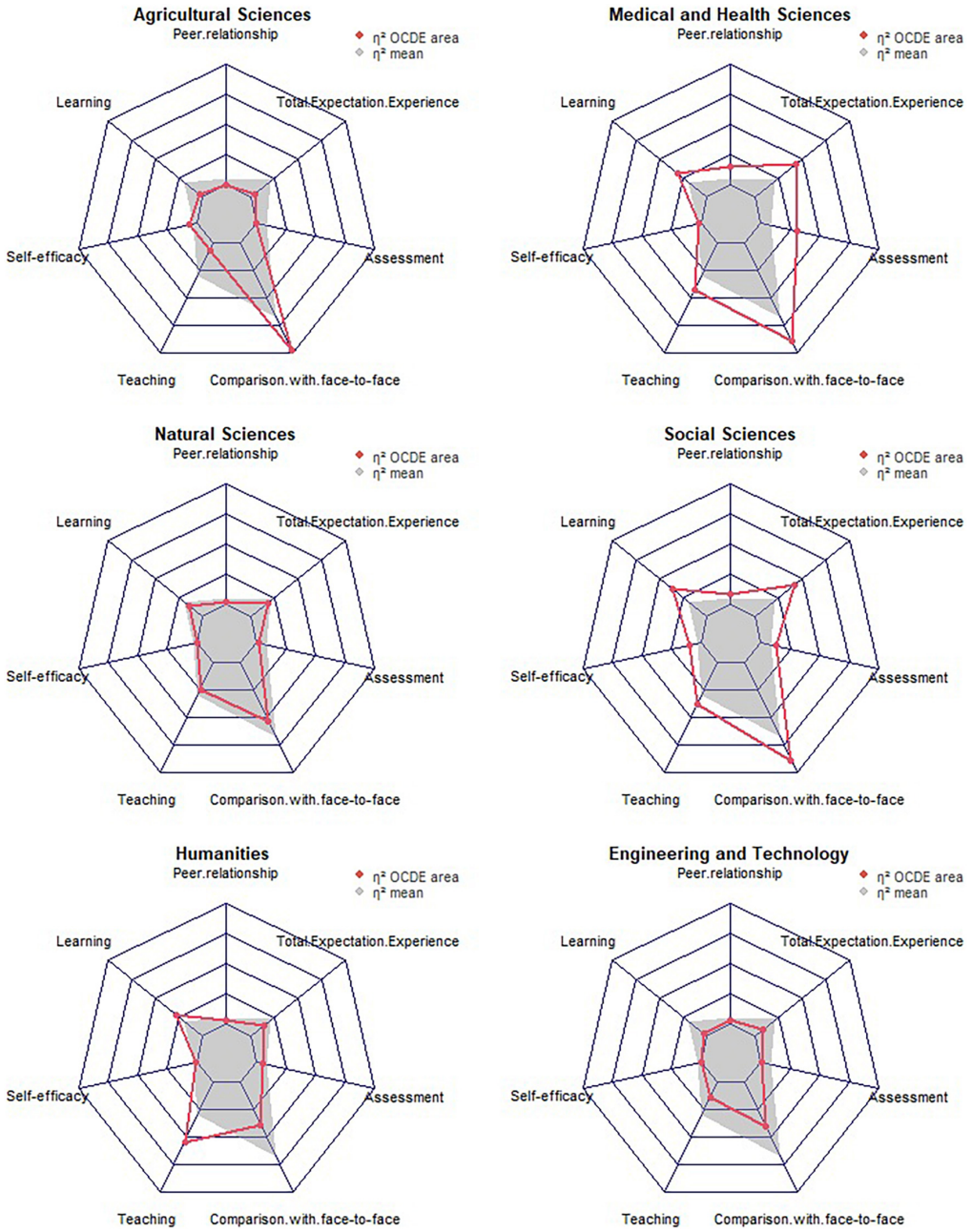

FIGURE 2 | Size effect regarding the change between expectations and experience according to the disciplinary area.

education opportunities. This mistrust is associated with a lack of knowledge of the modality and its advantages (Villa et al., 2020) and little awareness of the available virtual educational tools (Rahiem, 2020; Almomani et al., 2021). In addition, the unexpectedness of the transition was a challenge for teachers and students, generating a problematic, improvised, and intuitive confrontation (Barbour et al., 2020; Hodges et al., 2020).

Students' perception of the limited opportunities virtual classrooms and other technological tools provided them to interact and work collaboratively with peers is particularly noteworthy. Several reports emphasize the benefits of cooperative work versus a competitive or individualistic methodology in higher education. The former generates better learning and significant commitment and involvement in academic tasks (León del Barco et al., 2017; Guerra Santana et al., 2019; Hamdan et al., 2021). Also, collaborative work is closely related to desired competencies in the profession's exercise, an aspect that is not present in this study. In this context, the literature describes technological mediation in education to provide significant possibilities of simultaneous sociability, of

connection between communities and people, subscription, and asynchronous communication that generates network effects that tend to accelerate individuals and group learning (De Haro, 2010; Anthony et al., 2019). Therefore, it is crucial to understand why peer interaction during ERT was negatively perceived, especially considering that the LMS had the functionalities for such activities. We believe that it is partly a product of the little knowledge of these tools by both teachers and students.

The observation that students face online education with a high sense of self-efficacy, believing that they have the skills to respond to the learning challenges that this modality presents, could be explained by the lack of knowledge and experience, as well as underestimating the necessary skills. Consequently, students perceive a lower complexity than the real one, as described by the "Durning Kruger effect" (Dunning, 2011). It is possible that by the regular use of technology, social media, phones, and computers, they initially self-perceived as more competent.

The perception of a better experience concerning the initial expectation suggests that the implementation of ERT, although not devoid of difficulties, responded to students' needs. Hence, higher education institutions' response and the teachers' and students' adaptation adequately provided a well-perceived learning environment. Furthermore, the above is consistent with other research during the pandemic that reported positive experiences by teachers and students in terms of having been able to face the educational process despite the adversities of the confinement and its urgency (Sepulveda-Escobar and Morrison, 2020).

We can conclude that the educational community and higher education authorities have learned greatly during ERT. Therefore, it will be interesting to study how to translate these lessons into explicit guidelines and practices when returning to normality post-pandemic.

Gender Differences in University Students' Expectations and Experiences of Online Learning During Emergency Remote Teaching

When evaluating changes in expectation and experience scores considering the sex of the participants, at the beginning of ERT, men and women presented similar levels of expectations about online education. However, experiences showed differences according to gender. Although both perceived the educational experience as positive, women gave higher values than men, in the dimension with lower punctuation in the experience compared with a face-to-face modality and peer relationship.

These results are consistent with the study reported by Almomani et al. (2021), conducted during the COVID-19 pandemic, and reports that women students were more optimistic, satisfied, and committed to the online learning experience than men students during this period. Furthermore, a 62-country study on the impact of the pandemic on higher education (Aristovnik et al., 2020) reports a minor negative impact of confinement on women students' learning, adaptation, and relationship with the teachers. In this study, a similar result was obtained regarding the perception of online teaching. Women students presented a higher value of the teacher's commitment to ERT. Women considered that instructors were available and attentive to their learning needs, complied with the course syllabus, and made good use of the available virtual classroom tools.

In another study on online university education in the context of COVID-19 (Shahzad et al., 2021), the authors were able to identify differences between men and women regarding the perception of usefulness, ease, and satisfaction with the use of the learning management systems provided by the institution. This finding suggests that adaptation processes to university life in electronic learning environments may be different for men and women. Therefore, this information could be valuable for university authorities to strengthen and improve the university system support.

Differences in Students' Expectations and Experiences by Disciplinary Area of Online Learning During Emergency Remote Teaching

Research on the effects of the COVID-19 pandemic in the context of higher education has identified significant challenges for implementing online education, such as inequality, funding, and ways to develop learning in general (Aristovnik et al., 2020; Funk, 2021). In this context, it is essential to identify if these challenges and opportunities are specific to a particular disciplinary area or apply to the general community. Thus, differences during ERT between disciplinary areas were analyzed.

Differences in the expectations and experiences of university students in the six disciplinary areas classified according to their undergraduate programs were found. Unfortunately, there is little literature on the influence of the disciplinary area to which students' undergraduate programs belong regarding experience with online education in ERT. Knowing about students' experience in each disciplinary area will allow teachers and educational authorities to identify weaknesses and good practices that will otherwise not be detected to design and develop monitoring plans and improve the quality of online education in the future.

We found differences within expectations in the online teaching dimension for all disciplinary areas. On the other hand, Students from Engineering and Technology and Medical and Health Sciences areas reported higher experience scores in this dimension, which implies that these students felt more confident about the actions performed by their instructors. This result could be related to the use of technology by Engineering and Technology teachers and the teacher training in the medical education area, often advanced.

Despite the improvement between student expectations and experiences of the online assessment dimension, changes presented null (Agricultural Sciences, Natural Sciences, and Engineering and Technology) or small (Social Sciences, Humanities, and Medical and Health Sciences) size effect. The assessment processes continue to be an area of concern. Other reports support this statement. For example, Jordanian

university students perceived that assessment during the pandemic allowed them to obtain higher grades than face-to-face assessments. Nonetheless, most students perceived that the evaluative processes were unfair and learned more minor than the quality reflected (Almomani et al., 2021). Consistently, a study conducted with 8265 Chilean university students (Lobos et al., 2022) reported that students perceived a bad experience regarding the assessment process during the pandemic. Again, researchers observed a greater expectation of obtaining a good grade rather than of achieving learning. As a result, students considered that they failed to achieve good quality training. Despite these findings, a study carried out in Chile indicates that students' academic performance improved compared to the previous academic period (Franco et al., 2021). Therefore, the guidelines and strategies used by teachers regarding assessment continue to be an essential element to consider in the design of quality online education.

An interesting finding is a large-size effect obtained in the differences between the scores of expectations and experience of students of Agricultural Sciences and Medical and Health Sciences, for the comparison with face-to-face education dimension. Further research is required to identify good practices teachers and students implement in undergraduate programs classified in these two OCDE discipline areas.

We believe that the differences in the results of the students' expectations and experience according to the disciplinary area are due to the different challenges encountered in the adaptation of the courses (efficient ones). Accordingly, strategies used, for example, in Health Sciences, can be used in realistic training scenarios that relate to people (Social Sciences and Humanities). One of these strategies can be using remote standardized patients who have meetings with students through the Internet. These activities allow teachers and standardized students to have spaces for evaluation and feedback (Langenau et al., 2014; Bączek et al., 2021). This technique could be adapted to other teaching contexts using work situations in the training of other professionals.

Concerning the dimension of self-efficacy for online learning, no significant changes in four of the six knowledge evaluated areas were observed. Agricultural Sciences and Social Sciences displayed differences with small-size effect. Thus, ERT did not increase students' confidence beliefs toward taking classes in the online teaching modality.

Despite valuable information that has been obtained for this study, some limitations are identified. First, the results presented correspond to university students' responses from a single educational institution, so the interventions of university authorities could bias expectations and subsequent experiences in the context of ERT. Second, it was not part of this study to evaluate access gaps and other student variables that could affect the results. Finally, variables associated with the teacher or course characteristics that may influence the outcomes could not be controlled. Therefore, the results aim to study changes between students' expectations and experience in an exploratory way. Other studies must consider the assessment of student (e.g., difficulties in accessing online classes), professor (e.g., profession), or course (e.g., type, time commitment) variables that may affect undergraduate expectations and experiences.

Study Implications

In this research, we found that students' experiences with online education during the ERT were more optimistic than their expectations at the beginning of the semester. For this reason, the results found, together with other sources of institutional information such as learning analytics and institutional indicators, will allow authorities and teachers to develop guidelines to promote quality online education. It is also possible that university authorities could consider these preferences to design and create online courses for their students (Zapata-Cuervo et al., 2021).

The relationship with peers and professors is still considered a weak point of online education. This is a crucial aspect to be addressed by university professors. In the context of virtuality, professors need to maintain communication channels that allow them to provide students with timely feedback from online video tutorials or email guides after class (Bao, 2020; Vladova et al., 2021b). We identified statistically significant differences in the experiences of men and women. This represents an opportunity to investigate how the characteristics of each student improve academic performance and decrease the probability of dropping out of college.

We found differences in the students' experiences according to the scientific areas. These results translate into a challenge to identify the strategies and actions that facilitated a positive experience to replicate them in similar formative contexts. Further, studies can be performed to identify good practices applied in general contexts and those appropriate for each discipline. Higher education institutions are expected to accompany teachers and students in the different scientific areas during the post-pandemic academic continuity. Exceptional support is scheduled in aspects such as planning and prioritization of practical classes, promoting a combined approach of virtual and face-to-face education (Pham and Ho, 2020; Vladova et al., 2021b).

Future research could assess how students' variables (e.g., internet access, type of device used to study), courses' factors (e.g., number of hours of dedication, learning goals, instructional design, type of materials, or shared resources), teachers' aspects (e.g., technological acceptance, use of strategies, training) or the institution's elements (e.g., promotion of teaching through technology, support for students and teachers, use of online learning platforms, technological campuses) impact the expectations and subsequent experience of students during the development of online courses., especially regarding strength and weaknesses according to discipline areas.

The findings of this work contribute to identifying dimensions and areas that require special attention to establish preventive and corrective actions by university authorities for the near future and propose the opportunity of further studying good practices of better-perceived experiences of discipline areas.

CONCLUSION

The students' experiences during ERT due to the COVID-19 pandemic exceeded expectations. Students reported high

expectations about their self-efficacy to cope with this new scenario, even though low expectations regarding peer relationships, online teaching, and comparison with face-to-face education were observed concerning the experience after the semester. Students indicated positive experiences with online learning and teaching. They felt that the professor provided adequate support in terms of education, instruction, and assessment. Negative experiences persisted regarding peer relationships and the overall experience compared to face-to-face teaching. Additionally, men and women presented similar expectations at the beginning of the semester regardless of their discipline, while women were more optimistic about educational experiences during ERT. Finally, concerning the disciplinary area, differences in most of the assessed dimensions were observed, representing an opportunity to study further and identify good practices in those dimensions and disciplines that presented positive perception and effect.

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 Institutional Ethics Committee of University of Concepción. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KL and RC-R: conceptualization. KL, RC-R, and CB: methodology. JM-N: formal analysis and visualization. KL, RC-R, and AM-T: research and writing—preparing the original draft. AM-T, CB, and CF: resources, project management, and fundraising. JM-N and RC-R: data curation. CB and CF: writing—revising and editing. KL, CB, and CF: monitoring.

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Exploring the Relational Embeddedness of Higher Educational Students During Hungarian Emergency Remote Teaching

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In 2020, the researchers started studying with utmost haste the effect of the COVID-19 pandemic on teaching. The name of the form of teaching that came to be is disputed, neither the phrase of distance teaching nor digital teaching are professional enough. We use the term of emergency remote teaching (henceforth ERT), which appears in the scientific literature. This refers to the periodical diversion from the normal teaching, and to the emergency distancing in the teaching processes as well. In the present study, we focus on the alteration of student relationships and its correlation with higher educational efficiency because we see the reduction of student relationships as a discriminatory factor of this period. According to the previous results, the institutional embeddedness of students to be an indispensable condition of educational efficiency. In our study, we compared the states of the student relationships before and during the ERT. We hypothesise that the reduction of institutional relations caused by the epidemic is the cause for the student inefficiency, dissatisfaction, and distrust. Our questionnaire was filled by 677 students (172 males, 505 females) from 30 Hungarian higher education institutes altogether. Our results raise attention to the indispensable roles of instructors which are not in close relation to teaching. Furthermore, the results point that the weakening in the student relationships is in correlation with student persistence, student engagement, and institutional trust and satisfaction. According to the study, the reduction of student embeddedness had a negative impact on performance. A further conclusion is that all of this should be taken into consideration when working out a concept for a virtual university.

Keywords: COVID-19, emergency remote teaching, higher education, dropout, institutional embeddedness

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INTRODUCTION

As a result of the expansion of higher education, as in other developed countries, the massification of higher education in Hungary has been increasing, leading to changes in the institutional structure and diversification of students (Kozma, 2004; Pusztai, 2015). Nevertheless, the number of students entering higher education in Hungary has stagnated in recent years (European Commission, 2019). It is, therefore,

particularly worrying that the dropout rate of Hungarian students is higher than the OECD and EU averages and that 45% of the enrolled students do not graduate on time, while the average rate of students not finishing studies on time in OECD countries is around 30% (Varga, 2010). In addition, due to the pandemic erupted in 2019, the popularity of higher education in Hungary has further declined (Educational Authority, 2021). In the light of these data, achieving institutional embeddedness of higher education students in Hungary is of particular importance for their academic success. The pandemic has severely compromised the institutional embeddedness of students, as a new system of working without face-to-face contact, known as emergency remote teaching, has been introduced to avoid further infection (Hodges et al., 2020).

Drop Out and Student Achievement

In his work, Tinto (1975) found that students are more likely to drop out of their studies if they lack contacts and interactions within the institution. The poverty of students' institutional interactions weakens their academic effort, may weaken their belief in the successful attainment of their degree, and may reduce their academic achievement (Tinto, 1975; Astin, 1993).

Pusztai (2015) confirmed the research of Tinto (1975) and Astin (1993) on a Hungarian sample. Their research showed that students who are less embedded in the institution are more likely to drop out. The extent to which the students are embedded in their institution is a function of their intraorganisational relationships. Where students have quality relationships with fellow students (intragenerational relationships within the institution), they may find organisational and emotional support. In this way, partnerships can be created between them, which, in addition to friendship, can also serve as a source of knowledge. Tutors play a similarly indispensable role. In traditional models of higher education, the role of the lecturer was negligible in terms of embeddedness and persistence, but this role has now undergone a significant change. Research has shown that the instructor's interest toward the students, even when weak, can be decisive. If the students confronted are with a positive interest from their tutor, their trust in the tutor increases, which helps them complete their studies. When a tutor is also involved in talent management, it may increase the student's persistence and lead to scholarships, publications, or even job opportunities (Pusztai, 2015).

Studies often identify the risk of dropout with a lack of academic success. There are several ways to measure student achievement. In the present study, student achievement was measured through four efficacy predictors.

The first is persistence in higher education, which indicates student's motivation to study. For students, persistence means that they have succeeded in completing their studies or have conscious aspiration and conviction that they want to be able to complete their studies successfully (Tinto, 2017). Also an important factor of the student achievement is engagement, which is the time and effort students devote to educationally purposeful activities that contributes directly to the desired educational outcome (Hu and Kuh, 2002) since real success in higher education can only be achieved if a person also makes an effort to obtain a degree (e.g., taking classes, taking notes, etc.). It is important to examine students' performance indicators related to the institution, including their trust and satisfaction with the institution. In the wake of Coleman (1990), trust is students' expectations of other students, faculty and university leaders to act and behave in a way that is beneficial to the students or at least not detrimental to them. Satisfaction is a short-term students' disposition by subjective evaluation of educational experience, services and facilities (Elliott and Shin, 2002). These indicators have a determinant role in the dropout because the disillusionment with the institution and higher education can be a serious reason to suspend students' higher education studies (Pusztai et al., 2019).

The integration of students in an institutional social environment has a key role in the success (Tinto, 1993, 2006). Students, who cannot connect to the institution through their contacts, usually build up networks of contacts outside the institution, which can also contribute to persistence, in particular links with external activities such as volunteering or study-related employment (Kocsis and Pusztai, 2020; Pusztai et al., 2021). However, these friendships outside the institution (intragenerational relationship outside the institution) do not always increase students' persistence in their studies. In contrast, parents play an indispensable role in student achievement through their multifaceted and supportive influence on student persistence and engagement (Pusztai, 2019). It should be considered that both distance and remote education, in addition to their financial and practical benefits in pandemic-free times, may increase the risk of dropout for students by reducing school rituals, student and lecturer relationships and, thus, ties to the institution and higher education.

Risk of Dropping Out From Higher Education During COVID

One might think that the potentially globalising *virtual social capital* of the 21st century, which includes social networks among students, could make up for the lack of social contact caused by the pandemic (Arkhipova et al., 2020). Most of all, communities that existed before the ERT had the greatest impact on maintaining academic performance (Papp et al., 2021). Also, a study of ERT found that class attendance and academic activity did not decrease academic performance during ERT for students who had their relationships with faculty confirmed prior to the epidemic. The contact with the student's instructor was further strengthened by the fact that the instructors tried to connect with their students through various online platforms (Gares et al., 2020).

However, international researches in 2020 have shown that in forced remote education, impersonalisation is quickly followed by demotivation (Niemi and Kousa, 2020). Instructors who have been able to greatly reduce or prevent students' dropout anxiety and study problems with the help of a supportive emotional environment have proven to be extremely crucial to effectiveness during ERT (Steinberger et al., 2021). In addition, lecturers who may not be familiar with their own students and student's and lecturer's perceptions of learning are not the same also can

increase the risk of dropping out (Al Shlowiy et al., 2021), these may be related to the trust and satisfaction in the institution that we want to measure. It was particularly demotivational for students to attend online classes without interactions, which they said greatly reduced their faith in completing their studies (Ghazi-Saidi et al., 2020).

In light of this, our research does not aim to review the methods and technologies of remote education. The main aim for our research was rather to examine the perceived lack of intra- and intergenerational relationships often missing from remote education concerning the risk for dropout. It is legitimate to ask whether student achievement indicators deteriorate in relation to the loss of student contact during the epidemic, and we hypothesise that a decline in institutional embeddedness implies a loss of confidence in student progression and achievement.

MATERIALS AND METHODS

To answer our research question, we conducted a questionnaire survey during the first phase of remote education (May-June 2020). The questionnaire *"Learning Alone*[1]*"* consisted of two modules. In the first unit, we retrospectively measured the experiences before the remote education, and in the second unit, we used the same questions to assess the respondents' assessment of their situation during remote education. Over a 6-week-long period, 677 students (172 men and 505 women) from a total of 30 higher education institutions in Hungary completed the questionnaire. Respondents studied in 14 training fields; 46% were at the beginning, 38% in the middle and 16% were at the end of their studies. The average age of respondents was 21.7 (18–30) years. Most of the students' parents had a tertiary-level certificate (46.7%), followed by those with a secondary educational certificate (40.8%), while parents with primary education were the least represented among the respondents (12.4%). The research questions were answered by using or improving certain blocks of the IESA (Effects of Institutional Integration on Student Achievement in Higher Education) and PERSIST questionnaires developed by CHERD-Hungary. The internal validity of the questionnaire is based on the fact that the CHERD research has been using almost the same questionnaire since 2001. In addition, the external validity of the questionnaire is based on the fact that age, sex, and training fields composition of the sample is almost exactly the same as the reference population from which the sample was taken. The self-developed questions, to which students could answer on a four-point scale. From the IESA questionnaire, we adapted the blocks on student network (Cronbach's alpha 0.798), while from the PERSIST questionnaire, we adapted the questions on achievement indicators, i.e., trust (Cronbach's alpha 0.851), satisfaction (Cronbach's alpha 0.923) and persistence and engagement (Cronbach's alpha 0.841). Finally, our questionnaire block on parental relationships also had a high reliability index (Cronbach's alpha 0.909). Thus, per structural unit, the respondent had to answer 68 questions during our questionnaire through 12 question blocks.

[1]Referring to the book of Robert Putnam entitled Bowling Alone: The Collapse and Revival of American Community (New York: Simon & Schuster).

RESULTS

First, we examined changes in students' persistence (p = 0.000), engagement (p = 0.000), trust (p = 0.000) and satisfaction (p = 0.000) concerning higher education, which decreased significantly. The most significant decrease could have been experienced in academic engagement (62.8% of students) This was followed by the proportion indicating a decrease in trust (50.2%) and the proportion of students dissatisfied with the institution (50.2%). A slightly lower proportion (40%) was affected by a decrease in persistence in studies. Those who perceived a decrease in the former indicators were not over-represented in any groups created based on parental education (**Figure 1**).

The second step was to compare the structure and intensity of student relationships. We found that the relationship structure became significantly poorer everywhere except for parent-student relationships. Intragenerational relationships declined the most, with contact weakening mainly with fellow students (59%) (**Figure 2**).

The reduction of contacts affected all students equally, regardless of their social background. Since the average scores for academic persistence, academic activity, trust, and satisfaction showed significant differences between the two periods, it was justified to conduct correlation analyses.

Pearson correlation shows us, that change of student's relationships correlated with the achievement predictors. The change in persistence correlated with the change in intraorganisational intragenerational (p = 0.081), extraorganisational intragenerational (p = 0.131) and intergenerational (p = 0.160) relationships. The change in

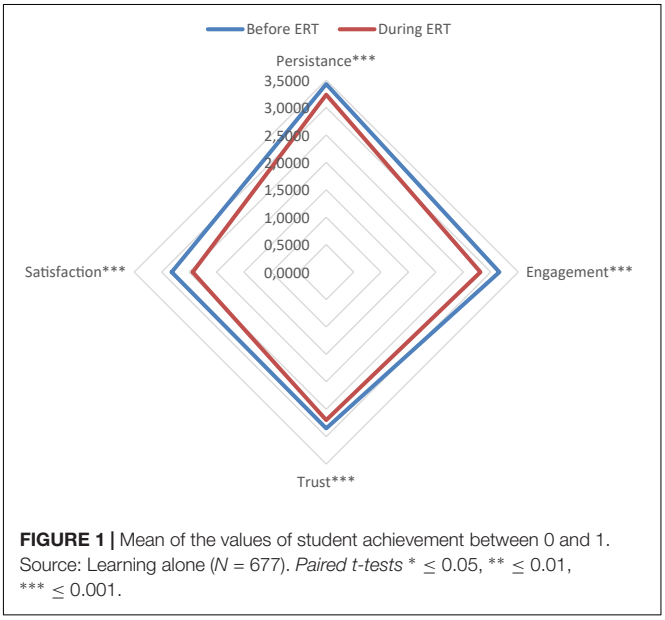

FIGURE 1 | Mean of the values of student achievement between 0 and 1. Source: Learning alone (N = 677). *Paired t-tests* * ≤ 0.05, ** ≤ 0.01, *** ≤ 0.001.

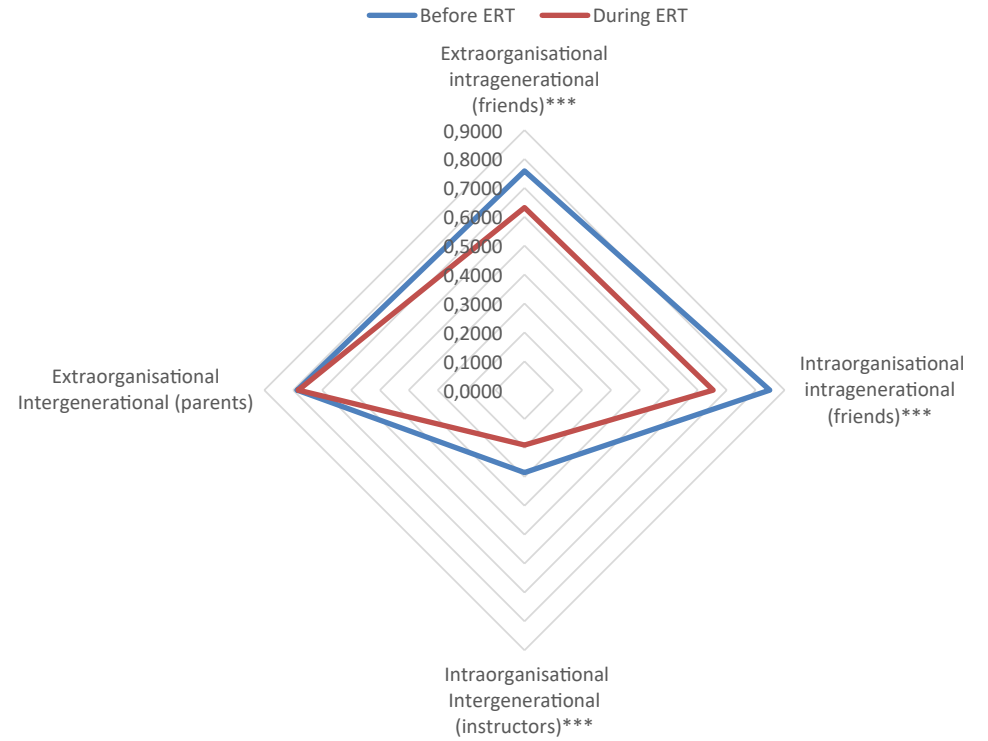

FIGURE 2 | Mean of the values of networks between 0 and 1. Source: Learning alone (N = 677). *Paired t-tests* * ≤ 0.05, ** ≤ 0.01, *** ≤ 0.001.

engagement correlated with the change in intraorganisational intragenerational (p = 0.189), extraorganisational intragenerational (p = 0.126) and intergenerational (p = 0.125) relationships. The change in trust correlated with the change in intraorganisational intragenerational (p = 0.108), extraorganisational intragenerational (p = 0.166) and intergenerational (p = 0.110) relationships. Finally, the change in satisfaction correlated with the change in intraorganisational intra- (p = 0.191) and intergenerational (p = 0.142), and extraorganisational intra- (p = 0.156) and intergenerational (p = 0.112) relationships. These results are presented in **Table 1**. It is important to note that our correlations were significant, however, can be characterised with weak intensity. Thus we continued our work with linear regression analysis.

Our linear regression analysis identified that the deterioration in the intraorganisational intragenerational relationships resulted in a decrease in both academic activity (p = 0.000) and satisfaction (p = 0.000). The deterioration in the relationship with instructors eventuated a significant decrease in satisfaction (p = 0.008). From the point of effectiveness, the decrease of the extraorganisational friendships proved to be decisive because the decrease experienced during the pandemic resulted in the deterioration in persistence (p = 0.006), trust (p = 0.001) and satisfaction (p = 0.088). Most people (48.3%) had no change in their relationship with their parents. There was no change for any of the outcome predictors. Our results show that most students have moved back home to live with their parents, so their relationship has not deteriorated. However, in the case of students with a deterioration in parental relationships, a decrease in persistence (p = 0.002), engagement (p = 0.006) and satisfaction (p = 0.007) were also observed (**Table 2**).

In the final step of the analysis, we examined which of the four dimensions of achievement (academic persistence, activity, satisfaction, trust), when aggregated and with a stronger than average chance of deterioration, was most affected by the weakening of the relationship resources while controlling for the other variables. With logistic regression analysis[2], the strongest increase in the odds of student achievement deterioration was found to be the lack of peer relationships (Exp.B = 1.828, p = 0.001), followed by the loosening of parental relationships (Exp.B = 1.623, p = 0.01), and then the decrease in instructor contacts (Exp.B = 1.473, p = 0.022). When controlling for other variables, peer contacts outside the institution are not significant influential factors (**Table 2**).

This suggests that the influence of relationships with fellow students, parents and lecturers is independent and strong. This result further supports the thesis that a student well-embedded in the institution is, in fact, a student well-integrated in the student society. Parents are essential partners in education to maintain students' academic persistence and activity even during higher education. Furthermore, the contact with lecturers, further reduced by the context of remote teaching, could be solid support for the effectiveness of education.

[2]The value of the dependent variable was 1 if the deterioration was more severe than the average, i.e., if there was deterioration in at least two dimensions of effectiveness.

TABLE 1 | Correlation of changing students' relationship with changing achievement predictors.

		Persistence	Engagement	Trust	Satisfaction
Intraorganisational	Intragenerational (friends)	0.081*	0.189**	0.108**	0.191**
	Intergenerational (instructors)	NS	NS	NS	0.142**
Extraorganisational	Intragenerational (friends)	0.131**	0.126**	0.166**	0.156**
	Intergenerational (parents)	0.160**	0.125**	0.110**	0.112**

*Source: Learning alone (N = 677). Pearson correlation, * ≤ 0.05, ** ≤ 0.01.*

TABLE 2 | Connections of changing student's relationship with changing achievement predictors (*N* = 677).

	Intraorganisational				Extraorganisational			
	Intra (friends)		Inter (instructors)		Intra (friends)		Inter (parents)	
	β	Sig	β	Sig	β	Sig	β	Sig
Persistence	–	NS	–	NS	0.113	0.006	0.120	0.002
Engagement	0.164	0.000	–	NS	–	NS	0.105	0.006
Trust	–	NS	–	NS	0,136	0.001	–	NS
Satisfaction	0.143	0.000	0.102	0.008	0.088	0.028	0.101	0.007

Source: Learning alone (N = 677). Linear regression.

DISCUSSION

Students' academic activity, persistence, trust and satisfaction with their studies have deteriorated consistently across all groups based on the parental educational level during the spring term of 2020. Apart from intergenerational relationships outside the institution (parent), all other relationship dimensions showed significant decreases concerning student contact.

Our study aimed to investigate how this change relates to changes in students' relationship networks with other people.

Particular attention was paid to changes in intragenerational relationships, as previous research has shown that these relationships are strongly associated with persistence and involvement in studies (Tinto, 1975; Astin, 1993; Pusztai, 2015). Our present data also confirmed this. The weakening of relationships with fellow students is most strongly associated with achievement: the reduction in friendships within the institution is accompanied by a reduction in academic activity and satisfaction.

The weakening of student- lecturer relationships was associated with a decrease in satisfaction. However, the relationship with lecturers was extremely low before ERT as well. Presumably, it can be due to the low involvement of Hungarian higher education lecturers in mentoring and tutoring students (Pusztai, 2015). Since our data suggest that the level of lecturer-student contact was already low before remote education, its deterioration was associated with increasing mistrust. Among the actors in higher education institutions, generally, the instructors are the most trusted by students compared to rectors, deans, administrators and student representatives (Pusztai, 2015). This has also disappeared, and we consider this particularly dangerous as distrust is a characteristic of disenchantment with the institution, which is closely linked to an increase in the risk of dropping out (Pusztai et al., 2019). It was also typical that half of the students, who became more dissatisfied, experienced a decrease in their relationships with their lecturers. This confirms research that poor or declining relationships with instructors significantly contribute to student dissatisfaction (Pusztai, 2015).

There was no significant decrease in parental relationships, but those who had looser relationships with their parents also showed a decrease in persistence and activity. Our research confirms that the support of parents is not limited to financial factors, but their help as social and emotional support significantly contributes to their child's academic success, thus reducing the student's chances of dropping out (Pusztai, 2019).

Previous research measuring the impact of changes in intra-generational relationships on student persistence has reported mixed results as these student relationships usually encourage students to obtain a degree in some cases and the opposite in others (Pusztai, 2015; Kocsis and Pusztai, 2021; Pusztai et al., 2021). A decrease in relationships with peers outside the institution was also associated with decreased persistence, satisfaction and trust. However, unlike the other three relationship dimensions, this did not have a significant independent effect on the decrease in students' achievement. This partly confirms our hypothesis that a reduction in relationships with fellow students and lecturers increases the risk of inefficiency.

In summary, the risk of dropping out from tertiary education was increased during COVID. The lack of impersonality and fellow friends greatly reduces persistence and engagement. From our results, it can be assumed that neither the students nor the instructors were able to use the online space properly for communication (Ghazi-Saidi et al., 2020). Community organisation must also take place in the online space, and it is necessary to build an online platform where both lecturers and students can reach each other. In Hungary, the role of instructors in mentoring and tutoring is only significant for

truly talented students, while policy measures help extremely disadvantaged students, leaving the widest range of students without institutional links to help them succeed. Consequently, to decrease the risk of dropping out, it would be important to draw the attention of instructors and education policymakers to the crowd left alone. During our research the largest available online student community was contacted. Thus, the conclusions drawn from the analysis cannot be generalised to the Hungarian student population. Although remote teaching caused by the pandemic can be seen as a much more rigorous distance education "experiment" than the average – exacerbated, of course, by the decline in extraorganisational contacts – this research has drawn attention to the fact that higher education has several additional functions besides knowledge transfer. Knowing this, it is important to be aware of the possible consequences of the lack of intraorganisational relationships in order to ensure that, in the future, alongside the increasing digitalisation of education, forms of work in higher education will be developed that can integrate the student into the social environment of the institution.

CONCLUSION

In our research, we aimed to examine the evolution of the relationship between higher education students during the pandemic period, after Tinto (1975) assumed a decrease in the qualitative and quantitative deterioration of relationships in performance predictors.

Results from our questionnaire were collected in the spring of 2020 suggest that the reduction of the students' relationship significantly correlated with the four outcome variables. The strength of intragenerational relationships within an institution is significantly correlated with changes in academic activity and satisfaction. Distance from instructors was associated with a rapid and sharp decline in satisfaction. Relationships with parents are strongly correlated with students' academic persistence and activity, and peer relationships outside the institution are associated with all dimensions except for academic activity. Based on our results, we can conclude that the decline in student relationships radically increased the risk of dropping out during the epidemic. The greatest detrimental effect was found on the decline in student relationships, followed by parent-lecturer relationships.

Our limitations are that we were not able to collect representative data during the pandemic, so our results can only be interpreted to a limited extent. It would be really useful to repeat our research to examine the extent to which students, who are already socialised online, differ from those who are socialised in attendance education and to consider the difficulty of socialising students entering higher education during COVID.

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

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

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Promoting Success and Persistence in Pandemic Times: An Experience With First-Year Students

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The transition and adaptation of students to higher education (HE) involve a wide range of challenges that justify some institutional practices promoting skills that enable students to increase their autonomy and to face the difficulties experienced. The requirements for this adaptation were particularly aggravated by the containment and sanitary conditions associated with coronavirus disease 2019 (COVID-19). With the aim of promoting academic success and preventing dropout in the first year, a support program was implemented for students enrolled in two courses in the area of education at a public university in northern Portugal during the first semester of 2020/2021. Three sessions of 50/60 min were implemented, namely, the first session focused on the verbalization of the demands, challenges, and difficulties of the transition, and the second and third sessions focused on the difficulties of academic adaptation and academic performance. Data from a dropout risk screening instrument and from the activities performed during sessions were analyzed. The main results point to student satisfaction with the content and the activities of the sessions and their usefulness. Students report not only high satisfaction levels with HE attendance, but also some emotional exhaustion due to academic activities. The continuity of the program is recommended with some improvements in its planning to ensure a more definitive version of the program in the next two years.

Keywords: higher education, adaptation to university, first-year students, COVID-19 pandemic, dropout

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INTRODUCTION

The European Education Area that was implemented some years ago seeks to foster cooperation between European Union Member States to enhance the quality and inclusiveness of national education and training systems (Farnell et al., 2021). The educational perspective based on the European Credit Transfer System has led to changes in the teaching-learning processes and requires the development of self-regulation skills, transversal, and lifelong education competencies by the students (Esteban et al., 2017; Panadero, 2017; van Rooij et al., 2018). To address these goals, the member states are improving their educational policies to increase the number of students in the tertiary education system and to reduce the number of students who drop out before graduation (OECD, 2018).

In Portugal, the expansion of higher education (HE) in recent decades has reflected the increase in the attendance of ethnic and socio-cultural groups that were previously excluded. However, this democratization is only reflected in a wider access but not in students' retention and success rates. Students who are less mature and less prepared academically present several difficulties when facing the demands or challenges of HE. Students who do not enter HE immediately after secondary education completion or who enter HE after several years in the labor market, students from disadvantaged socioeconomic groups or first-generation students in HE, migrants or students belonging to minority ethnic groups, among others, are the least equipped to successfully face the challenges of HE (Adabaş and Kaygin, 2016; Tight, 2019; Casanova et al., 2021c). In Portugal, students from low socioeconomic groups are more represented in polytechnic schools or in social and human sciences programs at university, seldom in their first vocational option (nearly 40%), as the entry system based on grades strongly regulates access to HE (Fonseca et al., 2014; Ferrão and Almeida, 2018; OECD, 2019). This socioeconomic differentiation in access persists in their academic trajectories in undergraduate programs, as students from low socioeconomic groups present higher academic failure and dropout rates.

In this article, the objectives, activities, and results of a pilot program are presented to advance a definitive version in the future. This effort is based on the awareness that supporting first-year students in their academic adaptation and success should happen through institutionally supported programs, avoiding short-time efforts, and preventing the end of assistance due to the departure of the responsible person, end of funding, changes in administration, or other motives (Tinto, 2012). A successful intervention program takes time and should respect the sociocultural characteristics of the institution and community in which it occurs, always with the main goal of addressing their real needs.

The HE withdrawal affects the individual, the educational institution, and the society at large (Duque, 2014; Casanova et al., 2018; Ferrão and Almeida, 2021). Vincent Tinto (1975) presented the first model of student attrition that is widely used in explaining the dropout phenomena, considering social and academic integration at university. His holistic approach points to teachers, academic staff, and peer relationships as relevant variables in the process of dropout decision-making. Research in this area evidences that student dropout can be related to personal characteristics (e.g., abilities, competencies, and motivations), family characteristics (e.g., first-generation students, sociocultural, and socioeconomic situation), academic background (e.g., previous achievement and vocational choices), and contextual characteristics (e.g., curriculum organization, size, and quality of institutions), among other (Häfner et al., 2015; Lindblom-Ylänne et al., 2017; Casanova et al., 2021b; Wangrow et al., 2022).

Often, students' levels of autonomy are not sufficient to face challenges and demands that characterize the HE context (Pascarella and Terenzini, 2005; Kuh et al., 2008). These levels of autonomy can be developed with some support, to address the responsibilities and self-determination of students in their academic activities. Teachers can promote students' self-determination, thus favoring their active learning behaviors (Ryan and Deci, 2000). This influence is evident through teachers' support in promoting their students' autonomy and in creating positive learning environments, e.g., helping students to overcome situations of anxiety or depression (Skinner et al., 2009; Lei et al., 2018). Teachers' support impacts students' academic emotions, increasing the positive emotions (e.g., enjoyment and hope) and decreasing the negative emotions (e.g., anxiety and anger), which may be decisive to ensure students' permanence and success during their first weeks in HE. In preventing academic failure and dropout, it is important to consider students' feelings of belonging to the institution and course, as well as good teacher-student interactions and positive peer relationships. Friendly relationships, including social, emotional, and appraisal support from teachers, allow students to increase academic engagement and to develop positive emotions, such as satisfaction, psychological wellbeing, and enjoyment with the academic experience (Respondek et al., 2017; Lei et al., 2018; Casanova et al., 2021a). These aspects should be considered in programs to promote students' competencies to ensure a positive transition and adaptation to HE.

Academic achievement stands out as a key factor in dropout prediction, namely, in the first-year students (Pascarella and Terenzini, 2005; Ayala and Manzano, 2018; Díaz-Mujica et al., 2019; Casanova et al., 2021a; Ferrão and Almeida, 2021). Thus, learning strategies and personal characteristics, such as expectations, self-efficacy, conscientiousness, or autonomous motivation, are included in the programs to promote students' academic success and retention (Kuh et al., 2008; Diniz et al., 2018; Girelli et al., 2018; Sobowale et al., 2018; Stajkovic et al., 2018).

The institutional implementation of a program that promotes success, engagement, and retention is quite challenging because of the diversity of students and their needs. The development of this type of program should be based on a deep knowledge of the students' characteristics and experiences (e.g., previous academic trajectories, motives to entering HE, sociocultural characteristics, motives for considering dropping out, and academic and social difficulties) and the resources available and the value assigned by students. Despite the relevance of initiatives, such as summer programs, workshops, and specialized services that institutions can offer, a broader and more democratic way to promote students' participation, success, and persistence is through initiatives in the classroom (Tinto, 2012). In this way, promoting adaptation and retention will reach those who do not have time beyond classes, nor the autonomy or agency to engage in other activities besides the mandatory ones (Tinto, 2012; Wangrow et al., 2022).

The recent pandemic situation resulted in a heightened awareness of the impact of dropout in students' and their family's living conditions, and its consequences for societal development. Coronavirus disease 2019 (COVID-19) had a relevant impact on teaching and learning activities and, therefore, on students' academic experiences and achievement (Schleicher, 2020; Sáiz-Manzanares et al., 2022). Many students perceived a decrease in the quality of their learning, namely, in what comes to

practical classes, lab, and practicum activities, regarded as critical for their professionalization, while others anticipated failing in the academic year (Hasan and Bao, 2020; Farnell et al., 2021). Students from less privileged families present more difficulties to face the severe limitations of lockdown, and fewer opportunities for remaining engaged and for investing in learning activities. Quality of internet connection and technological equipment or students' digital competencies differentiated learning experiences during the pandemic (Schleicher, 2020; Sáiz-Manzanares et al., 2022). In Portugal, the conditions to fully participate in remote teaching sessions affected mainly students from rural areas and from socially disadvantaged groups.

Coronavirus disease 2019 also impacts students' socioemotional adaptation and mental health, especially due to the uncertainty about the disease, about the national and local resources, and about personal and one's family's physical and mental health (Wang and Zhao, 2020; Farnell et al., 2021). This uncertainty fuels feelings of fear and uncontrollability of life, as the brutality of the pandemic has impacted all countries, including highly developed ones, directly affecting people who had never thought that they would be facing such hardships. It is important to recognize that a review of international research, prior to COVID-19, had already alerted to the high prevalence of symptoms of psychological distress in university students, with symptoms of anxiety in more than 40% and of depression in more than 25% (Cvetkovski et al., 2018). COVID-19 led to higher rates of consumption of psychoactive substances or psychopathologies, associated with experiences of loneliness, fear, and depression (Wang and Zhao, 2020; Charles et al., 2021; Schiff et al., 2021). The illness and death of family members, the closing of gyms and sports spaces and the consequent reduction in physical activity, less frequent and only remote relationships with friends, or the poor quality of equipment used to attend classes reduced the wellbeing of students (Maugeri et al., 2020).

The COVID-19 crisis has also led to an increase in academic difficulties. The universities have made a serious effort to implement alternatives to the absence of face-to-face teaching, to promote remote teaching and learning activities, as well as to ensure psychosocial support services. Considering the first-year students in mind, different responses are organized by institutions to facilitate their transition and adaptation. In general, institutions organize a reception day or week, providing information about institutional services and program organization and teaching activities, usually resorting to groups of students, teaching staff, and the program director. In a more targeted way, more specific measures are implemented, according to the type of incoming students and their educational or psychosocial needs. Study competencies and organization of curricular activities, programs for the development of interpersonal competencies, short or semester courses for leveling knowledge assumed as a requisite for key curricular units, activities for the development of the student's daily functional autonomy (e.g., funds and time management), or career counseling and career development sessions, among other activities, illustrate the diversity of preventive or promotional programs. Economic difficulties, loneliness or lack of social support, low self-efficacy in learning strategies, anxiety and depression, frustration of initial expectations, feelings of maladjustment, and psychological discomfort are often found in the first weeks at university (Araújo et al., 2016; Araújo, 2017; Díaz-Mujica et al., 2019; Sáiz-Manzanares et al., 2022). When experienced, such difficulties are either quickly and effectively overcome or tend to favor the behaviors of progressive disengagement from academic life, generating emotional exhaustion, failure in learning, and risk of dropping out.

This article describes the initial phase of a program developed to promote academic adaptation, learning achievement, and persistence in first-year students from Education degrees in a Portuguese public university during the pandemic crisis. Previous studies (ObservatoriUM, 2017, 2018) identified this group as displaying some adaptation risk because of their general profile, namely, low socioeconomic family status, family without a tradition of HE, leaving home to live near the university, not attending a degree of first vocational option, lower grade point average (GPA) in access, or nearly 20% of first-year dropouts. Considering these characteristics and the expected negative COVID-19 impact, a promotional program was developed to support first-year students from Education degrees in their academic adaptation and academic achievement.

MATERIALS AND METHODS

Participants

This study considers first-year students in two undergraduate programs in the scientific area of education, namely, Basic Education and Education (daytime and after-work). The annual reports produced by ObservatoriUM – Observatory of the Academic Paths of Students at the University of Minho (2017, 2018) suggest several academic vulnerabilities of students from Education programs. They are mostly students who benefit from a scholarship (awarded according to household income), and their parents' academic qualifications are low (parents with HE level never exceed 6% and mothers with HE do not usually exceed 20%). They are, therefore, mostly a group of first-generation students, with no family tradition of attending HE, which can foresee less preparation and resources to face the demands of this new education level. This sociocultural profile could account for the fact that, prior to the pandemic, nearly 20% of students in education courses drop out during their first year in HE.

One hundred and fifty students from the Basic Education and Education programs participated in the intervention sessions. There were two groups of students from Basic Education and three groups from Education (two groups of daytime students and one group of after-work students). Given the developmental and personal nature of the activities carried out in the sessions, we intentionally did not request microdata from students (e.g., age, gender, and socio-familiar descriptions) to ensure free and active participation in the activities.

Intervention Sessions

The intervention program to promote academic adaptation, academic achievement, and persistence was implemented in collaboration with the Pedagogical Council, a board that includes both teaching staff and students representatives. The first author,

a psychologist, and researcher in the area of HE dropout, held three intervention sessions for the five groups of students. Each session lasted approximately 1 h and took place in October and December 2020. **Table 1** presents the sessions' themes, aims, and information collected.

The first (face-to-face) session, entitled "Being a Higher Education student: the importance of a good start," introduced several activities to facilitate students' identification of challenges and opportunities for learning and wellbeing in HE. The second session (online), entitled "Being a Higher Education student in times of pandemic: academic achievement and success," addressed academic satisfaction, involvement in learning, and the relationship with colleagues and teachers during the first weeks in HE. The third session (also online), entitled "Being a Higher Education student: how it is going," analyzed academic experiences, such as classes and learning, first academic achievement results, satisfaction, and dropout intentions after the first exams.

Instruments and Digital Resources

Because of the increasing sanitary risk, there was only a face-to-face session. The remaining online sessions were held in *Wooclap*[1], a tool with several features for interactive and collaborative learning and compatible with the majority of digital resources used in HE. Each session started by asking students about difficulties in academic adaptation, peer relationships and support, and thoughts of leaving. Students answered to a screening instrument for students at-risk of dropping out from HE (Casanova et al., 2021c). It was composed of 12 items that were distributed by three scales, namely, (i) Satisfaction with education (4 items, e.g., I am satisfied with the education I am receiving at this university), (ii) Academic exhaustion (4 items, e.g., I feel exhausted due to my course activities), and (iii) Dropout intention (4 items, e.g., I am thinking of leaving HE). The first two scales were applied in all three sessions, being the scale of dropout intention only applied in the third session after students had received the results of the mid-term exams. The items were answered on a 5-point Likert-type agreement scale. The scales show adequate reliability coefficients, namely, Satisfaction with education ($\alpha = 0.81$), Academic exhaustion ($\alpha = 0.83$), and Dropout intention ($\alpha = 0.76$). Confirmatory factor analysis confirmed the differentiation of these three constructs, and structure measure invariance by gender was also ensured (Casanova et al., 2021c).

[1]www.wooclap.com

Procedures

This study was conducted in accordance with the Ethical Standards for Research with Humans and is part of a larger research project concerning dropout prevention in first-year university students, previously approved by the University Ethics Committee (CEICSH035/2019).

In the first session, being in the classroom ensured that students would be available to carry out the activities, since it was a period already destined for face-to-face academic tasks. Students were informed of the project, the three sessions, and their objectives, and gave free and informed written consent to participate in the project. Students were assured of the confidentiality of the data that they were not obliged to participate or continue with the study, and could leave the study whenever they chose.

At the beginning of the sessions, students connected with the *Wooclap* tool to participate, and their input was visible to everyone in the class. Initially, students answered a set of screening risk items about their satisfaction with education and academic experiences, as well as possible academic exhaustion. This was the starting point to naming, normalizing, and validating students' emotions and perceptions, both positive and negative ones. In a collaborative way, the researchers and students co-constructed these moments with some input about what the scientific literature and the institutional data from previous years state about this period at university. Practical activities were implemented, creating space for peer reflection and sharing in a relaxed and immediate way of communicating. The aim of this study was to promote self-awareness, autonomy competencies, and self-efficacy, as well as the exploration of alternative solutions for personal difficulties experienced. The acquisition of several problem-solving competencies was also developed. The sessions ended with an evaluation moment, when participants would point their satisfaction level with the contents, activities, and processes.

Data Analysis

Data were extracted from a Wooclap datasheet, exported, and analyzed using the IBM-SPSS Statistics version 28 for descriptive statistical analysis. Words mentioned by the students for characterizing the meaning of attending HE (co-construction of a word cloud) were analyzed in terms of frequencies, but also

TABLE 1 | Sessions, aims, and information collected.

Session	Aims	Information collected and analyzed
"Being a Higher Education student: the importance of a good start"	To facilitate students' identification of challenges and opportunities for learning and wellbeing	Academic challenges Threats to wellbeing Opportunities to enhance learning
"Being a Higher Education student in times of pandemic: academic achievement and success"	To address academic satisfaction, involvement in learning and in the relationship with colleagues and teachers	Well-managed personal and academic situations and tasks Challenging situations and tasks Strategies to manage uncertainty
"Being a Higher Education student: how it is going"	To analyze academic experiences like classes and learning, first results on academic achievement, satisfaction or dropout intentions	Threats to academic performance and achievement and wellbeing Thoughts about leaving Strategies to manage uncertainty and promote persistence

in a more qualitative approach, namely, by themes and meaning, both positive and negative meanings, as well as feelings.

RESULTS

In the first session ("Being a Higher Education student: the importance of a good start"), students described their experiences in the transition to HE. Their words and their frequency, synthesized in a word cloud, illustrate the challenges and demands felt, as well as the mobilization of resources to overcome possible difficulties in their transition and adaptation. In the word cloud, the size of the words increases depending on the number of times they are mentioned. Overall, students used 396 terms to describe the meaning that they give to being an HE student.

A mixed combination of feelings can be identified in a negative (e.g., confused and stressful) or positive sense (e.g., dream and enthusiasm). Considering the words provided by all the students, and the fact that the size of the words increases depending on the number of times they are mentioned, the words that stand out were challenging (n = 55), responsibility (n = 33), stressful (n = 19), change (n = 15), and difference (n = 14). There are a lot of words and expressions that denote a positive sense, particularly related to new challenges and opportunities, e.g., challenging, responsibility, growth, or adventure. The negative expressions and words are fewer and similar in all five groups, which means they all are experiencing the same difficulties. In this sense, the words and ideas more mentioned were pride, achievement, dream (n = 20), autonomy (n = 18), devotion and effort (n = 14), maturity and growth (n = 13), and adventure (n = 8). When discussing these results with them, students link these words to the fact that they are newcomers to HE, all is new, and they still need to explore how to manage several aspects related to their academic and personal life. Students also mentioned the uncertainty caused by pandemic (e.g., whether it was safe to go to classes and whether there would be more lockdowns) as an important factor that contributes to their experience of stress and perception of threats. **Figure 1** presents the word cloud of one of the five groups to illustrate the activity.

In the second session, "Being a Higher Education student in times of pandemic: academic achievement and success," students used the *Wooclap* tool to anonymously share their experiences with the group in real-time. Each group built a "Mural of Experiences," reflecting on "What has been going well" and "What a challenge still is." Positive experiences and challenges are presented in **Table 2**. Each student could choose what category to report, both, or none. Their ideas were a starting point to reflect within the group, encouraging students to explore and increase their awareness of academic experiences. The session dynamics promoted sharing personal experiences and strategies to face challenges and identifying good opportunities for supporting and being supported by their peers.

In terms of what was going well, adaptation and integration (n = 19) and positive interaction between peers and new friendships (n = 11) stand out. In spite of the adverse pandemic situation, students manage to successfully adapt to HE, build positive relationships with both teachers and colleagues, and find relevance in and adjust to academic work. What students find most hard is to organize themselves to successfully complete tasks (n = 27) and keep track of the learning pace and the study up to date (n = 6). They also find it quite difficult to concentrate on online classes (n = 8), which adds to the perceived sense of tiredness, stress, and anxiety (n = 5).

TABLE 2 | Perceived successes and challenges by the five groups of students.

	No. of times mentioned
What has been going well?	
Adaptation and integration	19
Positive interaction between peers and new friendships	11
Personal interest and motivation for the semester and good results	8
Monitoring the subjects, carrying out group work and preparing for exams/tests	7
Positive interaction between teachers and students	6
Classes work out well in classes, interesting classes	4
Personal organization	2
What is still a challenge?	
Time management and task organization	27
Concentration on online classes	8
Fast pace of learning, keeping the study up to date	6
Tiredness, stress, and anxiety due to group work	5
Meet deadlines	2
Oral presentations at face-to-face classes	4
Adaptation and integration in the class	4
Managing group work and studying for tests	3
Have personal time	1
Total	117

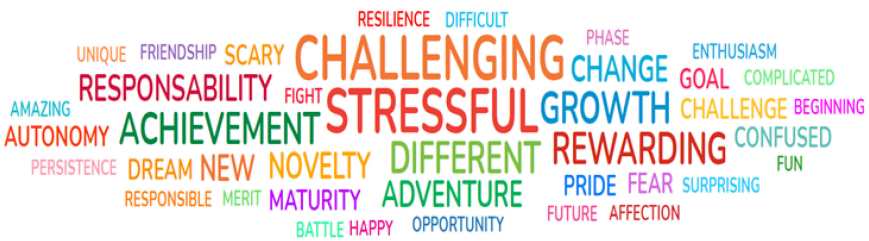

FIGURE 1 | Example of word cloud co-constructed in one of the students' groups.

Regarding the assessment of dropout risk for this group, **Table 3** presents the scores of means and standard deviations in each item and total per scale, namely, Satisfaction with education, Academic exhaustion, and Dropout intentions. The screening instrument was applied at the beginning of the three sessions, but the dropout intentions scale was only applied in the third session as stated before.

Considering 2.5 as the intermediate level of a 5-point Likert-type format scale, most students report feeling satisfied with the educational experience at the university. It is also worthwhile noticing stability of values per item and in total during the first semester (in the three sessions). The levels of emotional exhaustion due to academic activities are less than or close to 2.5. In the third session, it seems to occur a drop in the exhaustion levels. As expected, dropout intentions on the first semester present low levels, above 2.0 in the 5-point Likert-type scale. Considering the profile of these students in previous academic years, as many are not in a first-option grade course, the higher mean on the item "I am thinking of changing course" is predictable.

The students' evaluation of the sessions, carried out at the end of each session, was very positive. Students were asked to position themselves regarding the content covered, the activities performed, and the duration of the session, using a five-point Likert-type scale of 1 (not suitable) to 5 (very suitable). **Table 4** presents descriptive results concerning these three aspects of the sessions.

The overall evaluation of the sessions, considering the content covered, the activities carried out, and the duration of the sessions, was quite positive, with the average student evaluation score always above 4. The first session received a more positive evaluation, which may reflect some initial enthusiasm or higher expectations with interpersonal meetings in pandemic times.

TABLE 4 | Students' evaluation of the three sessions.

	1st session		2nd session		3rd session	
	M	*DP*	*M*	*DP*	*M*	*DP*
Contents	4.70	0.56	4.59	0.53	4.61	0.54
Activities	4.63	0.69	4.50	0.54	4.54	0.52
Duration	4.45	0.69	4.36	0.72	4.34	0.68

When asked about their interest in participating in similar sessions in the following academic year, most students express interest (81%).

DISCUSSION

With the increasing expansion and democratization of HE, more students from traditionally excluded sociocultural and socioeconomic groups arrive in HE. However, democratizing access does not equate democratizing academic success, as these students present several difficulties when they have to face HE challenges (Adabaş and Kaygin, 2016; Casanova et al., 2018; Tight, 2019). This study illustrates more problems in academic adaptation and higher academic failure and dropout rates in low sociocultural subgroups (Díaz-Mujica et al., 2019; Casanova et al., 2021b). The problem is accentuated when these students are also not in a program and/or in an institution of first vocational option, due to a *numerus clausus* system on access (Fonseca et al., 2014; Ferrão and Almeida, 2018). This situation is more frequent in human and social sciences, including Education programs. This can be explained by fewer opportunities for employment, but also by students often coming from less favored sociocultural backgrounds.

TABLE 3 | Results of the dropout risk screening instrument.

	1st session		2nd session		3rd session	
	M	*SD*	*M*	*SD*	*M*	*SD*
Satisfaction with education						
I am satisfied attending this university.	4.55	0.64	4.53	0.62	4.51	0.77
I am satisfied with the education I receive from this university.	4.10	0.77	4.27	0.61	4.15	0.78
My family is pleased with the education I am receiving at this university.	4.34	0.77	4.40	0.67	4.30	0.78
I would recommend this university to a close friend.	4.61	0.61	4.47	0.60	4.54	0.77
Total (4 items)	17.60	2.17	17.67	2.11	17.50	2.81
Academic exhaustion						
I am emotionally exhausted studying this course.	2.71	1.03	2.70	1.08	2.46	1.05
Studying or attending class is stressful for me.	2.68	1.12	2.62	1.11	2.64	1.04
I feel exhausted due to course activities.	2.50	.83	2.53	.87	2.35	1.02
I feel stressed every morning about going to university for another day.	1.94	1.04	2.05	1.11	1.93	1.00
Total (4 items)	9.82	3.19	9.90	3.36	9.38	3.35
Dropout intentions						
I am thinking of changing course.	-		-		1.60	1.17
I have already spoken with friends and/or family about leaving higher education.	-		-		1.36	0.89
I feel insecure / indecisive about continuing to study.	-		-		1.41	0.89
I am thinking in the possibility of dropping out of higher education.	-		-		1.29	0.77
Total (4 items)	-		-		5.66	2.84

Our study corroborates the evidence that difficulties increase with the negative impact of COVID-19 on students' academic experiences, achievement, and wellbeing (Hasan and Bao, 2020; Schleicher, 2020; Wang and Zhao, 2020; Farnell et al., 2021). Loneliness, fear, and depressive experiences have increased during the pandemic crisis (Wang and Zhao, 2020; Charles et al., 2021; Schiff et al., 2021). Students from less privileged families, namely, students in Education programs (ObservatoriUM, 2017, 2018), present more difficulties, which justifies paying more attention to their adjustment process to HE. A pilot version of a program to support academic adaptation of first-year students was implemented in the academic year of 2020/2021, and successive changes and improvements have been introduced for a final version. Three sessions were implemented in the first semester, creating opportunities for exploring and sharing cognitions, emotions, and experiences among students, to prevent feelings of maladjustment and psychological discomfort often found in the first weeks at the university.

Results of the program suggest that in the initial weeks, students describe their academic experiences in terms of challenges and demands felt, presenting negative and positive sentences to explore those experiences, which is in accord with previous research (Pascarella and Terenzini, 2005; Kuh et al., 2008). In addition, notwithstanding the difficulties, most students are excited and enter HE with enthusiasm, positive expectations, and a desire to be successful in learning activities and social interactions (Kuh et al., 2008; Diniz et al., 2018; Casanova et al., 2021a; Wangrow et al., 2022). These positive feelings and expectations explain the majority of optimistic words and sentences students use in the first session of the program, oriented to explore the initial academic experiences related to the transition to university. The homogeneity in the discourse that expresses negative feelings may be an indicator that most students present the same difficulties when facing the demands and challenges of being in HE. This strong similarity in students' feelings and thoughts may be related to common academic and sociocultural backgrounds. The majority of students on Education under graduation programs come from families with low socio-educational-economic backgrounds, are seldom in courses of first vocational option, and present a low GPA (classifications from secondary schools and access exams).

Some weeks later, a large number of students feel well, have positive interactions with colleagues and teachers, and perceive good learning strategies and high achievement. However, some students present difficulties in task organization, procrastination, presentation of work in face-to-face classes, or problems of concentration on online classes, in addition to tiredness, stress, and anxiety due to academic activities and group work. These difficulties are quite frequent in research concerning students' adaptation to university (Häfner et al., 2015; Lindblom-Ylänne et al., 2017). It is not uncommon for students to perceive significant differences in teaching in secondary school and at the university. Without textbooks for curricular units and without parents' supervision, students must develop more autonomy and self-regulation on learning and on daily activities.

Satisfaction with the university and the education program is higher and more stable during the first semester. Inversely, the levels of emotional exhaustion are lower, and in our study, there is a decrease when we compared the initial weeks and the end of the semester. This decrease may be interpreted as progressive students' adjustment to academic challenges. Combining the high levels of satisfaction with low levels of emotional exhaustion at the end of semester strongly reduces dropout intentions. This result may be an impact of program sessions where students can express their academic difficulties and share alternatives to solve them, provided they register a high level of satisfaction with the contents, activities, and duration of the three sessions of the program implemented. For example, the construction of the word cloud facilitated access to students' perspectives in real-time, promoting the debate about personal and academic expectations, tolerance, and peer support. Sharing their thoughts in a group, under the safety of anonymity, allows the normalizing of feelings and thoughts.

Some limitations can be presented. First, the program is still in its initial or pilot phase of construction, and it is expected that in the next 2 years, it will take on a more definitive version of activities, contents, and intervention strategies, always focusing on the difficulties of adaptation and academic needs of first-year students. The information collected and the initial evaluation of the three sessions highlight the need for increasing the number of sessions. The intervention can be extended to the second semester, e.g., taking into consideration the students' academic achievement at the end of the first semester. Another limitation is the non-inclusion in this pilot phase of a more controlled assessment design, eventually comparing groups of students who do or do not attend the sessions. Finally, this intervention program will have to be more thoroughly grounded in intervention models and procedures, namely, clarifying its objectives and choosing the activities and strategies that prove to be more effective.

CONCLUSION

Students' transition and adaptation to HE are the phenomena that have been increasingly studied to reduce the attrition and the risk of failure, dropout, or mental health problems. These concerns were suddenly worsened with the pandemic restrictions. Several lockdowns and the return to campus were lived with strong feelings of fear, uncertainty, and loss of sense of normality in students' daily lives. In this sense, HE institutions were required to implement actions to support students in this period, recognizing the necessity of quickly assessing and responding to students' needs.

This article presents a support program for students enrolled in two Education courses at a public university in northern Portugal during the first semester of 2020/2021. It was implemented with the aim of promoting academic

success and preventing dropout in the first year. Three sessions were developed, focusing on demands, challenges, and difficulties of the transition, difficulties of the academic adaptation and academic performance, and monitoring the dropout risk.

The main results point to student satisfaction with the content, the activities, and duration of the sessions. Students report not only high satisfaction levels with HE attendance, but also some emotional exhaustion due to the academic activities. In view of these results, some measures can be advanced. For example, considering the low socio-cultural background of these students, it seems important to offer them the opportunity to attend activities of a cultural nature, in articulation with teaching, to expand their experiences of cultural growth that will also enhance their wellbeing. Another important measure is ensuring that these students have access to the required technological and didactical resources and develop digital competencies. The pandemic heightened the socioeconomic difficulties of already struggling families seeking to keep their offspring in HE. An important role for the Pedagogical Council and for the presidency of the Institute of Education has been to support students in this area, namely, by lending technological equipment. In addition, given the fact that some students present difficulties in task organization and time management, it would be important to offer training in soft skills, such as learning to manage time and learning to study, in tandem with training in digital skills. Finally, the course coordination should promote the articulation of the learning and assessment tasks that are proposed to the students so that there is no work overload. The continuity of the program is currently being promoted, with some improvements in its planning to ensure a more definitive version of the program in coming years.

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.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Minho Ethics Committee (Ref. BI042754054). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JC, AG, MM, and LA participated in study conceptualizing, data analysis, and article writing, editing, and revision. JC implemented the program sessions and data collection. All authors contributed to the article and approved the submitted version.

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