

World teachers' day

Edited by

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World teachers' day

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Editorial: World Teachers' Day

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Editorial on the Research Topic World Teachers' Day

In the call for this Research Topic celebrating *World Teachers' Day*, we sought to “advance an understanding of and appreciation for the important and complex work teachers do, who teachers are, and the ways in which they advance education and democracy across the globe” (Edge and Haniford, 2021). World Teachers' Day is an annual event commemorating the 1966 Recommendation on the Status of Teachers. This landmark document outlines what societies should do to advance the profession of teaching in order to educate citizens able to participate fully in democratic life. One of the guiding principles organizing the document states:

Teaching should be regarded as a profession: it is a form of public service which requires of teachers expert knowledge and specialized skills, acquired and maintained through rigorous and continuing study; it calls also for a sense of personal and corporate responsibility for the education and welfare of the pupils in their charge. (UNESCO, 1966, p. 4)

Stemming from the full set of guiding principles are a host of recommendations. Section VIII is entitled, “The rights and responsibilities of teachers” and the first right listed is “professional freedom.” Per these recommendations, professional freedom includes:

The teaching profession should enjoy academic freedom in the discharge of professional duties. Since teachers are particularly qualified to judge the teaching aids and methods most suitable for their pupils, they should be given the essential role in the choice and the adaptation of teaching material, the selection of textbooks and the application of teaching methods, within the framework of approved programmes, and with the assistance of the educational authorities.

We highlight these elements of the Recommendation because 57 years since the Unesco document was written, teachers and teaching are again under attack, with the most troubling attacks happening to their professional freedom. (p. 8)

This Research Topic includes nine research papers based on original research addressing the complex work of teaching, teacher identity, and the continuing work of advancing education and democracy around the world.

The first paper, “*In enhancing preservice teachers' assessment literacy: focus on knowledge base, conceptions of assessment, and teacher learning*,” Atjonen et al. describe multiple levels and facets of assessment literacy in Finland, highlighting one small slice

of the complex knowledge teachers must be able to put into practice in a classroom setting. In “*Understanding identity development as a science teacher educator through shifts in pedagogical equilibrium*,” Mansfield et al. use the frame of pedagogical equilibrium to explore teacher educator identity and knowledge development through self-study methodology at an Australian, research-intensive university, calling attention to the relationship between teaching practice and identity formation. The context of science teacher education highlights epistemological tensions between teaching and learning as simple, factual, and certain vs. those which acknowledge the problematic and complex nature of teaching and learning in environments of uncertainty. Also in the context of Australian teacher education, Cooper and Marangio take up the complexities of learning to teach and the number of people it takes to do it well in their study “*Views across the boundary: school-based Co-teachers experiences with co-teaching in initial teacher education*.” Cooper and Marangio highlight the transformative nature of dialogue between university-based and school-based science teachers as a mechanism for creating new knowledge and identities within and beyond particular sites of practice.

Through multiple case studies of student teaching in Thailand, Prabjandee illustrates the differences between transmission-oriented and constructivist-oriented mentoring approaches on student-teacher identity in “*Inconvenient truth? How different mentoring approaches impact student-teacher identity development*.” Feng et al., in their study, “*The structure and evaluation of educational research skills and accomplishments among rural teachers: data from China*,” explore the structure of rural teachers’ engagement in action research carried out in the context of their teaching practice in the Hynan Province.

From their survey of 304 teachers in Indonesia, findings in “*The mediating role of meaning at work in promoting teacher commitment and reducing burnout*,” Suyatno et al. take up what can happen when teachers are not supported and the importance of considering the entire schooling context. When leaders don’t take seriously the requirements of teaching and the impact professional circumstances can have on teachers, they risk negative consequences on teacher wellbeing and on student learning. Set in Germany, Dreer research report, “*Witnessing wellbeing in action: observing teacher wellbeing during field experiences predicts student teacher wellbeing*” emphasizes the importance of the wellbeing of in-service teachers on the wellbeing of student teachers.

In their study, “*Will I be molded or crushed? Artistic representations of student teachers’ identities and emotions*,” Kennedy and Glaese utilize arts-based educational research methods to explore the complexity of teacher identity at two United States universities. Kennedy and Glaese help make more visible the often invisible emotional work of learning to teach by reporting findings from teacher candidates’ reflections from

anonymously creating and interpreting art about their student teaching experiences in school settings. Given the shortage of teachers worldwide, the importance of supporting the complex work of learning to teach is critical. Dori et al., in “*Assessing and comparing alternative certification programs: the teacher-classroom-community model*,” investigate the integration of graduates from five Alternative Certification Programs in Israel.

Collectively, articles in this Research Topic illuminate the dynamic nature of teacher learning and identity through theoretical underpinnings which acknowledge identity as narratively constructed and reconstructed, often unconsciously influenced by the contexts in which teacher candidates learn and teach (Edge, 2023). Research findings also highlight the non-linear nature of teacher learning and identity as well as the influence of context on a teachers’ perception of their credibility. As editors from the United States, where attacks on teachers, books, and curricula are especially fierce, we see the events in the U.S. right now as marking a particularly troubling forecast for teachers, education, and democracy. Articles in this World Teachers Day topic take up the 1966 ILO/UNESCO Recommendation Concerning the Status of Teachers, document the complexity of being and becoming a teacher, and call for the continuing work of advancing education and democracy around the world.

Author contributions

LH: Writing—original draft, Writing—review and editing. CE: Writing—original draft, Writing—review and editing. All authors contributed to the article and approved the submitted version.

Conflict of interest

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Understanding Identity Development as a Science Teacher Educator Through Shifts in Pedagogical Equilibrium

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This article reports research investigating the identity development of a science teacher educator (STE) (Author 1) through the lens of pedagogical equilibrium. Despite previous experience as a secondary science teacher and STE, Jennifer found herself questioning her feelings of legitimacy and relevance when teaching pre-service primary science teachers. Identifying moments of disturbance in her pedagogical equilibrium, and working with a critical friend to analyze her ideas and experiences, she began to develop her professional self-understanding, contributing to improved feelings of credibility, and professional identity development. Emerging from this study, Jennifer experienced two important shifts in her perspective and understanding of her role. The first shift concerned recognizing the different sources that comprised her “authority of experience” as a STE, while the second shift involved learning to see pre-service teachers in her classes as future teachers, rather than students. These shifts in perspective were facilitated through applying self-study as the research methodology. The study provides insights into the identity formation processes of an early career teacher educator, as well as the value of pedagogical equilibrium and self-study for exploring teacher educator identity.

Keywords: science teacher educator, pedagogical equilibrium, teacher educator identity, self-study, critical friendship

INTRODUCTION

This study explores the identity development of Jennifer (Author 1), a science teacher educator (STE). In her sixth year as a tenured academic working in a large research-intensive university, Jennifer found herself questioning her feelings of credibility in her role, especially when working with pre-service primary teachers, as her formal qualification and classroom teaching experience was in secondary science education. The need to be perceived as credible by one's students is an experience that other teacher educators share (see for example, Dinkelman et al., 2006; Simpson, 2019; Cross Francis et al., 2022). These feelings

can be heightened when teacher educators lack experience in the theory or practice of the courses they are required to teach (Santau, 2012; Logan and Butler, 2013). Exploring situations where credibility is felt to be threatened offers potential insight into teacher educators' professional identity development. Learning to recognize and manage one's own and others' expectations of the role is central to the process of constructing a professional identity as a teacher educator, because there is a close connection between identity and practice (Davey, 2013; Izadinia, 2014).

Pedagogical equilibrium (Mansfield, 2019) refers to the notion that teachers (at all levels) regularly encounter dilemmas in their classroom practice which can lead to feelings of destabilization and pedagogical discontentment (Southerland et al., 2011). Pedagogical equilibrium becomes noticeable when a dilemma arises and unsettles existing routine practice; therefore, it challenges the existing state of equilibrium. Pedagogical equilibrium offers a frame for identifying and articulating these situations and how they play out in teacher educators' professional identity development. The study reported in this article focuses on Jennifer's attempts at identifying, analyzing and addressing challenges to her pedagogical equilibrium in terms of her identity and role as a science teacher educator (STE).

Over the course of three semesters, Jennifer met regularly with a critical friend, Meredith (Author 2) who is also a STE, and together they worked on identifying instances and uncovering possible reasons for the challenges to Jennifer's pedagogical equilibrium. Two main concerns preoccupied Jennifer's feelings of legitimacy and credibility as she began this study; how long it had been since she taught in a secondary science classroom and the fact that she was not qualified in, nor had she ever taught, primary level science. As a STE who had not taught in a primary classroom, how could she be considered credible for preparing primary pre-service teachers?

LITERATURE REVIEW

The literature framing this study consists of two sections: research on STEs and their development, and teacher educator professional identity.

Science Teacher Educators

One of the challenges that is particular to science education, and by implication for STEs, is that the disciplines of science are often seen as a quest for 'right answers' typically promulgated through the way in which science is taught and experienced in school. This means that pre-service science teachers are often expecting to be provided with 'right answers' not only about what science to teach, but how to teach it. However, as Bullock (2012, p. 1) stated, "[s]cience teaching and science teacher education are complex endeavors that require far more than. . . technical rationality." The education of pre-service science teachers therefore, often involves shifting their prior expectations about science as applying a correct, prescriptive method, to learning to teach science as a complex task of sense-making through argumentation. As Russell (2012, p. 194) points out, this is what makes "the shift from

student and teacher of science to educator of science teachers . . . particularly complex and difficult." STEs typically experience forms of discomfort or unease as they come to recognize and learn to manage: (a) the complexities of a situation in which their students expect to be told how to teach, (b) their own expectations of being viewed as competent in the eyes of their students, and (c) understanding there is no formula for how to teach science.

Professional Identity of Teacher Educators

In general, a person's identity is understood to form from the self-perceptions that a person has of their own role performance in particular groups or contexts (Stets and Burke, 2000). Zembylas (2003 p. 221) reminds us that identity formation is a "non-linear, unstable process. . . by which an individual confirms or problematizes who she/he is/becomes." The perception that one is satisfactorily fulfilling a role heightens feelings of self-esteem and self-worth, whereas perceptions of poor performance raises doubts about one's self-worth and can cause distress (Stryker and Serpe, 1982; Hoelter, 1986). Burke and Stets (1999) suggest that identity activation includes self-verification, where individuals look to the responses of others to confirm their own self views.

Izadinia (2014) conducted a literature review focusing on teacher educators' professional identity, in particular the tensions they experience during their induction into the role and the impact of these tensions on the formation of their professional identities. She classified the tensions into two types: external challenges (e.g., organizational knowledge, research skills, making professional connections) and internal tensions (e.g., feeling uncertain, deskilled, having self-doubts, failure in establishing academic credibility). According to Izadinia (2014), teacher educator identity formation is "slowed down" through negative self-views about one's confidence and competence to fulfill the requirements of the role. Other factors which limit teacher educator identity development are negative self-views about vulnerability, being disempowered, marginalized or de-skilled (Murray and Male, 2005; Field, 2012).

Dinkelman studied his own teacher educator formation and described it as an active process that occurs "in context, in practice and over time" (2011, p. 314). From this study, he described teacher educator identities as complex. He noted that similar to other forms of identity,

Teacher educator identities reflect an unstable and ever-shifting weave of personal and professional phenomena. They are both claimed by teacher educators and given to them via the roles and institutions that frame the profession (Dinkelman, 2011, p. 309).

Self-studies, such as the one reported here, offer insight into the challenges experienced by teacher educators when establishing their identities and defining their roles. As Dinkelman (2011) suggests, the context in which teacher educators work matters and is highly influential on their identity formation. Therefore, reporting self-studies, like this one, enables greater understanding of the challenges and tensions experienced by teacher educators within specific contexts. When shared, these studies are valuable

for supporting the professional development of others and contributing to the scholarship of teacher education.

THEORETICAL FRAMEWORK

Pedagogical Equilibrium

This study employs the theoretical frame of Pedagogical Equilibrium (Mansfield, 2019) as a means to uncover and articulate aspects of Jennifer's (Author 1) developing identity as a STE. The notion of pedagogical equilibrium builds on Southerland et al.'s (2011) theory of pedagogical discontentment and Piaget's (1959) theory of cognitive disequilibrium, to describe what happens to teachers when they encounter pedagogical situations which lead them to stop and think. When a teacher's actions for teaching do not align with their intentions, they can feel a sense of unease or unrest (Southerland et al., 2011). The construct of pedagogical equilibrium expands on this premise, and recognizes that not all moments which demand a teacher's attention are negative or engender feelings of discontent. The process need not be described through value labels such as negative or positive, but can be considered as a catalyst for recognizing the limits of one's routine knowledge and skills. In this paper, routine knowledge refers to smoothness of practice through the use of well-practiced routines and the mastery of procedures that enables high levels of efficiency and accuracy (Hatano and Inagaki, 1986).

Challenges to pedagogical equilibrium can be framed by identifying situations that highlight a teacher's inability "to enact their goals and intentions for teaching, or when they are surprised by the way they have implemented a lesson above and beyond what they had expected" (Mansfield, 2019, p. 191). These situations occur when routine knowledge is unable to help the teacher make sense of, and manage, a new situation which arises in their teaching. Such situations challenge routine knowledge, demanding the teacher's attention through feelings of unrest, curiosity, uncertainty and perplexity.

Teachers can respond to challenges to equilibrium in various ways; on one hand, by seeing the feelings as inconvenient and choosing to ignore or not to respond, and on the other hand, a teacher can actively listen to these feelings, critically analyze the situation and generate a plan for action to actively seek a way to return to a steady state. The process of action can be described as the search for pedagogical equilibrium (Mansfield, 2019). To find a steady state or state of balance, requires the teacher to invest additional thinking about the situation and engage with alternative actions.

A challenge to pedagogical equilibrium signals an opportunity for learning. When challenges to equilibrium are recognized as an opportunity to examine beyond the boundaries of routine knowledge, the moment offers teachers a chance to engage with real and relevant professional learning, thus offering insight into a teacher's self-knowledge and self-understanding. Similar to cognitive dissonance theory (Festinger, 1957), the search for equilibrium may provoke meaning making, facilitating transformative learning. However, for such learning to occur the teacher must be willing to, (a) see their practice as problematic;

and (b) perceive the situation as a transformative learning opportunity, and (c) be willing to manage feelings of uncertainty and discomfort as they develop new insights through the process of critical interrogation of their practice.

In this study, pedagogical equilibrium was utilized both as a tool for noticing Jennifer's practice, to identify situations which gave rise to feelings of unrest, surprise or uncertainty, and as a language for discussing and analyzing practice with her critical friend.

AIM OF THIS STUDY

The motivation for this self-study was for Jennifer to critically reflect, in collaboration with a critical friend, on her developing identity as a STE of pre-service primary teachers. Through participation in this critical friendship, Jennifer aimed to better understand how she was positioning herself, that is, what she valued and saw as important for her pre-service teachers to experience in her class as she prepared them to teach science to young children. From this process she aimed to better understand and develop her practice, and in so doing, alleviate feelings of doubt about her legitimacy and credibility as a primary STE.

Challenges to pedagogical equilibrium (Mansfield, 2019) was used as a guiding theme to journal about unrestful situations which were relevant to Jennifer's context and stage of professional development. Through a continuous cycle of data collection, analysis, planning, testing and reflecting, Jennifer was able to expose elements of her views on, and assumptions about teaching and learning that may be contributing to her sense of legitimacy and put into action some strategies to manage her unrestful feelings. Critical friend conversations between Jennifer and Meredith (Author 2) became an essential aspect of this process for surfacing Jennifer's views and challenging her assumptions. Considering the framing of this study and the iterative and collaborative process of reflection with the critical friendship, the following questions guided this study:

- What are the major sources of challenge to Jennifer's pedagogical equilibrium as she learned to position herself as a primary STE?
- What are the implications of recognizing these challenges on Jennifer's developing identity, and as a consequence her teaching practices, as a STE?

MATERIALS AND METHODS

This research employed self-study methodology (Bullock, 2009; Bullock and Ritter, 2011) to examine the evolution of Jennifer's identity development when teaching about teaching science to pre-service primary teachers. Self-study involves "intentional and systematic inquiry" (Dinkelman, 2003, p. 8) into one's own teaching practice, "to develop [one's] basis for knowing about teaching teachers" (Bullock, 2009, p. 291). Samaras (2002) proposes that self-study researchers examine their practice critically to develop consciously driven modes of pedagogical activity. Through raising practice from habit or routine into

conscious awareness, self-study researchers can begin to make explicit and question their tacit knowledge of practice. Through the study of their practice, self-study researchers seek not only to improve their own practice but also “to make explicit and validate their professional expertise with the explicit intent of advancing the public knowledge base of teacher education” (Vanassche and Kelchtermans, 2015, p. 509). In this way self-study is a form of personal critical reflection that is made public.

Role of Critical Friendships in Self-Study

The inclusion of a critical friend in self-study research is something that has gained traction over the past 10 years, as many researchers have viewed it as an important step for ensuring trustworthiness in the data (Stolle and Frambaugh-Kritzer, 2022). Despite an increase in the use of critical friendships in the design of self-study, little attention tends to be given to explaining the actual role of critical friendships in the design of the study with respect to supporting the participants’ professional growth (Stump and Gannon, 2022). However, if researchers are to rely on critical friendships as a critical part of self-study, and we agree they should, then it is important for researchers to clearly note how a critical friendship is employed within the framing of self-study, so that it can be understood as a source of data and/or means of analysis in addressing the aim of the study (Stolle and Frambaugh-Kritzer, 2022).

For the purpose of our study, we draw on the critical friend definition continuum that Stolle and Frambaugh-Kritzer (2022) first introduced in 2018 and recently elaborated on with further analysis of additional self-studies from 2018 to 2020. Specifically, the dichotomy of terms close friend/stranger; insider/outsider; fully involved/loosely involved; and reciprocal in nature/one way, pertain to our application of a critical friendship. With respect to friend vs. stranger, Jennifer and Meredith first met at the Castle¹ Conference 2018 and quickly became friends, but in the definition continuum of these two terms, they would be classified as being strangers entering the work of self-study. This perhaps limited some of the vulnerability Jennifer felt in sharing her experiences with Meredith early in the study, but over time, as Meredith shared instances of not feeling credible in her position as a teacher educator, it opened the door for Jennifer to share more, and the friendship started to move along the continuum of this dichotomy toward “close friend.”

The questions being explored in this study focus on Jennifer’s understanding of and attempts to address challenges she felt existed because of a lack of credibility she believed she had in teaching primary preservice teachers. As a former primary teacher herself, and a teacher educator who mainly prepares primary teachers, Meredith served more as an “outsider” to the study, as it was the basis of her knowledge and expertise that provided Jennifer with an opportunity to bounce around ideas and seek some feedback from a knowledgeable other, before implementing with her primary pre-service teachers.

With respect to the “level of involvement” dichotomy, Meredith was fully involved in supporting Jennifer with studying her teaching. Due to distance (opposite hemispheres) Jennifer and Meredith connected through video conference and kept an interactive journal, which each contributed to by responding to each other’s thoughts and questions. From these conversations, Jennifer often made pedagogical decisions about how to approach challenges with her students.

Although the critical friendship began more with a focus on understanding Jennifer’s issues with credibility, and thus suggesting a one-way friendship, Meredith realized by the end that her extensive involvement in Jennifer’s process of seeking pedagogical equilibrium resulted in more of a reciprocal relationship. As such, the critical friendship used in this study illustrates the dynamic nature of this component of self-study work and researchers should be encouraged to let their roles in the friendship evolve as the study requires.

The critical friendship employed in this study purposefully stimulated challenges to Jennifer’s pedagogical equilibrium by drawing attention to any taken for granted assumptions. This enabled problem setting and, in some cases, planning of actions which she could initiate to address the situation. Testing of the actions included assessment of perceived impact on student learning and engagement, which were considered in subsequent critical friend conversations.

Context and Data Sources

To bring the narrative to life, from this point onward, the text will be written in first person, from the perspective of the 1st author, Jennifer.

Although I had a background in science and secondary science education both as a teacher and as an academic, I had not taught young children and I had limited knowledge of young children’s science learning and development. I was conscious of this lack of experience as I noticed that many of the pre-service teachers in my primary science methods class had little background in science and/or were fearful of their own perceived science content inadequacies. I felt unsure of how to respond when these pre-service teachers asked about how to translate ideas from university-based workshops into practice in the primary classroom. These instances created pressure on me to tell the pre-service primary teachers what to teach and how to teach it. This, in turn, prompted me to grapple with my feelings of adequacy as their STE.

At the time of the study, I had been teaching for 6 years in a university setting; including 3 years as a sessional academic before becoming tenured as a STE. The study took place over two teaching semesters [Semester 1 (S1): July–November 2018 and Semester 2 (S2): March–June 2019]. Data collection and analysis consisted of two levels. Level 1 data collection related to the immediacy of teaching and Level 2 involved reviewing and analyzing this data with a critical friend, Meredith (Author 2).

Level 1 data consisted of 4 different types that I produced alone (emboldened terms are used to identify data sets in the results):

- **Pre-semester journaling of 1–2 pages (approx. 500–1,000 words) (x3 semesters) using a free-write approach.** This

¹The Castle conference is a bi-yearly professional gathering of self-study researchers sharing about their research and pedagogy toward self-reflection, understanding, and improvement of teacher educator pedagogy. The reference to a castle in the name of the conference is because it is held at a castle in England.

data source captured my aims and philosophy for teaching in the primary units, along with what I was hoping to achieve and why. I also included my concerns and apprehensions about teaching (i.e., what was challenging my sense of pedagogical equilibrium) and things I was going to be doing differently because of previous experiences (**Pre-SJ**).

- Weekly pre- and post-teaching reflections (250–500 words) during the semester (S1 \times 6 weeks; S2 \times 7 weeks) for the primary science teacher education units (**Pre-w or Post-w [workshop] RJ**) which were framed using the following questions:
 - What have I planned and why?
 - What went well?
 - What has challenged my sense of pedagogical equilibrium?
 - What am I learning from this experience?
- End of semester reflections of 1–2 pages (approx. 500–1,000 words) (\times 3) that captured my overall impressions about challenges to pedagogical equilibrium and my learning from thinking about my challenges to pedagogical equilibrium. I used the frame of “challenges to pedagogical equilibrium” to stimulate reflective writing using a free-write format (**Post-SJ**).
- In semester 1 only, I audio recorded my teaching in the primary science workshops to use for personal reflection (4 \times audio recordings ranging from 12 to 25 min). I listened to the recordings, extracted excerpts and added them to my reflective journal to illustrate examples of practice for my CF (**Workshop audio**).

All of my written data sources were uploaded to a shared and password secured Box folder to facilitate access and communication between the first two authors.

Level 2 data consisted of two types, produced through interactions with my Critical Friend:

- Critical friend reading and responding to my journal entries during semesters 1–2 (**CFFeedback**). Based on her responses to my journal entries and other written data, CF posed a question/s for me that we discussed during our CF conversations.
- 8 \times CF conversations (**CFC**) across the 2 semesters with 3 additional conversations in the 3 months after semester 2 had concluded to further discuss the data collected in S1 and S2. The audio recorded conversations were designed to facilitate critical reflection on my practice to unpack and potentially reframe the issues (Loughran and Northfield, 1996) which were challenging my sense of pedagogical equilibrium. This process manifested initially as informal suggestions for me to “notice” (Mason, 2002) or try in my classroom and reflect on in our subsequent meetings.

Data Analysis

Data analysis was iterative and ongoing during data collection consistent with a self-study approach to researching practice

(LaBoskey, 2004). To recognize and examine the major sources of challenge to my pedagogical equilibrium, I regularly read through my journals looking for recurring patterns or themes. My critical friend also read my journals and analyzed them for common themes which she highlighted with different colors. As described above, when my critical friend read the journals, she would pose written questions to me, to seek clarification, stimulate reflection and probe any apparent taken-for-granted assumptions. I would respond to her comments in writing and then we would discuss the journals and our impressions of them in our online (zoom) conversations. In these conversations we would also identify emerging themes, particularly with respect to changes in my pedagogical equilibrium, which addressed the second research question related to recognition of the challenges to pedagogical equilibrium on my developing identity as a STE. This ongoing cycle of data collection, analysis and testing continued across the two semesters.

RESULTS

Two key themes emerged from analysis of the data. Initially, feelings of identity and legitimacy permeated the S1 data sets, as I positioned and repositioned myself (Theme 1) as a teacher educator, seeking to clarify my identity. As I processed these feelings and found a sense of pedagogical equilibrium with relation to my identity, I started to notice new challenges to equilibrium related to my role and how I was positioning and repositioning my students (Theme 2). The challenges to equilibrium which led to the development of these themes are described below and brought to life through data extracts.

Theme 1—Positioning and Repositioning Myself

This self-study was initiated because of unrest I was experiencing in relation to my developing identity related to teaching primary science. My self-questioning and unrest about identity were obvious in the initial research questions I created for the self-study. The questions highlighted concerns about how I felt I was being perceived by my students and what past experiences and knowledge was I drawing on to help me feel confident in my role as teacher educator. Some questions I asked myself at the beginning of S1 were:

I am a secondary trained teacher but I work in primary units. This is about my developing identity as a primary teacher educator. How do I perceive and position myself as a primary and secondary teacher educator?

Feeling like a fraud. Which prior experiences am I drawing on and how am I linking these prior teaching identities when teaching primary and secondary science? (S1, Pre-SJ).

I felt uncertain about my teaching because if I was identifying as a secondary science teacher, teaching in primary science teacher education units, would my students listen to what I had to say and trust me as an educator if they knew I didn't have any primary teaching experience? It was evident from my lesson

recordings that I was so conscious of this, that I made a point of telling my students about my self-study:

Workshop audio: Part of my identity as a science teacher educator is I taught in secondary schools, so I am a secondary science teacher. But since I transitioned into tertiary, I have been teaching in primary science units. And so it's interesting to see how I draw on experiences when I don't have a lot of experiences in primary schools. That's something that over time I have had to become comfortable with sharing because how can I teach in ways that do not make me feel like a fraud. And, so, over time I have had to confront my identity in certain ways. That is why I am going to be recording myself (S1, W1, Workshop audio).

My students responded remarkably positively to this positioning of my vulnerability, which made me feel comfortable to share my concerns. However, what I didn't realize at the time was that I had positioned myself as a secondary teacher; someone who was different to these students. It was not until the end of the unit when I was conversing with my CF that she highlighted this contradiction.

In reviewing my journal, I noticed moments where I was drawing on experiences and knowledge outside the primary unit to help me feel more confident when teaching in the primary unit. For example, using other people's stories and anecdotes or drawing on my knowledge about teaching in secondary schools.

Journal entry: Today I drew heavily on my learned knowledge of the Victorian science curriculum—rather than my understanding of how to enact the curriculum in primary schooling. My knowledge of the progression of concrete to abstract ideas was knowledge I gained through doing the unit. . . . But I did not draw on my direct knowledge of how to plan for teaching, as for primary, as I don't have this. I know what I might do, but I would not know or be confident about how it would go (S1, W2, Pre-w RJ).

CF comment: Perhaps not officially, but how many times have you taught this class? How many times have you been out in primary schools observing your students teaching? Perhaps you are not as "new" to this as you think? (S1, W2, RJ)

My CF's comment about identifying as "new" was interesting. Was I considering myself new, so that my lack of experience would be more acceptable to my students? By holding on to my "new" identity, perhaps that gave me permission to make mistakes and not need to 'know all the answers'? It became clear to me, as illustrated in the next journal excerpt, that I was placing a great deal of emphasis on 'knowing things' and 'having experience' as a source of authority, compounding my sense of challenge to pedagogical equilibrium. In hindsight, perhaps my background in science and secondary education, both of which are disciplines which promote the guise of certainty, prompted me to feel there must be a 'right' way of doing things in primary science teacher education?

Journal entry: I find this [my] lack of knowledge a little debilitating/limiting. I feel that I am talking about what "could be" rather than what I know "has been." I know that I still have something of worth to give, but I am still conscious of my feelings of not really knowing (for sure) how what I suggest would work in reality. I feel apprehensive about this, and so I think I sometimes avoid really digging down into the specifics of practice as I don't feel I have the capacity to bring prior experience to bear. I think in these cases I tend to keep the conversation more theoretical and general (S1, W2, Pre-w RJ).

CF comment: This almost sounds to me like you think the value of a teacher educator resides only in their past official classroom teaching experience. Do we not improve with our experiences as educators of teachers and as researchers of teacher education? . . . So many of my comments above so far have dealt with this notion of apprehension you are conveying. I'd really like to dig into this more. Why you feel this—what is contributing to it — how you are responding to it in your practice—how your students are perceiving it (or do you think they perceive it), etc. (S1, W2, RJ)

My CF helped me to recognize how my sense of identity seemed heavily relying on my "street cred" (Dinkelman et al., 2006) and feeling like I was straddling two identities simultaneously—as an experienced secondary teacher and beginning teacher educator. I felt I was trying to draw on experience in one context to help me feel legitimate in the other.

My challenge to pedagogical equilibrium was driven by assumptions I was making about how my students viewed me. However, in searching for a sense of equilibrium, I started questioning these feelings and began to recognize that my knowledge of pedagogy, developed through being a teacher educator, was also a source of knowledge and credibility. I started seeing glimpses in my journals of drawing on my experiences as a teacher educator, particularly in primary science units, but I was not necessarily recognizing them as sources of credibility or legitimacy, until my CF questioned them. She also began to question whether perhaps I had idealized my prior experiences as a teacher.

Later in the semester, I recognized that my confidence had increased after students in the primary unit had returned from their practicum experience, and I felt comfortable to lead discussions about their experiences. I could encourage them to think deeply about their teaching and learning, which did not depend on my feelings of needing to have direct primary teaching experience.

By the end of the unit, my sense of identity as a primary STE had changed. While I valued having relevant prior knowledge and experience, the nature of the experience that I valued was different, as illustrated in the excerpt below.

Journal entry: I am drawing identity from being a primary science educator. I see myself as having expertise in teacher professional learning. I would say that I am knowledgeable, but not an expert. I know you don't have to be an expert to teach in other units, but I invest a lot of time and effort

making sure I know my stuff—I don't like to walk into classes unprepared. So identifying as someone who has some expertise in a subject is important to me. I am beginning to feel that with my primary science teaching. Although, I think, to make myself feel an even higher degree of expertise in primary science, I want to publish and research in primary science education. I think that would make me feel even more confident and comfortable with my expertise and identity (S1, W11, Post-w RJ).

In the above reflection, I was less concerned with relevant classroom experience as a source of credibility and instead drew my identity from my role as a teacher educator academic, knowing relevant theory and seeing experience as transferable. The source of my credibility was now becoming aligned with the scholarly activities of conducting research and being published in the field of primary science education.

What Came Out of Recognizing and Learning to Manage These Challenges to Equilibrium?

An important shift in my identity perspective emerged as a result of examining the challenges to equilibrium throughout my self-study in S1. It had not occurred to me until my CF had pointed it out. I was using my 'beginning' teacher identity as a "cushion" to make excuses for my lack of primary teaching experience and pre-empt any mistakes I might have made in my teaching.

Author: I suppose that raises in me questions of, would I be seen as fraudulent if I...[did] not make that distinction... I haven't taught science in primary schools. Therefore, how much of an expert can I actually say that I am? (S1, CFC end of semester).

CF reply: No, I do think identity is important. But I think that when I read the statements from your journal from the start to several weeks later, that part about positioning yourself as the secondary biology teacher almost seemed like you were using it as a cushion. Like, "if anything goes wrong, just keep in mind, I'm a secondary biology teacher and I don't have access to primary school." But as you were going along in your entry, you began to talk about the fact that you've taught this course other times. This wasn't new to you. You had been working with other people that had been in classrooms and primary grades. You've actually been out and seen people teaching science in primary grades... So your experience with primary science does exist (S1, CFC end of semester).

Later in the conversation, my CF said something which became the catalyst for a shift in my identity perspective.

CF: Okay. So I kind of wonder, going into next semester, if you kind of took your position as not, "I am a secondary science teacher," but "I am a teacher of science. I am a teacher educator, of science." Would positioning you in that way, begin to have your students take you up in different ways and look at you in different ways and take your ideas in different ways? Would you feel less like they're judging you? More like you have something of value to them. And then how would

your identity begin to develop there, as a result of positioning yourself that way vs. positioning yourself by the grade levels that you formally taught? (S1, CFC end of semester).

At the time, while I could hear what she was saying, it took time for me to process the meaning, through personal reflection over the following weeks. As I began to make sense of her comment, I came to realize that I was hanging on to my 'beginning' status and not recognizing the wealth of knowledge and competence through my identity as a teacher of teachers.

Journaling forced me to make thinking and questioning about my practice explicit and to mentally process what was causing my feelings of unrest. Analysis of my data, especially with the aid of my CF's questions, helped me appreciate alternate perspectives which I would not have had otherwise. The process of self-study helped me name and frame (Loughran, 2004) what was creating unrest, which formed a tangible basis from which I could purposefully inquire about my practice and re-imagine my developing identity. Even though some apprehension and uncertainty remained, my attention was no longer powerfully drawn to what had been causing my feelings of unrest during semester 1.

Theme 2—Positioning and Repositioning My Students

The second major challenge to my pedagogical equilibrium emerged between S1 and S2. Once I had established a sense of equilibrium with regards to my feelings of legitimacy and identity in my primary STE role, I was able to consider more deeply my role in relation to students' learning. To what extent was I responsible for their learning and therefore, how much control did or should I have over their learning? The notion of control was recognized by my CF during S1. In a primary science workshop, I had recorded myself saying:

Workshop audio: "Learning from experiences—we have to be learners to know how to adapt in the future. When I first started teaching my focus was very much on the 'teaching' because I could control the 'teaching.' I could not control these kids (i.e., their behavior)... It's easier to control what 'I' do, than it is to control what 'they' do" (S1, W1, Workshop audio, added to RJ).

CF response: There is a lot of emphasis on this notion of having control...are you sharing this with your preservice teachers? Is that how you are wanting to position them in their roles in the classroom—as the controllers? (S1, W1, PJ).

My uncertainties, and hence disequilibrium, related to planning effective pedagogies to support PSTs' learning about teaching and my role in the learning process. One example of how this manifested was through my noticing how much talking that I was doing in class:

Journal entry: The activities we did today went well, but my disequilibrium is about how much talking I do and how effective it is. How much talking is enough and when to move on... What is it I am saying that is adding value and what

is extra and not really necessary? . . . I love explaining—but I also know that it's not always effective and that I need to hold back and position learners as active learners. Often it's about asking the most effective questions that positions the learner in ways that help them construct ideas, not just telling them the answer. I know teaching is not telling and I feel the tension of this when I talk too much. Am I adding value??? Or is it just talking. How do I find out?? (S2, W4, Post-w RJ).

CF response: *What is your talking all about? What is the purpose of it? When is it happening in the class? Is it both whole class and small group discussions? You seem to be focused on there being a 'right amount of time' for talking. . . .but really the talk should have purpose. . . .does it? Different purposes take different amounts of time.*

My uncertainty about whether I was talking too much made me concerned that I was depriving students of the opportunity to learn for themselves. I had noted “talking too much” was something I had a habit of doing, from a previous self-study. I felt the contradiction of saying that positioning the learner as active in the learning process was an important goal of my teaching, yet, I did not seem to be “walking my talk.”

My observations of the extent of my “teacher talk” led me to make a change to my practice in the primary science class to encourage more student interaction and engagement.

Journal entry: *So this week we explored scientific literacy. As I was preparing the slides for this week I realized that. . . scientific literacy is not well defined. I also noticed from last year that we give a lot of “theory”—we position the students as passive. Therefore, in preparation for week 9 I changed the slides. Instead of just talking through the theoretical slides, which would be a bit blah, I said “The notion of scientific literacy is contentious. There is no fixed definition.” I posted 5 big questions around the room and asked them to wander around the room, read the questions and leave a comment. They were then to go back. . . .and read the comments and write something else—if they wanted to (S2, W9, Post-w RJ).*

Despite taking this action, I still struggled with positioning the students as active and responsible learners. My CF and I discussed this issue in our end of semester conversation:

CF: *So one of the things you highlighted was “I know teaching is not telling and I feel the tension of this when I talk too much. Am I adding value or is it just talking? How do I find out?” And I wrote, this is an all very important question because there's a lot of this where you're having this conflict with yourself. About talking too much. And is talk not valued [by your students]? (S2, CFC).*

I'm asking questions throughout (your journal) about the purpose and the intention of the talk. You seem to be focusing on the quantity of the talk. And it's not perhaps the quantity that's the issue, so much as whether you feel that it's targeting the purpose or is it addressing the intention of what you want to get across? And if it's not doing that, that's ultimately the goal, right, is understanding what your objective is and then

is the talk helping to get to that? Because maybe it seems like you're talking a lot, but maybe the talk is you really pushing ideas, questioning them to think about things or trying to pull students ideas together where you're facilitating that, talk across students more (S2, CFC).

What Came Out of Recognizing and Learning to Manage These Challenges to Equilibrium?

My CFs comments pushed my thinking about how I was positioning my students and how they were also positioning me in this experience of learning to teach. I valued learners as actively responsible for their own learning and I set up workshop activities in ways that put them into an active role. However, at the same time, I tended to undermine my own actions. Although I wanted to position my students as active, when they didn't actively take up this role, I increased my “teacher talk” and then became frustrated with myself. How could I maintain a view of teaching that positioned students actively, when they didn't necessarily accept that role for themselves?

Grappling with these uncertainties and working with my CF throughout semester 2, led to a second significant shift in my thinking about my TE role. This shift was catalyzed when my CF suggested that my students' apparent passivity could be due to my positioning them as students, rather than future teachers. Realizing this led me to re-read my data sets to look for evidence of where I was reinforcing this point or missed opportunities to position them as teachers. Similar to my shift in Theme 1, I realized this was about *their* identity construction processes. It was not that they should become more actively responsible because I told them to do so, it was because they needed to prepare themselves, as future professionals.

I recognized that I was frequently positioning my PSTs as students and lamenting all of the behaviors we are disappointed in when students do not behave the way they want them to. But these were future teachers. They were not doing the work and completing the assignments just to go through the motions. They were developing knowledge as future professionals.

Shifting my thinking about our respective roles as student and teacher led to a change in my actions during my teaching—how I positioned my students and what role I was encouraging them to assume. Throughout my teaching units, I started using the language of “you as future teachers” instead of referring to them as “students.” This manifested in responses to students such as, “what would you do in this situation?” identifying opportunities where there was no single generic way of responding to a teaching dilemma. Pre-service teachers readily took up this language and the final weeks of the unit, in the final assessment task and in notes of gratitude at the conclusion of the unit, students used the language and lens of “me as a future teacher” to talk about themselves as future teachers.

The second shift demonstrated to me that the way I was viewing my students and the assumptions I was making about what they valued, greatly influenced the role I assumed and how I was positioning them as learners. By processing these new challenges to my pedagogical equilibrium with my CF, I was able to appreciate that when I positioned my PSTs in similar ways to how I had positioned my secondary school students, my attention

was drawn to what appeared to me to be passivity on their part. I saw their apparent lack of engagement as a reflection of my capabilities as a TE. However, after critically reflecting on my practice, I came to realize that in positioning them as school students, they were behaving as school students. I needed to position them as future teachers and professionals, and encourage them to take responsibility for their own learning.

DISCUSSION

This study employed the frame of pedagogical equilibrium to reflect on and analyze, in collaboration with my CF, my developing identity as an early career STE. The first research question (RQ1) sought to identify the major sources of challenge to my sense of pedagogical equilibrium. In the previous sections I unpacked these sources of challenge as two major shifts, that in turn had implications (RQ2), for the way I was positioning myself, and the way I was positioning my students as future teachers.

The processes of critical reflection on my practice and with a CF, as an integral component of this self-study, have been highly influential on the development of my teacher educator identity. As described in the introduction to this study, Izadinia (2014) identified self-study as a meaningful way for teacher educators to develop their identity. She highlighted two kinds of activities which are influential on identity development: self-support and community support. Through “self-support” mechanisms such as personal journaling, I was able to examine my teaching approaches and critically reflect on my practice. Through community support with my CF and now, through the process of writing and editing this article with Authors 2 and 3, I have benefitted from working in a learning community (Izadinia, 2014).

The two shifts were powerful in terms of developing my identity and defining my role as a teacher educator. After the first shift, I discovered a new source of authority. Similar to Munby and Russell (1994), I learned how I was interpreting experience and from where I was drawing my authority. Initially, I was undermining my “authority of position” by stating to students that I did not have the kind of experience which I anticipated that they would expect me to have. Like the pre-service teachers in Munby and Russell’s (1994) study, I was unable to see and trust my own experience as a teacher educator and as a former secondary teacher as an authoritative source of knowledge about teaching. Through examining my shift in pedagogical equilibrium, I came to realize that I didn’t need specific experience in the disciplines or classrooms that the PSTs were going to be teaching in. In fact, the variety of contexts in which they would find themselves meant that I could never know exactly what their teaching experience would comprise. My previous experience of teaching in schools, and my experience as an academic teacher educator were valuable sources of experience and authority that I could draw on. By drawing on these sources, I felt more confident about how I could support PSTs to better understand their ideas about the nature of teaching and learning, and to help them to appreciate how they were developing their own identities as beginning teachers.

In the second shift, I came to appreciate my role as a professional who was “educating or cultivating future teachers” (Ping et al., 2018, p. 98) rather than simply teaching “students.” This shift was important for helping me to develop my role as a teacher of teachers. As such, I repositioned my role as being one who would ideally put the onus of learning back on the PSTs by posing problems and encouraging the pre-service teachers to consider and find solutions themselves rather than feeling like I had to provide all the answers (Ping et al., 2018). My new mantra of “you as future teacher” is empowering, yet is taking time to fully develop. The continual pressure and desire for certainty from PSTs about “how to teach” is destabilizing at times, and still prompts me to drift back to feeling like I have to, or ought to, provide answers and certainty. It is difficult to overcome years of enculturation in education landscapes which demand certainty. Finding ways to shift teacher and student perceptions of teaching and learning as being simple and factual to the more realistic view of teaching and learning as being problematic and inherently uncertain, remains an ongoing challenge for teacher educators.

I realize I am always going to experience challenges to equilibrium as a TE, but I also realize that through these shifts, I am developing my pedagogy of teacher education (Korthagen, 2001; Loughran, 2006). My insights across the two shifts align with the findings of McKeon and Harrison (2010) who studied the developing teaching practices and professional learning of new teacher educators. They recognized a change in teacher educators’ focus from their own teaching to pre-service teacher learning, similar to the changes that can be observed in pre-service teachers as they shift their focus during their teacher education from “their teaching” to the “pupils learning” (Fuller, 1969).

These experiences helped me appreciate parallel experiences with the PSTs in my classes. Just like me, the PSTs were also looking for certainties in an educational environment plagued with uncertainty. Teaching looks easy, but it is inherently problematic, sophisticated and complex (Loughran, 2011). Just like me, pre-service teachers need to have opportunities to make sense of experience in ways that help them appreciate that they have knowledge to offer and that they are simultaneously building their knowledge of practice. Helping them to develop their authority of experience is an important next step in my teacher education work.

CONCLUSION

This research provides insights into the identity development of an early career teacher educator. It responds to Izadinia (2014) call for more studies into teacher educator identity and has demonstrated the utility of pedagogical equilibrium (Mansfield, 2019) as a tool for exploring teacher educator identity and professional knowledge development through self-study. By viewing the uncertainties and disequilibrium associated with my practice as opportunities for learning, I was able to make explicit those aspects of my practice which were drawing my attention. This included micro challenges, such as moments in

class where I felt uncomfortable and perplexed, and larger scale, macro challenges such as my unsettled sense of identity. Viewing challenges to pedagogical equilibrium in this way recognizes that teaching is problematic and dilemma based. Teaching contexts are seldom identical and there is no ‘one size fits all’ approach to teaching and learning. Therefore, teachers are constantly searching for equilibrium more than they are experiencing feelings of equilibrium.

Viewing professional knowledge development through pedagogical equilibrium recognizes that when a “steady state” is reached, it is not long before a new challenge is identified. For example, during this study I felt a moment of being in a steady state with my identity development when I felt I had a wealth of knowledge as an experienced secondary teacher. However, working in the teacher education space, in particular teaching in primary science education units, my sense of pedagogical equilibrium was challenged. I realised the knowledge and expertise I had developed about teaching science in schools was not as useful for teaching about teaching as I had initially thought. The notion of searching for pedagogical equilibrium complements a self-study approach, and empowers the researcher to embrace the unsettling as an opportunity for learning and not a knowledge deficit.

By reporting on the findings from this self-study, the specific knowledge we have developed adds to the growing knowledge base related to how teachers transition into teacher education and how their identity develops over time. This valuable knowledge highlights the conditions which can influence identity development, and the nature of transformations which are necessary to ensure successful transitions for teachers to teacher educators. The powerful shifts I experienced studying my practice over two teaching semesters represent a transformation in my personal and professional identity. My journey to becoming a

teacher educator, included transitioning from identifying as a “beginning” teacher educator to a “becoming” teacher educator (Hamilton and Pinnegar, 2015). In turn, I changed how I positioned myself as a TE to my pre-service teachers, and was sensitized to the ways in which I was positioning them, as students rather than future professionals. This enabled me to be more explicit and confident about the ongoing process of building my identity.

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 the Monash University Human Ethics Committee. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

JM and MP collected and analyzed the data and co-wrote the manuscript. AB analyzed data and co-wrote the manuscript. All authors contributed to the article and approved the submitted version.

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In Enhancing Preservice Teachers' Assessment Literacy: Focus on Knowledge Base, Conceptions of Assessment, and Teacher Learning

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Assessment has a critical and time-consuming role in the teaching profession. However, teachers generally possess low levels of assessment knowledge and skills, with their understanding more about the culturally and historically established summative compared to formative assessment. Therefore, developing assessment literacy in preservice teacher education (PsTE) is important. In the present study, a special study module of assessment was designed for PsTE to examine Finnish student teachers' assessment literacy. Deductive and inductive content analyses of students' ($N = 168$) written diaries were conducted applying a conceptual framework of teacher's assessment literacy in practice (TALiP). Based on the results, the students' assessment knowledge base and assessment conceptions were promisingly versatile and indicated a rich awareness of the broad nature of assessment. However, the key findings also suggest that assessment is not an easy topic for student teachers to discuss with peers. It can be concluded that even short PsTE assessment courses can enhance student teachers' views of versatile pedagogical inputs and outputs of assessment.

Keywords: teacher assessment literacy, assessment and education, assessment conceptions, knowledge base, teacher learning, teacher education – preservice teachers

INTRODUCTION

Teachers spend as much as a third or even half of their professional time involved in assessment-related work (Stiggins, 2014). If the first purpose of assessment is to meet pupils' needs for learning and support, the second and equally important one is to inform teachers about improvements needed in their teaching. As Mellati and Khademi (2018) point out, by employing adequate assessment techniques and grading practices, teachers can improve their instruction, enhance learners' motivation, and increase their levels of achievement.

Do teachers listen enough to assessment data when adapting the pace of instruction, choosing assignments, giving feedback, and deciding on grades, placement, and tracking (Herppich et al., 2018)? Based on international research evidence, the answer seems to be no. Assessment is not taught well enough in preservice teacher education (PsTE) in many countries, and either a lack of advanced courses or effective pedagogy on assessment is evident (Volante and Fazio, 2007; DeLuca et al., 2013, 2019). DeLuca and Bellara (2013) observe that the limited preservice assessment education is theory-laden and disconnected from teachers' daily assessment practices. Similar results were seen also in Atjonen's (2017) research of Finland which is the context of the research reported in this article.

Teachers generally have low levels of assessment knowledge and skills, with beginning teachers particularly underprepared for assessment in schools (Volante and Fazio, 2007; DeLuca et al., 2019). Difficulties with common assessment responsibilities, basic conceptions, and the purposes of assessment are reported (Mellati and Khademi, 2018). Hill et al. (2017) found negative feelings and attitudes toward assessment, and Deneen and Brown (2016) revealed polarized affective conceptions of assessment among preservice teachers. Hill et al. (2017) described how they employ the same assessment strategies they experienced themselves as pupils (see also Hamodi et al., 2016), tend to see assessment as synonymous with the testing culture, and generally abandon formative assessment. To sum, newly qualified teachers' assessment literacy (TAL) level is low.

On the other hand, research findings suggest that when preservice teachers have opportunities to learn about assessment, they demonstrate development (DeLuca et al., 2013). PsTE courses of assessment can be more beneficial by emphasizing formative assessment, avoiding the most traditional assessment methods, and involving preservice teachers as partners in the assessment process (Hill et al., 2017). Assessment-educated PsTE students were more inclined to perceive assessment positively (Yan and Cheng, 2015) and had stronger overall confidence in doing assessment (Charteris and Dargusch, 2018). Positive correlations between self-efficacy and conceptions of assessment are also reported (Levy-Vered and Alhijab, 2015).

In the research reported in the article in hand, we focused on promoting preservice teachers' assessment literacy (TAL). We invited Finnish PsTE students in the research-informed study module to learn about assessment in heterogeneous peer groups. We used the following three pedagogical constructs suggested by DeLuca et al. (2013): perspective-building conversations; praxis: connecting theory to practice, and critical reflection and planning for learning. The special pedagogical viewpoint in the assessment was interaction, i.e., how pupils' participation and educational partnership in assessment processes can be enhanced instead of keeping the summative power solely in the hands of the teacher and school. Our research questions focus on students' assessment knowledge base and conceptions including their collaborative learning about assessment.

From an international research viewpoint, our study enhances the weak tradition of interventions or experiments (2010 onward) that are planned for improving assessment education of PsTE. By our approach, we stand out among the research literature that

focuses on the conceptual analysis of TAL (e.g., Herppich et al., 2018; Pastore and Andrade, 2018), is based on student surveys (e.g., Hill et al., 2017), or prefers assessment education standards (e.g., Schneider and Bodensohn, 2017; Wyatt-Smith et al., 2017). To our knowledge, this is a new approach to assessment also in Finnish teacher education.

DEVELOPMENT OF TEACHER ASSESSMENT LITERACY IN PRESERVICE TEACHER EDUCATION

Definitions of Teacher Assessment Literacy

Stiggins (1991) introduced the idea of TAL in his seminal article "Assessment Literacy." Over time, there has been a shift from instrumental and one-dimensional conceptualizations of assessment literacy toward a socio-cultural multidimensional understanding that links to teachers as developing professionals (Willis et al., 2013; Xu and Brown, 2016; DeLuca et al., 2019). This change can be described as a shift from "testing culture" and summative assessment toward "assessment culture" and formative assessment, according to Massey et al. (2020).

Several research examples (e.g., Volante and Fazio, 2007; Stiggins, 2014; Massey et al., 2020) indicate that in-service and preservice teachers perceive assessment mainly as summative tests and grading. This product-oriented approach should be enhanced to include learning processes, i.e., the formative approach needs to be promoted (Cañadas, 2021). These two functions do not exclude each other; assessment literate teachers recognize them both. However, socio-constructivist notions of learning may call for a more rigorous understanding of "assessment for learning" (AfL) (Black and Wiliam, 2018) compared to the culturally and historically established summative approach.

To be assessment literate means primarily having a deep understanding of the interrelatedness of assessment, curriculum, and learning theory, but other advantages are obvious as well. Mellati and Khademi (2018) add that assessment literate teachers can provide understandable information on assessment to educational authorities and parents. Even though parents tend to believe in the ideals of formative assessment (Nieminen et al., 2021), school stakeholders too often rely on testing culture and thus draw inadequate conclusions regarding teaching quality, as Stiggins (2014) points out. Levy-Vered and Alhijab (2015, p. 379) indicate that "assessment-literate teachers are able to draw more valid and reliable inferences about their students' learning and to make better instructional decisions about the content."

Among the important impacts of TAL, confidence in assessment has been explored. Massey et al. (2020, p. 218) explain that "... when individuals feel incompetent and lack confidence in a task, they will choose to engage in it. In contrast, when an individual feels incompetent and lacks confidence in a task, they will avoid engaging in it." Educating assessment-literate educators is also a question of instilling confidence in carrying out assessment, i.e., teachers learn to trust their own skills to diversify

assessment tasks and methods rather than routinely resorting to the most general or typical assessment approaches. Levy-Vered and Alhijab (2015) argue that training in assessment and its multiple conceptions directly affect assessment literacy. Finally, assessment literacy directly and indirectly affects assessment self-efficacy and may result in new assessment practices.

Key Ideas of Teacher's Assessment Literacy in Practice-Model

We prefer the concept “assessment literacy,” although DeLuca et al. (2019) mention also the terms “assessment competency” (see e.g., Schneider and Bodensohn, 2017; Herppich et al., 2018) and “assessment capability” (see e.g., Booth et al., 2016; Hill et al., 2017; Charteris and Dargusch, 2018). Our research relies on the model of “teacher assessment literacy in practice” (TALiP-model) designed by Xu and Brown (2016), who use the concept “teacher assessment literacy.” Xu and Brown (2016) legitimize their model by reviewing one hundred original research articles on assessment literacy and illustrating it as a pyramid (**Figure 1**).

The TALiP-model includes six components: (A) Knowledge base; (B) Teacher conceptions of assessment; (C) Institutional and socio-cultural contexts; (D) Teacher assessment literacy in practice; (E) Teacher learning; and (F) Teacher identity (re)construction as assessor. Drawing on the socio-cultural approach, Xu and Brown (2016) describe how the knowledge base (elements 1–7) enables teachers to formulate their conceptions of assessment that are interpreted in the national curricular framework, for example. These conceptions have both cognitive and affective dimensions, and they are integrated into the broader views of learning and teaching.

Based on their conceptions, teachers choose different assessment practices (e.g., exams, portfolios, essays, and presentations), which may be successful or may sometimes require a return to the knowledge base or conceptions. Xu and Brown see “assessor identity” as the aim at developing of TAL, which involves teacher learning, i.e., constant reflection on practices and collaboration with colleagues. This long-term process can be successfully launched during PsTE if the developmental scenario is introduced and opportunities to practice some of its components are available.

Based on their praxis-oriented model, Xu and Brown (2016, p. 159) state that “assessment literate teachers are those who constantly reflect on their assessment practice, participate in professional activities concerning assessment in communities, engage in professional conversations about assessment, self-interrogate their conceptions of assessment, and seek for resources to gain a renewed understanding of assessment and their own roles as assessors.”

Research Questions

Based on the above-described theoretical framework, we formulated our research questions as follows:

RQ1: How do preservice teachers reflect on the *assessment knowledge base*? (TALiP-component A)

RQ2: What kinds of *conceptions of assessment* do preservice teachers have? (TALiP-component B)

RQ3: How do preservice teachers describe their *collaborative learning* of assessment? (TALiP-component E)

We planned a study module that aimed to increase students' assessment literacy by presenting the key concepts, interactive nature, and methods of assessment (hereafter “assessment module”). After implementing the assessment module, a qualitative evaluation of students' experiences was carried out to answer the RQs.

To our knowledge, this is the first study of the TALiP-model, originally explored and designed for in-service teachers, where it is used to describe preservice teachers' assessment literacy. The TALiP-model did not guide the design of the assessment module because we were not familiar with it while planning the course. Therefore, TALiP is used as the analysis tool for the data that did not include students' texts regarding components C, D, and F.

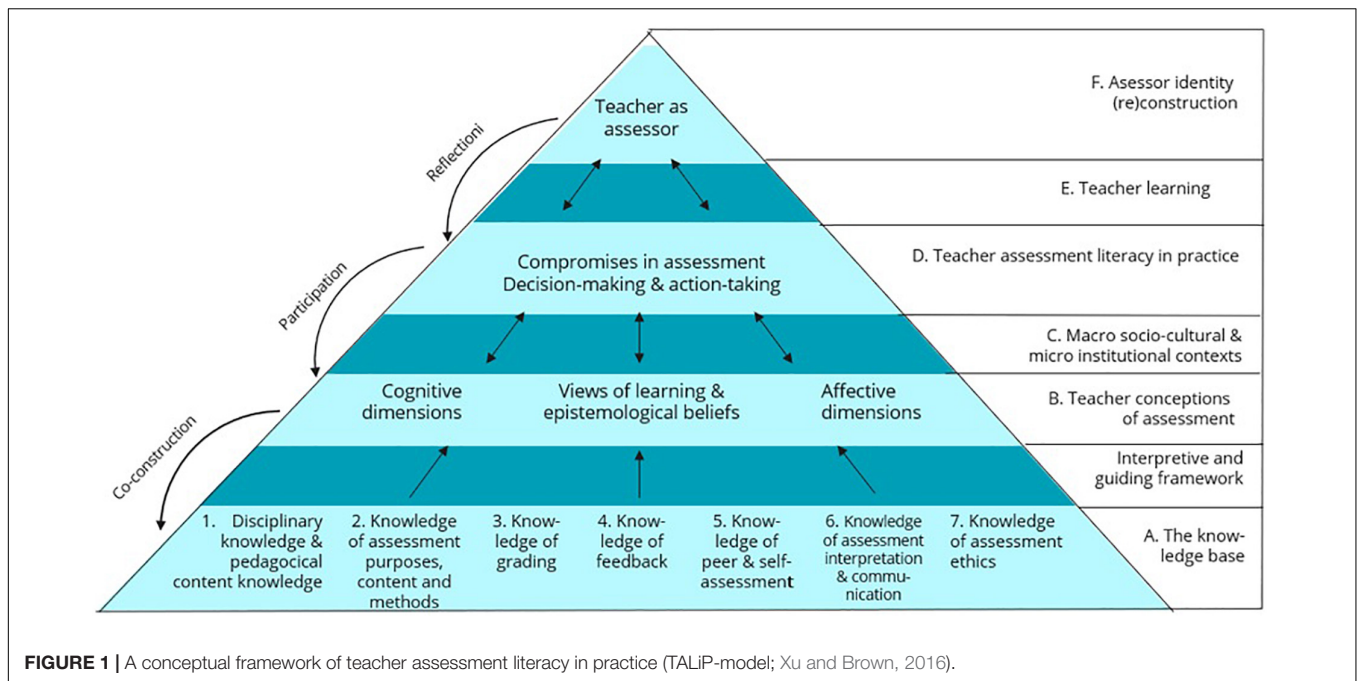
MATERIALS AND METHODS

Finnish Context for Research Results and Their Interpretation

Our assessment module took place in October–December 2020, in the middle of assessment changes in the basic education of Finland (grades 1–9) initiated by the Finnish National Agency for Education (FNAE). In February 2020, renewed guidelines for assessment were published (Finnish National Agency for Education [FNAE], 2020a) to specify the national core curriculum for basic education (Finnish National Agency for Education [FNAE], 2014). At the end of December 2020, new assessment criteria for the final assessment of basic education were introduced (Finnish National Agency for Education [FNAE], 2020b).

As the Finnish educational system is strongly decentralized, municipal educational authorities design local curricula following the national guidelines of the core curriculum. However, despite the acknowledged expertise of teachers and local educational authorities, decentralization can cause unequal assessment practices. Actually, both curriculum-related assessment reforms in 2020 were motivated by rigorous research evidence that assessment was not equal enough in schools all over the country. In addition, new results of the broad national evaluation of assessment practices (Atjonen et al., 2019), conducted during 2017–2019, were also useful for the reforms.

As a country of low-stakes assessments, Finland trusts well-educated teachers' professional knowledge, sees formative assessment as very important, and prefers steering and development over accountability. All teachers in Finland are educated at research-based universities where students take master's degrees, majoring either in education (lower level of basic education) or in their respective subjects (upper level of basic education). Broad pedagogical studies (60 ECTS) are included in their studies.



Based on this TE background, Finnish PsTE students should become quite well informed about assessment as an effective pedagogical tool. Because each university decides independently on the PsTE curriculum, there may be a need for special attention to ensure that all prospective Finnish teachers will become provided with basic knowledge on assessment. Therefore, we saw it as important to strengthen assessment literacy among a student cohort of a university in the way that is described next.

Description of the Assessment Module

The second author of this article planned the assessment module together with her teacher educator colleague, and four other experienced colleagues supported them. It took place in a TE department in a publicly financed, research-based University of Eastern Finland (UEF) in October–December 2020. The assessment module was the comprehensive part of the theoretical-pedagogical course of “Interaction in learning and educational environments” (ILE; 5 credits) which was compulsory for the whole cohort of students in the academic year 2020–2021. The TE of the UEF has study programs for prospective counselors and teachers of preschool, primary school, secondary school, special education, craft education, home economics, and adult education.

Our study module was not a “traditional assessment course” in which assessment concepts, paradigms, principles, and methods were studied independently of the learning substance. Despite their strengths, in Finnish PsTE, assessment is seldom taught as separate courses. We integrated assessment into the study module that was pedagogically focused on interaction, one of the core concepts of the teaching-studying-learning processes and educational theory. This resonated well with assessment’s modern

notions of involvement and engagement, and the practical study mode of student peer groups.

Special online learning materials were designed for the ILE, consisting of two modules: assessment theory (e.g., definitions of concepts and methods, school-home cooperation in assessment, and assessment and novice teachers) and assessment digitalization (e.g., interactive elements, formative methods, quizzes, and e-portfolios). Students had to study and discuss the learning material before engaging in their peer group activities. The learning materials presented the basics of summative assessment as well, but we chose to focus more on formative assessment. Students themselves have not often witnessed it during their own school years, and recent Finnish curricular changes emphasize the pedagogical use of formative assessment for learning promotion. Formative assessment fitted well to the underlying theoretical topic of “interaction” in the ILE study module that was available to us to improve assessment literacy.

Five workshops (90 min each) were devoted to planning and modeling a learning object for a digital learning environment, with a special requirement to plan and discuss it from an assessment viewpoint. Students ($N = 382$) were randomly divided into peer groups of 4–5 persons with mixed study program backgrounds. The groups produced a learning object collaboratively, and each student wrote an open diary regarding their personal reflections on the assessment and their discussions in the multidisciplinary peer group.

Regarding research ethics, students knew in advance that the diary was included in the evidence needed for the grading of ILE (university’s assessment scale: 1 = poor, 5 = excellent) for each student. We wanted to encourage them to write well-thought diaries which would improve also the quality of our data.

They were also informed that giving or withholding research permission would not have any impact on the course grade. We did not use students' grades in the data analysis.

Data for Empirical Analysis

We explored the written diaries as our empirical data. We asked the students to reply to three diary assignments (DA): (DA1) What did you learn about the assessment? (DA2) What would you like to learn more about the assessment? How would you develop the learning material designed for ILE? (DA3) Did you have shared views and conceptions of assessment in the group, or did they vary? Did you reach a common understanding in your assessment reflections? By numerous thought-provoking questions, we wanted to avoid categorical yes-no-accounts that would have flattened the contents of diaries.

Altogether, 168 students gave permission to use their diaries as research data. The majority were prospective subject teachers (47% of the participants), followed by students of a class teacher education program (26% of the participants). In Finland, class teachers teach all school subjects to pupils of 7–12 years old, and each subject teacher is typically responsible for teaching 2–3 school subjects to 12–15-year-old pupils. The rest, 27%, were studying to become special education teachers, pre-primary teachers, counselors, or adult educators. Regarding the background variables that were available (study program, course grade, and gender), no biases were noticed in the sample (168 students) compared to the population (382 students).

The scope of the fully anonymized data was 33,300 words. The shortest accounts consisted of 45–70 words (10 out of 168 accounts), and the longer ones were approximately 400 words (the longest included 851 words). The middle-sized accounts were typically 100–120 words. The students were coded with randomly chosen numbers, and the DA-number was also included in the citations in the Results (e.g., 2:154 = an account of diary assignment no. 2 written by student no. 154).

One analysis unit was defined as an utterance with a single meaning. Often, the units consisted of a sentence or two.

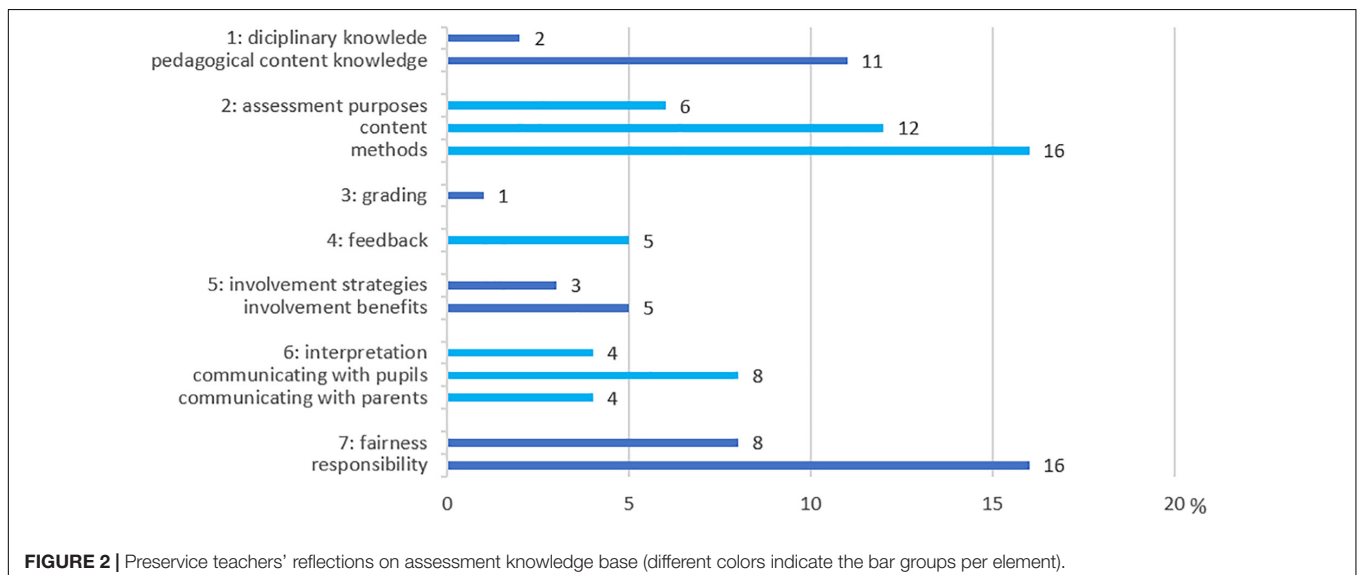
Students' accounts of each DA typically included 2–4 single meanings. Therefore, the sums of the utterances in **Figures 2, 3** are larger than the number of students. The content analysis was done by means of Excel and ATLAS.ti Web software. Based on shared negotiations regarding the coding protocol and its principles of interpretation, short manuals were written for each DA. The first two authors of the article took on the main responsibility of the analysis.

Analysis of Knowledge Base (RQ1) and Conceptions (RQ2)

To answer RQ1 and RQ2, we addressed the data by deductive content analysis (Neuendorf, 2019; Kyngäs and Kaakinen, 2020), where analysis has prior theoretical knowledge as the starting point and at least a half-structured matrix is used. The data from DA1 in RQ1, and DA1 + DA2 in RQ2 were classified and interpreted from the following viewpoints, relying on the manifest content of the diary texts (Bengtsson, 2016):

- RQ1: Xu and Brown (2016) see the solid *knowledge base* (TALiP-component A) as essential (but not sufficient) for both pre- and in-service teachers to become effective assessment practitioners. The knowledge base is comprised of the seven elements displayed in **Figures 1, 2**.
- RQ2: Xu and Brown (2016) define *conceptions* (TALiP-component B) to denote the belief systems that teachers have about the nature and purposes of assessment when pupils' learning is examined, tested, evaluated, or assessed. Brown and Gao (2015) classify six inter-correlated assessment purposes (see also Brown et al., 2019). With reference to Xu and Brown (2016), Xu and He (2019) identify six targets of assessment conceptions of preservice teachers. These two categorizations overlap in "purpose," which is one of the targets.

Although the percentages of the distinctive categories of the knowledge base and conceptions are indicated in



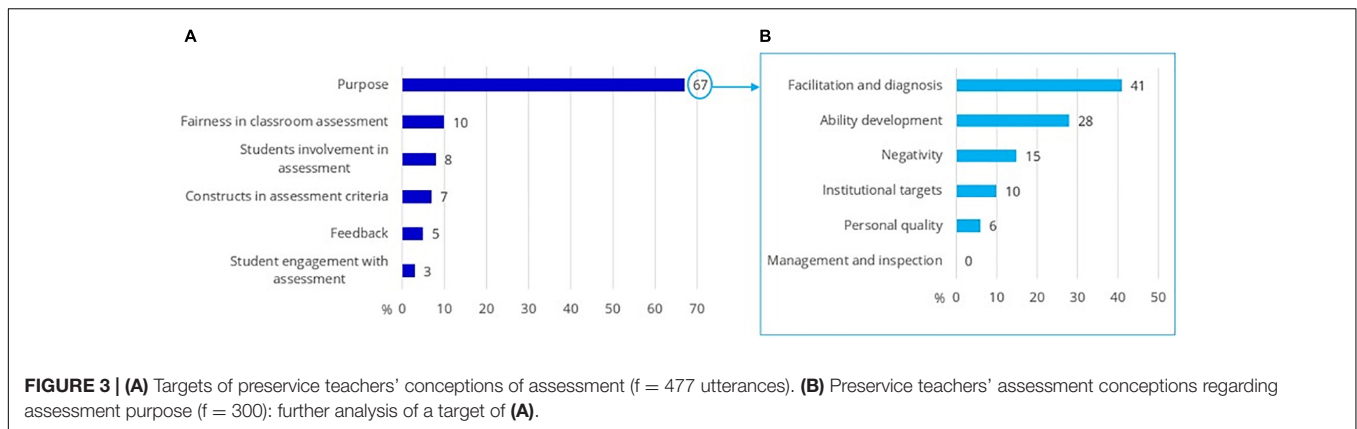


FIGURE 3 | (A) Targets of preservice teachers' conceptions of assessment ($f = 477$ utterances). **(B)** Preservice teachers' assessment conceptions regarding assessment purpose ($f = 300$): further analysis of a target of **(A)**.

Figures 2, 3, we do not interpret the results quantitatively. Instead, we use frequencies to facilitate the presentation order of the results and discuss the frequencies as indicative of the heterogeneity in the participants' views. Therefore, more emphasis is placed on the qualitative approach to illustrate preservice teachers' versatile ways of perceiving functions, principles, and methods of assessment.

Analysis of Student Teacher Learning (RQ3)

Student teacher learning (TALiP-component E) was our third focus. To answer RQ3, mainly inductive content analysis was performed on the data of DA3. In the first phase, each of the student teachers' ($f = 157$) accounts were reduced to keywords that included the main messages. Most preservice teachers described their reflections with words such as "*consensus*" (consensus, congruent, common, together; used 98 times) or "*similar*" (similar, similar-like, parallel, agreed, of the same line, homogenous; used 49 times) meaning that the group members had virtually the same opinion of assessment. These were left out of the analysis because they did not increase any knowledge on student learning. The same was true also with words *sharing* and *differences* (i.e., different, differing, or contradictory) that were rare (used 17 times) and used alone without any supplementary wording.

Second, rest of the keywords ($f = 89$) were grouped into two main themes. They were discussions and negotiations ($f = 51$), and compromises and contradictions ($f = 38$). Third, the themes were qualitatively analyzed which was facilitated by means of two theoretical conceptualizations of collaborative learning published by Nokes-Malach et al. (2015) and Scager et al. (2016).

RESULTS

Knowledge Base of Teacher Assessment Literacy (RQ1)

When all utterances ($f = 449$) of the assessment knowledge base (KB) were counted, **Figure 2** was constructed to illustrate student teachers' reflections of seven elements based on the TALiP model of Xu and Brown (2016). The students reflected

mostly on assessment methods and responsibility (16 + 16% of the utterances) and least on grading, disciplinary knowledge, and involvement strategies (1 + 2 + 3%).

There are some differences in **Figure 2** compared to **Figure 1** due to the nature of our empirical data regarding preservice teachers (not in-service teachers) and the integrative topic of the assessment module (*interaction* in assessment processes).

- Instead of title "no. 5 Knowledge of peer and self-assessment" in **Figure 1**, the title of "involvement strategies and involvement benefits" is used in **Figure 2** based on the broader title suggested by Xu and Brown (2016) on page 156 in their article.
- Titles no. 6 in both figures vary slightly because we wanted to clarify what "communication" meant in our data.
- "No. 7 Ethics" in **Figure 1** is clarified with the aspects "fairness" and "responsibility" in **Figure 2**.

The first broad finding (not specified to single elements 1–6) from **Figure 2** was the prominence of the pedagogical aspects of assessment in utterances. The students focused on formative assessment, although other assessment purposes were named. They explained, for example, that "in primary education, assessment has two mutually reinforcing purposes, which are formative and summative assessment" (1:70) and that "the familiar methods of assessment are mainly diagnostic, formative, and summative assessment" (1:47).

Assessment purposes and content (KB-element 2) was linked to the core pedagogical benefits of formative assessment: to enhance pupil motivation and achievement (Cauley and McMillan, 2010). The students explored formative assessment as a process that was closely linked to the pupils' learning needs. Strength-based and forward-looking approaches were described as important. As concrete steps toward these ends, they stressed frequent assessment to detect and support pupils' individual skills and capabilities in the long term. For example, students reflected on this knowledge base as follows:

“The purpose of the assessment is to inform pupils and encourage their progress. Assessment should be varied and continuous” (1:64).

“Assessment’s purpose it to describe how objectives set for growth and learning have been achieved . . . it is a good tool for a teacher to control studying and learning” (2:47).

The student teachers were committed to applying versatile *assessment methods* (KB-element 2) in their teaching. They combined different assessment methods aimed at giving “pupils the opportunity to demonstrate their skills in a more diverse way” (1:48) and commented that “self-assessment, peer assessment, and assessment work best together as a whole” (1:140). However, students reported that the teacher must choose appropriate assessment methods in determining assessment goals. This was suggested because “the same assessment method does not work for every situation” (1:48) or “it is good to make use of different methods in assessment so that everyone can demonstrate their skills in a variety of ways” (1:17).

Assessment methods, digital assessment included, drew the students’ attention, although they did not view digital assessment and traditional assessment separately. Using digital tools in the classroom can help the teacher and pupils meet individual learning needs (Panero and Aldon, 2016). Despite the benefits of digital assessment practices, the students claimed that the use of these tools can reduce interaction, particularly in online learning and distance learning settings. The following examples summarize the students’ views that the teacher is responsible for deepening pupils’ learning processes and results both in the traditional classroom and in online or distance learning settings:

“... the digital assessment should also stay with the pupils afterward, so that, for example, after the Kahoot multiple-choice test, we return to discuss the answers” (1:65).

“... being supportive in the assessment is a complex or even challenging task in face-to-face teaching, online learning will make these even more difficult. As the interaction between teacher and students decreases, formative assessment in particular, can be a major challenge for the teacher” (1:88).

Feedback and pupils’ involvement (KB-elements 4 and 5) revealed critical knowledge areas. Finding a balance between positive and developmental feedback was valued by students since “there is something good about every job and it is important to bring it out. Negative feedback should also be brought up as constructive criticism, and it is not good to just give direct negative feedback” (1:123). For example, Li (2019) suggests that pupils must be provided with assessment training before engaging them in complex assessment practices. Student teachers admitted that attention must be paid to the pupils’ assessment skills since “assessment also requires pupils to understand feedback and to work on issues where there were shortcomings or to strengthen their own strengths” (1:120).

Communicating with pupils and parents (KB-element 6) illustrated one-way communication. “The teacher states assessment criteria both for pupils and parents, as this kind of activity increases understanding and mutual trust” (1:165), and the teacher’s role is “to make assessment more transparent so

that both pupils and their parents know what is being assessed and how” (1:73). Obviously, knowledge concerning mutual communication can be tricky for the students to reflect on since their experiences of teaching and home-school cooperation might be limited.

The reflections involved in interpreting the assessment data to deepen professional knowledge remained vague but promising. As Timperley (2009) suggests, assessment data is used not only to make the links between particular teaching activities and what the pupils actually learn but also to guide teachers to change their teaching practices. The students clearly noticed that assessment data “helps identify gaps in teaching and improves one’s own performance, as through assessment, you get the guidelines” (1:47) and “the role of assessment remains minimal if the teacher is not capable of directing her or his teaching with the “assessment information” she or he collected” (1:53).

Since knowledge of *assessment ethics* (KB-element 7) gives teachers the opportunity to engage in assessment at a deeper level (Xu and Brown, 2016), it was good to notice that ethics was reflected in the fairness and responsibility perspectives. This represents that a general body of student teachers’ understanding of assessment included statements about the fairness, equity, and social justice of assessment. *Responsibility*, in turn, referred to clarifying the complex nature of assessment and of implementing assessment practices. In other words, re-thinking the nature of assessment and attempts on how to improve assessment practices in everyday settings seemed to conceptualize the ethical points of assessment for the prospective teachers. The following examples summarize well the preservice teachers’ attempts to engage in implementing transparent, fair, and accurate assessment practices:

“I learned that in addition to development targets, assessment should pay attention to strengths, however, in a way that assessment is fair to everyone” (1:17).

“Above all, I learned how complex the assessment is and what aspects a good assessment should consider. . . . One of the issues raised was how difficult it can sometimes be to make a fair assessment, as the teacher may lack relevant information. Therefore, in conducting the assessment, you must always be very accurate and careful” (1:156).

Conceptions of Assessment (RQ2)

The TALiP-model indicates that teachers’ versatile conceptions of assessment are distilled from the knowledge base mainly through the curriculum as the guiding framework. Based on the deductive content analysis of DA1 and DA2, utterances ($f = 447$) of assessment conceptions were condensed in **Figures 3A,B** to illustrate student teachers’ reflections.

As **Figure 3A** indicates, most utterances regarding assessment conceptions focused on assessment purposes. Regarding various assessment purposes illustrated in **Figure 3B**, the students saw that assessment’s main purpose was to *recognize and support pupils’ needs* (“facilitation and diagnosis”) and to *promote pupils’ ability development*. Based on the research literature, these two

are undoubtedly the most important pedagogical purposes of assessment. Therefore, it is encouraging to notice that the students had understood this already in their PsTE phase. For example, the students described their conceptions as follows:

“Assessment is a whole that has enormous influence on a pupil’s learning and self-concept” (1:11).

“Assessment’s purpose is to describe how the objectives set for growth and learning have been achieved . . . it is a good tool for a teacher to manage studying and learning” (2:47).

“In assessment, pupils must be noticed as individuals regarding their development and skills levels” (1:55).

“The purpose of assessment is to inform students about progress and to encourage them” (1:64).

Reflections on the *institutional or managerial* purposes of assessment were not numerous, but conceptions of assessment’s *negative functions*, bad reputation, or critical consequences are worth noting here. On the one hand, they mentioned negative aspects, such as “assessment is sometimes very challenging for both pupils and teachers” (1:147) or “many pupils are overloaded because of continuous assessment, including an increased number of tests and projects” (2:139). On the other hand, they talked about how to cope with pupils’ negative experiences of assessment:

“Assessment has the danger of giving pupils a feeling of failure . . . therefore, it is important to explain to pupils about assessment methods so that they understand the grounds of their grades” (1:133).

“. . . try to avoid starting with negative feedback, but say first what was successful and then focus on criticism” (2:105).

“Pupils’ trust in assessment may be diminished by deficient information of assessment criteria” (1:80).

Approximately a third of the conceptions dealt with other targets than the purpose (**Figure 3A**). Many students expressed two ethically topical and inter-related assessment conceptions: they wrote diligently about the teacher’s task to care for the *fairness in classroom assessment* or used explicitly the word “(assessment) criteria” included in the category of *constructs in assessment criteria*. The students described fairness with adjectives such as fair, unbiased, honest, truthful, transparent, and valid. They discussed fairness in relation to the versatile use of methods in enabling the visibility of pupils’ learning (e.g., 1:10, 1:17, 1:96) and emphasized teachers’ cooperation in the assessment of the same pupils (e.g., 2:4, 2:35). They referred also to biases in relation to careless documentation (2:34), ignorance of individual differences (1:55), and negligence of developmental orientation (1:60).

The difference between the two conceptions of *pupils’ involvement and engagement* (**Figure 3A**) was apparent: the student teachers were more concerned with the equal distribution of power between teacher and learners and felt that the learners’ voices should be better heard in assessment. They explained how “it is important to let pupils to participate in assessment more often” (1:2) or “a pupil should decide together with the teacher

what is the best way to show what is learned” (1:6). Less was written about how to succeed in engaging pupils themselves to improve their learning by means of assessment [“pupils should learn something from assessment and, based on that, try to develop their activities in the future” (1:43)].

Student Teachers’ Collaborative Learning (RQ3)

Near the top of the TALiP pyramid is the “teacher learning” (component E), in our case, “student teacher learning.” Xu and Brown (2016) argue that assessor identity construction is possible by means of frequent reflections and participation in learning communities with colleagues, in our case, with “peer students.” The DA3 enquired about peer group reflections.

The key result was *unanimity* as was anticipated in the analysis section above. Discussions were seen as “superficial” (3:144), “tentative” (3:35), or “insufficient” (3:42). Probably, some students were not provided with proper basic knowledge on assessment (concepts, methods, and principles), did not clearly recognize the assessment element of this ILE study module, or were too much stuck on their own school experiences of assessment (e.g., 1:15, 2:37, 3:4, 3:35).

Regarding the two main topics in the second phase of analysis, students reflected upon group *discussions or negotiations* (words as discuss, negotiate, ponder; $f = 51$) and recalled contributions with *versatile, even contradictory viewpoints* ($f = 38$). Several students indicated the added value of cooperation and talked about *observational learning, increased engagement, or negotiating multiple perspectives* (Nokes-Malach et al., 2015):

“In our discussions, we complemented each other very much. A team member started to talk, and another member enhanced it but also dared to bring in even very different opinions” (3:60).

“With the help of discussions, we were able to enhance our own personal views of assessment” (3:88).

“It was particularly important to have common critical discussion so that everybody knew others’ viewpoints and their rationale” (3:97).

Longer accounts in the DA3 data were valuable because they illuminated constructions of shared thoughts and struggles for consensus. The following two excerpts exemplify how the two groups tried to enrich the discussions and reach a common understanding of assessment and its use in learning.

“Assessment . . . caused significant reflections due to differences of opinion. These differences focused on formative assessment and whether it should be included or excluded. I saw the final compromise as reasonable and thanked Mary [pseudonym] for her perceptive comments. She did not look grumpy, and she accepted it. I can say that differences of opinion existed, but they did not escalate to dispute situations, and we reached unanimity by means of discussion in which both viewpoints were appreciated. This compromise solution is typical of group work, and it worked well in our case” (3:101).

“I tried to be active and express my own opinions – and I did it even sharply at times, to provoke discussion. But the deeper understanding of assessment was not reached very well

in our team. We all were perhaps lacking courage to bring our personal views into the discussions, and we preferred to go along with others' opinions of assessment. We had several assessment discussions and noticed how difficult peer feedback is to receive or give. People remained aloof, and we unfortunately started to repeat ourselves" (3: 144).

Using the concepts of Nokes-Malach et al. (2015), the first citation is an example of *observational learning*, with the idea of *complementary knowledge and error correction*. In terms of the collaboration factors of Scager et al. (2016), this refers to "mutual support" and "complementing one another." The latter excerpt reflects the notion of "*fear of evaluation*" (Nokes-Malach et al., 2015), whereby some members did not want to share their thoughts because they probably were afraid of critical comments. The researchers call it "*social loafing*" if team members just agree with others' views in order to make probable contradictions easier to handle.

DISCUSSION

Promisingly Versatile Knowledge Base of Teacher Assessment Literacy

The student teachers' reflections on the *assessment knowledge base* (RQ1) indicated that they were aware of the pedagogical significance of assessment methods and strategies, the ethically oriented responsibility to support pupils' learning processes, and pedagogical content knowledge. Less attention was paid to grading and disciplinary knowledge. Their interest in formative assessment is in line with the research evidence reported in our theoretical background (e.g., Yan and Cheng, 2015; Black and Wiliam, 2018; Cañadas, 2021). For example, Wilsey et al. (2020) found in their intervention study with experienced science teachers that "several teachers developed conceptions that were more iterative, in which frequent assessment was used to inform future instruction . . . The shifts in . . . mental models . . . may also suggest an approach to developing more process-oriented assessment practices in schools" (pp. 136, 154).

Awareness of versatile assessment methods is crucial for TAL because different methods improve pupils' opportunities to make their learning visible. An important enhancement in the methods repertoire was digitalization, which was a novel topic for our students. They realized how digital tools can make the assessment rationale more transparent not only for pupils and teachers (see Panero and Aldon, 2016) but also for important stakeholders, particularly guardians. The power of digital tools to motivate adolescents to view assessment favorably (perhaps as "edutainment") should not be underestimated.

Our data raised a considerable number of reflections regarding assessment ethics and responsibility, in relation to not only the knowledge base but also the conceptions. As Coombs et al. (2018) conclude, issues of fairness in assessment and the equitable treatment of students within the classroom are significant aspects for preservice teachers to reflect on in PsTE. Equitable treatment was a timely topic regarding the Finnish National Agency for Education [FNAE] (2020b) reform on assessment criteria for

the final assessment of basic education. Our assessment module proved to be successful in encouraging discussions on fairness, not only as a part of the knowledge base but also regarding assessment conceptions.

Assessment Conceptions in Opening Broader Views on Teacher Assessment Literacy

Regarding *assessment conceptions* (RQ2), a similar kind of pedagogically informed orientation as in RQ1 was also evident here. Preservice teachers preferred recognising pupils' needs and promoting their ability development when assessment purposes were reflected on (Brown and Hirschfeld, 2008; Xu and He, 2019). The assessment criteria or its institutional targets did not inspire them. Perhaps surprisingly, assessment's power to enable feedback was seldom mentioned, either in relation to the knowledge base or the conceptions (Harks et al., 2014). Without feedback, pure summative or formative data do not stand on their own and do not facilitate pupils' learning.

The question of preservice teachers' trust in their assessment literacy emerged also from the analysis of conceptions, which was anticipated in our second chapter with the help of DeLuca and Klinger (2010); Levy-Vered and Alhijab (2015), and Massey et al. (2020). We did not theoretically focus on self-efficacy but were able to make observations about what was included or excluded in the reflections regarding assessment confidence. There were only a few comments in the data claiming that assessment is an easy job, but not many serious complaints about its difficulty were found. The students were fully aware of assessment's broad nature ("may influence everything") and recognized the need for constant improvement in their own professional learning.

The assessment conceptions of our preservice teachers ($N = 168$) were slightly more focused on formative assessment's role in promoting learning compared to the most recent survey data of Finnish preservice teachers ($N = 287$) reported by Kytälä et al. (2022). Both explorations focused on similar teacher groups (subject, class, and special teachers) and introduced also a group of preservice teachers that see assessment as useless, harmful, or negative (inequal grading, stress, time-consuming). The last-mentioned group needs special attention in TE.

Student Teacher Learning as a Part of Teacher Assessment Literacy

We did not anticipate that peer group reflections would be as unanimous as they were. Xu and Brown (2016) emphasize in their TALiP-model that *teacher learning* (RQ3) in a collaborative context is crucial for assessment literacy. Perhaps the time for peer discussions was too short in our course to prompt varied or contradictory opinions of assessment. Another explanation might be the assessment criteria that were used: Modeling a learning object for a digital learning environment and justifying the choices related to it were assessed at the team level but learning diaries that included reflections on the multidimensional nature of assessment were assessed individually. In this sense, our results confirm Tinoca and Oliveira's (2012) suggestion that if online

practices are designed in accordance with the formative character of assessment, they could motivate participants' professional learning and be a valuable source of feedback for their learning processes.

The students' multiprofessional backgrounds (e.g., students of special education, history, mathematics, and counseling may have drawn lots in the same peer group) may have been challenging in terms of reaching a deeper mutual understanding if the concepts in the various fields of expertise were not yet established. On the other hand, there were good examples of progressive negotiations and complementary sharing of different viewpoints. Several studies (e.g., Charteris and Dargusch, 2018; Wilsey et al., 2020; Atjonen, 2022) suggest that assessment is not an easy topic for teachers to discuss and exchange their views and practices on with colleagues. Fear of mistakes and strong feelings of autonomy may make it difficult, and people may therefore resort to "common polite agreement."

The key perspective of our assessment module was interaction, as indicated in the title of the study module. This aspect remained slightly superficial in light of the results, although peer learning is important in the development of assessment literacy. Interaction referred not only to the interaction between pupils and teachers (involvement and engagement in **Figure 3A**) but also to the cooperation between schools and homes. Preservice teachers must become familiar with educational partnership in assessment as well. Based on our research data, school-home interaction was present in the students' reflections, although some had difficulty exemplifying this concretely.

Limitations of Our Research

Although one of our research strengths was the theoretically rigorous TALiP-model in the data analysis, we focused on only three of its components (see **Figure 1**; A, B, and E) that were not integrated tightly together in the empirical analysis. The integration was not possible because the students' reflections of the "guiding framework," "macro and micro contexts," and "assessments in practice" (i.e., three layers between components A, B, and E) were not discussed in the data. An interesting research project would be to explore students' assessment literacy from all the TALiP components by means of interviews.

Our assessment module was available for a student cohort in a TE department where voluntarily participating experienced teacher educators wanted to improve preservice teachers' assessment knowledge. Therefore, the convenience sample may question how the results can be used in other TE units. However, we were able to identify theoretical support for our efforts to strengthen student teachers' TAL (see e.g., DeLuca et al., 2013, 2019; Booth et al., 2016; Hill et al., 2017; Wyatt-Smith et al., 2017) and succeeded in describing interesting conceptions of assessment in a way that could be visible for other teacher educators as well.

Despite the presence of the TALiP-model and its conceptual illustrations in the article of Xu and Brown (2016), it sometimes required careful re-reading of the student accounts to be sure which category of knowledge base or conceptions was suitable.

On the other hand, qualitative analysis requires continued close reading in parallel with theory to fine-tune the classifications. In some cases, the students had produced longer accounts to clarify their thoughts or referred to a supplementary reply of another DA. By means of negotiations as a group of four authors of the article, we were able to become more convinced of the coherent line of interpretation.

One practical concern relates to working online due to COVID-19. Was something essential gained or missed due to distant studies as compared to "normal" lecturing, workshops, and face-to-face studies? Several surveys and practical experiences during the pandemic period indicate that some students strongly prefer personal contact in their learning. Technology-mediated peer group working may have reduced the extent and quality of the discussions in which people were not personally familiar with each other. On the other hand, the staff and students were well equipped with distance teaching and learning already in autumn 2020. We cannot indicate any significant differences in the results compared to autumn 2021, when the same assessment module was carried out with another cohort of students, and conventional classroom teaching and learning (in parallel with the remote option) was also available.

Our conclusion is that PsTE experiments need not to be resource-intensive to open preservice teachers' eyes to the various pedagogical inputs and outputs of assessment. This is in line with our previous experiences of the same TE unit (Äikäs et al., 2020; Atjonen et al., 2022) where the assessment module reported in this article was carried out. To encourage preservice teachers to enhance their assessment literacy, authentic assessment experiments with pupils must be available during teaching practice periods. The kinds of practical actions with pupils were not included in our assessment module. By means of practical experiments, more light could be shed on students' understanding of how learning objectives and assessment strategies coincide.

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 approval was not provided for this study on human participants because the preservice teachers gave their written permission to use their learning diaries as research data. The data were fully anonymized and did not contain particularly sensitive data. Intervention, as such, did not require any permission, but it belonged to the autonomy of the staff members that put it into practice as a part of the research-based TE program. Based on these reasons and the principles of the UEF Ethics Committee, approval was not needed. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s)

for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

SP, PA, and SK contributed to the key conception, empirical content, and design of the study. SP organized the database for the analysis and wrote a part of the Results section of the manuscript. PA and SP performed the deductive and inductive analyses of data and discussed its complicated cases with SK and PR. PA wrote the first draft of the manuscript. PR elaborated the interpretations from the viewpoint of student teachers' teaching practice. All authors contributed to manuscript revision, read, and approved the submitted version.

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Inconvenient truth? How different mentoring approaches impact student–teacher identity development

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This research attempted to illustrate how different mentoring approaches impact student–teacher identity development. Mentoring approaches in this study were categorized into transmission-oriented and constructivist-oriented. Guided by the biographical-narrative identity theory, the data in this study were extracted from interviews with four student teachers from Thailand while they were in the teaching practicum. It was found that student teachers who received the constructivist-oriented mentoring perceived themselves as teachers, were more confident about their teaching abilities, and expressed willingness to enter the teaching profession than those who received the transmission-oriented mentoring. Implications for selecting qualified school-based mentor teachers and the urgent need to offer an induction program to support mentors are discussed.

KEYWORDS

student–teacher identity, mentoring, teaching practicum, teacher education, mentoring approach

Introduction

Teaching practicum is an integral part of teacher education worldwide, and it varies from country to country (Darling-Hammond, 2017). In Thailand, where this paper is situated, teaching practicum is compulsory for teacher education, which is expected to be designed in constructive alignment with professional standards prescribed by the Teachers Council of Thailand (Vibulphol, 2015; Prabjandee, 2020). Teacher education in Thailand has undergone many reforms since 1978, “from a traditional model for teachers to a degree-led teacher educational model, and more recently, to a licensed and accredited teacher professional model” (Thongthew, 2014, p. 543). In 2005, Thai teacher education was changed from four years to five years in an attempt to uplift the status of the teaching profession (Chailom, 2019). However, in 2019, Thai teacher education was

shortened to 4 years to solve the teacher shortage crisis (Sairattanain and Loo, 2021). Even though the teaching practicum has received tremendous interest from researchers worldwide for at least five decades (Caires et al., 2012), research on teaching practicum in the Thai context, with a few exceptions (e.g., Prabjandee, 2019; Imsa-ard et al., 2021), is under-represented.

The teaching practicum is very important since it provides opportunities for student teachers to put theory into practice and learn about themselves (Britzman, 2003; Farrell, 2008; Zeicher, 2010; Cohen et al., 2013; Furlong, 2013; Trent, 2013; Smith and Lev-Ari, 2015; Prabjandee, 2019). In the teaching practicum, student teachers spend most of their time with school-based mentor teachers; thus, the heart of the teaching practicum experience depends mainly on the relationships with the mentor teachers (Johnson, 2003; Graves, 2010; Yuan, 2016; Izadinia, 2017). Mentoring relationships can be positive or negative (Izadinia, 2015). Prior research has extensively documented the positive side of mentoring (e.g., Johnson, 2003; Lindgren, 2005; Hobson et al., 2009; Richter et al., 2013; Orland-Barak, 2014; Mok and Staub, 2021). In Germany, for example, Richter et al. (2013) pointed out that positive mentoring relationships fostered teacher efficacy, teaching enthusiasm, and job satisfaction. Additionally, in the review of mentoring beginning teachers, Hobson et al. (2014) summarized that mentoring enabled student teachers to put challenging experiences into perspective, increase job satisfaction, and improve teacher retention.

A plethora of research has documented the positive sides of mentoring; however, little attention has explored its negative side, leaving a considerable gap in teacher education research (Izadinia, 2015, 2017; Yuan, 2016). The emphasis on the negative side will shed light on “useful insights into the complexities and challenges involved in pre-service teachers’ learning to teach” (Yuan, 2016, p. 189). Investigating the impact of negative mentoring will also complement extant literature to inform teacher education design to support student teachers’ professional development. In addition, when attempts were made to explore the negative side of mentoring, it was conducted to focus on student teachers’ knowledge (e.g., Mena et al., 2016). Still, limited research has been undertaken to realize how negative mentoring relationships between mentors and student teachers affect teacher identity development (Izadinia, 2017). This paper attempts to contribute to this sphere of inquiry.

Theoretical underpinnings

Student teacher identity

In the seminal reviews of teacher identity (Beijaard et al., 2004; Beauchamp and Thomas, 2009), it is widely accepted by most researchers that teacher identity is socially constructed,

dynamic, and multifaceted. To elaborate, teacher identity is formed through interaction with others in social contexts, and it is also developed based on how others perceive us. Teacher identity is not static; it is constantly evolving. It has been used to refer to in-service and in a discussion of pre-service teachers (Prabjandee, 2020), consisting of myriad aspects such as personal, professional, and political (Beijaard et al., 2004). In a more recent review on student–teacher identity, Izadinia (2013) summarized that student–teacher identity could be defined as “perceptions of their cognitive knowledge, sense of agency, self-awareness, voice, confidence, and relationship with colleagues, pupils and parents, as shaped by their educational contexts, prior experiences and learning communities” (p. 708). Based on this definition, student–teacher identity is all-inclusive, so it is necessary to situate it in a particular theoretical framework (Prabjandee, 2019).

In this study, the biographical-narrative theory, popularized by Kelchtermans (1993), was used to conceptualize student–teacher identity. The theory is appropriate for exploring student–teacher identity because it explains teacher identity construction as a learning process in which student teachers form a teacher identity by making sense of the teaching profession (Prabjandee, 2020). As student teachers learn to become teachers, they develop their understanding of the teaching profession by observing what teaching entails, performing “real” teaching in the school setting, and reflecting upon what kinds of teachers they want to be (Prabjandee, 2020). This understanding demonstrates student–teacher identity as an ongoing trajectory of professional development (Kelchtermans, 1993). In the biographical-narrative theory, Kelchtermans (1993) defined identity as autobiographical stories one narrates in a social context. Specifically, student teachers use stories as an interpretative framework to understand the teaching profession. The stories are both a form and a process illustrating a collective representation of oneself to others (Sfard and Prusak, 2005). The stories are inherently multiple, contextually shaped, and constantly evolving.

Kelchtermans (1993) explained that teacher identity development is an ongoing process of constantly identifying the *professional self* and formulating a *subjective educational theory*. The professional self is described as a personal story narrated in a social context. Kelchtermans (1993) argued that the professional self could be conceptualized in five dimensions: self-image, self-esteem, job motivation, task perception, and future perspective. For self-image, it is a general description of oneself as a teacher. Closely related to self-image, self-esteem is one’s confidence in their teaching ability evaluated against professional norms. Job motivation is the desire to choose, stay, or leave the teaching profession. Task perception is the conception of the teaching profession that one perceives. The future perspective is the expectation for professional development. Finally, the

subjective educational theory is an interpretative system that student teachers use to make sense of education and teaching (Kelchtermans, 1993).

The impact of mentoring on student–teacher identity

Mentoring is a social activity involving interactions between the mentor and the mentee (Ambrosetti et al., 2014). It is an essential component of the teaching practicum because it supports student teachers in learning about teaching, putting knowledge obtained from teacher education into perspective, and improving their teaching ability (Mena et al., 2017; Mok and Staub, 2021). The notion of mentoring is often used interchangeably with coaching and supervising (Ambrosetti et al., 2014); however, they are somewhat different in their focuses. Mentoring is often juxtaposed with coaching, but mentoring suggests a reciprocal relationship whereby the mentors and the mentee are involved in two-way knowledge sharing through reflective activities (Ambrosetti et al., 2014). In contrast, coaching emphasizes on-the-job training for in-service teachers to achieve implementation fidelity (Teemant et al., 2011). Supervising suggests a hierarchical relationship whereby specific skills are explicitly trained and assessed (Ambrosetti et al., 2014). This paper situates in the context of mentoring since it is conceptually precise when referring to the teaching practicum.

Different mentoring approaches were articulated to characterize the quality of interaction between mentor and mentee (Richter et al., 2013). Cochran-Smith and Paris (1995) described a mentoring continuum as *knowledge transmission* and *knowledge transformation*. On the one side, in knowledge transmission, a mentor is perceived as an expert passing on accumulative knowledge and experience of teaching in a hierarchically structured relationship to the mentee. However, on the other side, in knowledge transformation, a mentor is regarded as a collaborative partner helping a student–teacher grow professionally in a mutually generated relationship. In addition, Feiman-Nemser (2001) categorized mentoring as *conventional* and *educative*. Even though the two terms (conventional and educative) are different from Cochran-Smith and Paris (1995), conventional mentoring is like the knowledge transmission approach, whereas educative mentoring is like knowledge transformation. As a result, Richter et al. (2013) consolidated the interrelated conceptualizations into *transmission-oriented* and *constructivist-oriented* mentoring since they better reflect learning theory. The transmission-oriented mentoring is based on the behaviorist learning theories, describing learning as “a unidirectional process in which learners as passive recipients of information” (Richter et al., 2013, p. 168). The constructivist-oriented mentoring describes learning as the active construction of their

knowledge by linking new learning with previous experiences (Richter et al., 2013).

Research on how mentoring impacts student–teacher identity development is scarce in the international research landscape and Thailand context. For example, Izadinia (2015) explored how mentor teachers shaped student–teacher identity by using interviews and reflection journals in an Australian context. It was revealed that a positive mentoring relationship enabled student teachers to feel more confident as teachers. On the contrary, a negative mentoring relationship decreased their confidence, and they thought they did not improve as teachers. Similarly, Yuan (2016) investigated the dark side of mentoring on student–teacher identity in China by using in-depth interviews, field observation, and personal reflection. It was found that negative mentoring dismantled student teachers’ ideal identities, created feared identities, and influenced their professional growth. Recently, Izadinia (2017) added that different mentoring styles impinge on student–teacher identities, facilitating or inhibiting their professional development. Based on these studies, it can be concluded that the different mentoring approaches affect teacher identity and professional growth. While these studies provide valuable insights into the negative side of mentoring, they treated the impact on teacher identity holistically. However, since teacher identity is multifaceted (Beijaard et al., 2004; Beauchamp and Thomas, 2009), how mentoring relationships affect different aspects of teacher identity remains overlooked. By implementing a theoretical framework with multifaceted nature, such as the biographical-narrative theory (Kelchtermans, 1993), the following research questions were used to guide the pursuit of knowledge in this study:

1. How do student teachers describe their mentoring relationships?
2. How do different mentoring relationships affect teacher identity development?

The present study

Context and participants

This paper is part of a larger research project conducted before the COVID-19 pandemic in 2017. The project examined teacher identity development in teacher education and its roles in supporting identity development (Prabjandee, 2020). This paper is not *a priori*, in which the research questions were formulated to pursue accordingly. Instead, the objective of this paper emerged during the data analysis stage. When this study was conducted, the teacher education program was a 5-year curriculum (4 years of classes and 1 year of a teaching practicum) affiliated with a public university in central

Thailand. It was purposively selected because it has a long-history reputation of preparing pre-service teachers to enter the teaching profession. Still, the teacher education program has not yet fully understood why it could produce the graduates who decided to step into the teaching profession to become teachers. This study focuses on one aspect of teacher preparation – mentoring student teachers.

In the larger research project, ten participants volunteered to participate in the study. This paper extracted the data from only four student teachers (hereafter referred to by pseudonyms as *Nantipon*, *Wanna*, *Arisa*, and *Wisit*) because they were strong cases to illustrate how mentoring approaches affected student-teacher identity. Out of the four participants, *Nantipon* and *Wanna* received transmission-oriented mentoring, but *Arisa* and *Wisit* received constructivist-oriented mentoring. They were strong cases because the mentoring approaches they received were extremely different, which allows for greater comparison between the two groups. The other six participants were excluded because they received transmission-oriented mentoring like the two cases in this study (*Nantipon* and *Wanna*), and their teaching practicum contexts differed from the two selected cases. The participants' demographic information is presented in [Table 1](#).

All student teachers taught Grade 9 students from different secondary schools. Upon asking why they chose to enter teacher education, all participants reported various reasons. *Nantipon* said she wanted to be like her secondary-school teacher, whom she admired. *Wanna* remembered her inspiring childhood moments when she played the role of teacher. Unlike *Nantipon* and *Wanna*, who decided to join teacher education because of internal factors, *Arisa* enjoyed the external benefits of being a teacher. She narrated that teaching is a stable job that she could stay at until 60 years old. Similarly, *Wisit* entered teacher education simply because he enjoyed the subject, not because he wanted to become a teacher. All student teachers brought these initial reasons into teacher education, where they tried to make sense of the teaching profession. All student teachers chose the schools where they wanted to do a teaching practicum by themselves. The student teachers were assigned to work closely with school-based mentor teachers. In the interviews,

Nantipon and *Wanna* described the relationships with their mentor teachers as corresponding to the constructivist-oriented approach. *Arisa* and *Wisit* characterized their relationships with the mentors as the transmission-oriented approach.

Data collection and analysis

The data in this paper were derived from four semi-structured interviews, in which the interview protocol was designed based on the biographical-narrative theory ([Kelchtermans, 1993](#)). The interview protocol consisted of several topics: self-concept, perceived confidence to teach, reasons for entering teacher education, their understanding of what teaching entails, and teacher professional development expectations. Before the interviews, the participants were informed of the study's purposes. They signed a consent form before the interviews were conducted face to face. The interviews were audio-recorded and later transcribed for the analysis. The length of the interviews ranged from 29.50 to 33.13 min. During the interviews, written notes on critical points, direct conversations, and hunches were recorded to supplement the data.

In the larger research project, the initial goal of data analysis was to examine teacher identity development in teacher education. The coding method was used to analyze the data to find emergent themes ([Saldaña, 2009](#)). While exploring the interview data, it was evident that the student teachers' self-concepts as a teacher differed. Two student teachers perceived themselves as teachers, while the other two perceived themselves as students learning to become teachers. In trying to find the reasons for the difference, it was found that their relationships with school-based mentor teachers were the cause. As a result, the moments when the student teachers described the relationships with their mentors were analyzed closely by looking at how they linked with their teacher identities.

To maximize the trustworthiness of the analysis, a critical inter-rater was requested to analyze the data independently. Later, we discussed our analyses together until we reached a consensus. For example, we discussed the term to describe mentors' practices. In my analysis, I used the word "mentoring strategies" to describe the practices narrated from the student teachers' perspectives. Still, the critical inter-rater suggested that "strategy" might not be conceptually accurate because it is used in the context of acting and solving problems toward a particular aim. Instead, we agreed to use the term "approach" since it is a general way of thinking about the mentors' underlying thoughts of what student teachers should or should not do. Given the limitation of qualitative research, even though attempts were made to explain the cause for different self-concepts among student teachers contributed by different mentoring approaches, I did not intend to claim a causal relationship. Instead, the goal of the analysis was to

TABLE 1 Demographic information of the participants.

Student teachers	Gender	Level of teaching	Mentoring approaches	
			Transmission-oriented	Constructivist-oriented
Nantipon	Female	Grade 9		✓
Wanna	Female	Grade 9		✓
Arisa	Female	Grade 9	✓	
Wisit	Male	Grade 9	✓	

provide a detailed description of how different mentoring affects student-teacher identity.

Findings

Different views toward mentor teachers

The thought of entering the teaching practicum for the first time was exhilarating for the four student teachers. They reported that they were extremely excited. It had been four years of learning in the teacher education program. Finally, they had an opportunity to learn about being a teacher in the “real” school setting. However, the relationships with their mentors gave them more exciting or bitter experiences depending on the mentoring approach being implemented. The interview revealed that two student teachers (Wisit and Arisa) described the relationships with their mentor teachers as unfavorable, controlling, and uneasy. In contrast, the other two (Nantipon and Wanna) described the relationships with their mentors as supportive, encouraging, and favorable. Even though Wisit and Arisa were placed in different schools, they were assigned to work with mentor teachers who adopted the transmission-oriented mentoring approach. It should be noted that the mentor teachers did not articulate what approaches they used for mentoring. Still, judging from the participants’ perspective, they implemented transmission-oriented mentoring. When asking why they did not feel like a teacher, Wisit immediately replied:

Wisit: “My mentor has certain views about teaching. She wants me to do exactly what she tells me to do. Before I do something, I must ask for permission from her. I must run through what I want to do with her. She told me not to use negative reinforcement when the students misbehave. I tried to use only positive reinforcement, but the students didn’t care. They didn’t respect me. They said that even their parents did not tell me what to do. I don’t think I can be a good teacher. She corrected me when I taught the students that ‘eat breakfast’ was okay. She interrupted me immediately during my class and said that’s wrong. She told the entire class to ‘have breakfast.’ I saw in a book that ‘eat breakfast’ is okay, but I don’t share it with her. It seems like she wanted me to teach just like her. I keep my mouth shut most of the time.”

It was evident that Wisit’s mentor wanted to mold Wisit into a particular type of teacher based on her conception of a good teacher. She had “certain views about teaching,” such as “not to use negative reinforcement,” and she tried to impart these views to Wisit. As indicated in the interview response that “I must run through what I want to do with her,” the mentor teacher did not relinquish her authority to Wisit, resulting in a

lack of freedom to experiment with teaching by himself. These mentoring practices hindered the adoption of teacher identity since Wisit did not perceive himself as a teacher.

Similarly, upon being asked to articulate why she did not see herself as a teacher, Arisa immediately narrated her relationships with the mentors.

Arisa: “My mentor always controls me. She always tells me to do things and asks me to follow strictly. She always gives me the topic to teach last minute. I always don’t have much time to prepare. When I asked for permission to plan teaching topics by myself, she refused. She told me she knew the students and what they wanted to learn. She asked me to have hands-on activities in every class. I can’t do every class because she gives me the topic to teach last minute. I became incompetent in her eyes. One day she asked me in front of the crowd ‘Do you really want to be a teacher?’ I don’t have the freedom to do what I want. Sometimes, I envy my friends who have supportive mentors. I feel like I am not myself.”

Based on the quote above, it was clear that Arisa worked with a highly controlling mentor teacher who did not allow her to have freedom in teaching. Like Wisit’s mentor, Arisa’s mentor had a clear image of what teaching should be, and she wanted to implant this image in Arisa. Her response is filled with bitter emotion, which signifies her inability to adopt a teacher identity.

On the contrary, Nantipon and Wanna described the relationships with their mentors as overwhelmingly positive and corresponding to the constructivist-oriented approach. Nantipon reported that she felt like a teacher because her mentor was supportive and kind.

Nantipon: “My mentor is amazing! She always supports me in everything. My first day of teaching was a disaster. I was shaking. I couldn’t hear myself. I knew it was not a good class even though I was very prepared, but my mentor comforted me at the end of the class. She told me that it happened to everyone. Prepare more if you feel that you are not confident. Keep doing it. Just do it. What is good about her is that she allowed me to fail even though she knew that I would fail. When I succeed, it is because of her support. When I asked for teaching tips, she gave me valuable suggestions.”

For Nantipon, the relationships with her mentor were depicted as positive and favorable. Nantipon’s mentor gave her the freedom to experience teaching by herself and learn from her mistakes. Her mentor also offers psychological support (she comforted me) and technical support (she gave me valuable suggestions). These types of support eased the challenges she encountered during the teaching practicum.

Moreover, upon being asked why she felt she was a teacher, Wanna immediately reported that it was because of her mentor.

Wanna: “My mentor always gives me opportunities to do the job of real teachers. She allows me to plan lessons, solve students’ misbehaviors problems, or give consultations to students. She never intervenes in what I do, but she observes. I know she cares, but she gives me space. When I need help, she is there for me. I’m not afraid to make mistakes because I know that she has my back all the time.”

It was obvious that Wanna’s mentor is very supportive during her teaching practicum. Freedom is the central practice of their mentoring relationships. Since she was given a space to experiment with her teaching and she was permitted to fail, Wanna was empowered to take charge of her own learning to become a teacher. She could construct the knowledge of teaching by herself, and she could adopt teacher identity positions based on her teaching experiences.

The impact of mentoring on student–teacher identity

Teacher identity was shaped by student teachers’ biographies, including motivation to choose teacher education as a career choice and initial image of the teaching profession. Wisit was not interested in being a teacher but was attracted to teacher education because he enjoyed the English language. Arisa perceived that teaching could offer her financial stability, and she wanted to be an English teacher, “just like my mother.” The interview data revealed that mentoring relationships strongly impacted student-teacher identity development. The impacts are manifested in different aspects of student–teacher identities as illustrated in [Figure 1](#).

The data revealed that different mentoring approaches affected three aspects of student-teacher identities (*self-image*, *self-esteem*, and *job motivation*); however, the other three aspects were not affected by mentoring approaches (*task perception*, *future perspective*, and *subjective educational theory*). Nantipon and Wanna, who received constructivist-oriented mentoring, perceived themselves as teachers because they were given the power and space to experiment with teaching and learn from their mistakes. In other words, they were provided opportunities to take risks. They could construct the knowledge of the teaching profession by themselves. However, Wisit and Arisa did not start to adopt teacher identity because they were not given freedom. In addition, the four students also reported different self-esteem or their perceived confidence to teach. Those who received the constructivist-oriented mentoring tended to be more confident in their teaching ability than those in the transmission-oriented group. Moreover, different mentoring approaches affected their job motivations. At the end of the teaching practicum, the

constructivist-oriented group was more willing to step into the teaching profession than the transmission-oriented group.

However, the other three aspects of student-teacher identities were not affected by different mentoring approaches, namely task perception, future perspective, and subjective educational theory. All participants reported that they understood the nature of teaching better and witnessed its complexities with their own eyes. During the teaching practicum, they also developed expectations to know how to get into the teaching profession, even though those who received the transmission-oriented mentoring expressed a reluctance to enter the teaching profession. Finally, their subjective educational theories were materialized into reality; they became aware of the real meaning of teaching. These similarities across the participants were attributed to the holistic experiences of the teaching practicum. The context of the teaching practicum itself helped student teachers understand the complexity of the teaching profession.

Discussion

Utilizing the biographical-narrative theory ([Kelchtermans, 1993](#)), this study pointed out that different mentoring approaches impact student–teacher identity development. Mentoring approaches revealed in this study were characterized based on the interaction between the mentor and the mentees, degree of freedom to experiment with teaching, and mentoring expectations from student teachers. The mentoring approaches, revealed in this study, followed transmission-oriented and constructivist-oriented mentoring ([Richter et al., 2013](#)). Unlike prior research that presented the impact of negative mentoring relationships on student-teacher identities from a holistic perspective (e.g., [Izadinia, 2015, 2017](#); [Yuan, 2016](#)), this study found that mentoring approaches affected *self-image*, *self-esteem*, and *job motivation*, but they did not affect *task perception*, *future perspective*, and *subjective educational theory*. Based on the findings, it was clear that mentoring relationships partially impacted student-teacher identities.

This study pointed out that different mentoring approaches affected how student teachers perceived themselves (teachers or student teachers) and later influenced their confidence to teach (gradually confident or not confident) and the decision to step into the teaching profession after completing the teaching practicum (choose teaching or reluctance to choose teaching). Those who had self-concept as teachers believed in their ability to teach and tended to step into the teaching profession more than those who did not. The findings are not entirely surprising, but they are unique in the literature. Prior research has revealed that negative mentoring affected student-teacher identity ([Izadinia, 2015, 2017](#); [Yuan, 2016](#)), but this study found that negative mentoring approaches did not only affect student teachers themselves but also affected the teaching profession

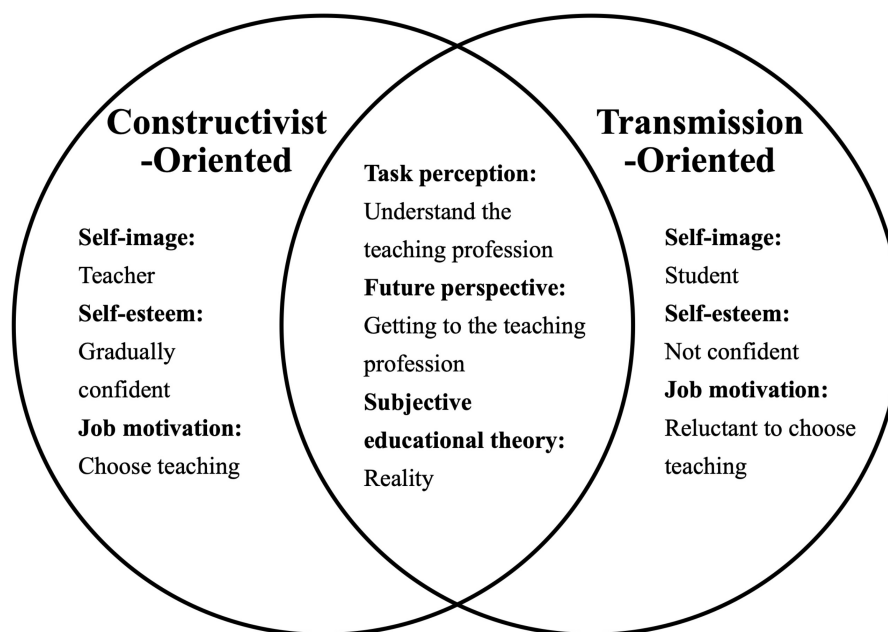


FIGURE 1

The impact of mentoring on student-teacher identity.

since some student teachers were not certain about entering the teaching profession because of the negative mentoring approaches they received during the teaching practicum.

Mentoring relationships did not affect the other aspects of student-teacher identity: task perception, future perspective, and subjective educational theory. This finding is also new to the literature. Regardless of receiving different mentoring approaches, all participants became aware of the complexity of the teaching profession, expressed the desire to improve themselves similarly, and their subjective educational theory became a reality than before. This might be because the teaching practicum itself provides tremendous opportunities for the student teachers to figure out the nature of the teaching profession (Kelchtermans, 1993). These findings added to the benefits of the teaching practicum articulated clearly in prior research (e.g., Britzman, 2003; Farrell, 2008; Zeicher, 2010; Cohen et al., 2013; Furlong, 2013; Trent, 2013; Smith and Lev-Ari, 2015; Prabjandee, 2019).

Even though this study offers an insight into how different mentoring approaches impact student-teacher identities, interpreting the findings should be conducted with caution. The results could not be generalized since the participants were only case studies to illustrate how different mentoring approaches impact student-teacher identity development. Additionally, the data in this study were obtained from the student teachers' perspectives only; "the other side of stories," for example, from mentor teachers, were not included. Future research may want to compare the data from student teachers' perspectives with mentors' perspectives to triangulate the results. Other possible

reasons can also be further explored to see how they affected student-teacher identity development.

Implications and conclusion

This paper provides empirical evidence to claim that a mentor teacher is essential in the teaching practicum. The importance of mentor teachers is evident from the impact of their mentoring practices on student-teacher identity development (Izadinia, 2015, 2017; Yuan, 2016). Teacher educators should spend considerable time selecting qualified mentor teachers to work closely with student teachers. Based on the findings of this study, it was clear that mentor teachers should be supportive of student teachers during the teaching practicum. They should also offer a safe space for the student teachers to experiment with teaching by themselves. The student teachers should be allowed to fail to teach and learn from their mistakes rather than protect them from failure. Imposing what student teachers should do from the mentors' preference hurts more than helps.

Because the mentor teachers in this study did not use similar mentoring approaches, resulting in different practices that negatively impact student-teacher identities, the roles of mentor teachers should be communicated clearly. On the one hand, mentor teachers should be aware that the transmission-oriented approach, where mentor teachers impinged particular views of teaching to student teachers, hindered the adoption of student-teacher identity even though they might adopt it with

healthy intentions. On the other hand, they should be aware that the constructivist-oriented approach could facilitate student-teacher identity development. The findings call for offering a mentor induction program to prepare mentor teachers to implement constructivist-oriented mentoring. Extensive literature often finds ways to provide an induction program for student teachers, but induction programs for mentor teachers are overlooked. This study calls for an urgent need to design an induction program to support mentor teachers to undertake effective mentoring practices for student teachers during the teaching practicum.

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 Burapha University Institutional Review Board (BUU-IRB). The patients/participants provided their written informed consent to participate in this study.

Author contributions

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

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Conflict of interest

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

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Views across the boundary: School-based co-teachers experiences with co-teaching in initial teacher education

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School and university partnerships are widely promoted as an effective means to support the preparation of pre-service teachers (PSTs). However, these partnerships are rarely conceived with practicing teachers working in a university context as co-teachers with university teacher educators. School-based co-teachers (SBCTs) (practicing teachers who contribute to Initial Teacher Education (ITE) by teaching alongside university-based teacher educators) contribute to ITE through their support for curriculum and assessment development, providing opportunities for observation and experiences in schools, and teaching with university teacher educators. However, the role of a SBCT requires some careful navigation and negotiation of the educational spaces that a SBCT must cross as they teach in university classrooms and foster a co-teaching relationship. This research articulates the process of boundary crossing that four SBCTs undertook as they supported the development of pre-service science teachers. Boundaries exist between the practices and perspectives of teaching school science students and teaching science PSTs at university. Data were collected from four SBCTs across one academic year, including an initial survey at the beginning of the year, an interview at the end of the year, and documentation from co-teaching meetings across the year. An inductive thematic approach was taken to analyze the data. Five themes were identified that describe the ways SBCTs viewed their role as a co-teacher and their associated learning in this role. Drawing on literature around boundary-crossing dialogical learning mechanisms, the themes are described with illustrative excerpts to represent the range of SBCTs experiences. Our data indicates that SBCTs found many opportunities to share their wealth of knowledge and experience with pre-service science teachers but also identified, and often sought out, opportunities to professionally learn and grow. Findings include the importance of sharing aims and purposes to understand the context and the generation of shared knowledge through peer reflection on teaching. This article offers insights to others who are looking to form and sustain productive relationships with SBCTs to support learning for PSTs in ITE courses.

KEYWORDS

co-teachers, boundary crossing, Initial Teacher Education, science education, identity

Introduction

Initial Teacher Education (ITE) programs are frequently set up in such a way that reinforces the often noted disconnect between pre-service teachers (PSTs) experiences in schools and universities. PSTs go between university and placements at schools (in a variety of permutations) and are supposed to take what they have learned at university and put into practice on placement (Korthagen and Kessels, 1999). While on these placements, PSTs are supported by practicing teachers (mentor, co-operating, etc.) who play a significant role in developing PSTs' knowledge and practice, especially during the initial stages of their development (He, 2009). However, the support provided is often haphazard, with very few mentor teachers being well-prepared to work with PSTs (Goodfellow, 2000). Zeichner (2010) suggests that very few mentor teachers have knowledge of what PSTs have experienced at university prior to coming to placement and thus, PSTs often find that there is little connection between what happens at university and what they experience on placement. Darling-Hammond (2009) referred to this lack of connection between university and placement as the "Achilles heel of ITE." As suggested by White et al. (2015), there are now many school-university arrangements that have brought schools and universities together to support the development of PSTs in ITE programs and has seen practicing teachers become an integral part of teacher education. This article looks to explore the experiences of four practicing science teachers who were involved in a school—university partnership that saw them cross the border from school to university and work as school-based co-teachers (SBCT) in a science education unit as part of an ITE program.

Literature review

School university partnerships

In an attempt to escape the flawed assumption that ITE is the sole responsibility of universities (Clarke et al., 2012), school-university partnerships with a focus on co-teaching opportunities for practicing teachers are being formed (Nissim and Naifeld, 2018). These partnerships take many forms (such as practicing teachers teaching at university, teachers acting as mentors to PSTs on placement, to name a few) and begin to draw attention to an opportunity for shared learning between teacher educators, PSTs, and mentor teachers. Lopez-Real and Kwan (2005) suggest that the focus is usually on the PSTs learning, with little emphasis placed on mentor teachers in relation to their own learning.

In the Australian context, an inquiry into teacher education titled Action Now: Classroom-Ready Teachers (Teacher Education Ministerial Advisory Group [TEMAG], 2014), framed the "problem" of ITE as universities and lecturers

failing to locate the "balance" of theory and practice in ITE. The report states an urgent "appetite for change" in ITE throughout the sector (Teacher Education Ministerial Advisory Group [TEMAG], 2014). In considering this change with reference to locating a balance between theory practice, one way an ITE program may seek to "bridge" the perceived "knowing-doing gap" (Loughran, 2011) is to create school-university partnerships that utilize the best skills and practices of all involved, providing opportunities for shared learning and mutual benefit. Partnerships between schools and universities are widely promoted as effective means to support the preparation of PSTs (Smedley and Rooy, 1996). Although, the nature of partnerships between schools and universities is changing around the world, with experienced teachers taking more of a role whilst remaining in the classroom, as opposed to making the transition to university and becoming a teacher educator (White et al., 2015). Particularly in Australia, partnerships have been formed in response to numerous reports, such as Teacher Education Ministerial Advisory Group [TEMAG]'s (2014), suggesting that there needs to be a much stronger integration between the school-based and university-based components of ITE. While there are numerous school—university partnership models, co-teaching often plays a role in bringing schools and universities together.

The many types of teacher educators

Many researchers have explored the types of teacher educators that are involved in ITE, possibly in search of a simplistic response that they were not able to find (see Ducharme and Ducharme, 1993; Swennen and van der Klink, 2009; Goodwin and Kosnik, 2013 as examples). While Snoek et al. (2011) defined a teacher educator "as someone who contributes in a formal way to the learning and development of teachers" (p. 652), the European Commission (2013) have acknowledged that "many of those who teach teachers might not consider themselves to be teacher educators at all" (p. 8) highlighting the ill-defined nature of the role of teacher educators. A further search through the literature brings to light the mutual influences on PSTs during their ITE that may go unrecognized if only "formal contributions" are acknowledged. While there has been an expansion of teacher educators in the sense that they can be employed in varying ways, work in sole or across multiple contexts and participate in a wide range of activities related to the initial and/or ongoing professional learning of teachers, the literature (White et al., 2015; White, 2019) identifies three types of teacher educators: institute based teacher educators (IBTEs), school-based teacher educators (SBTEs) and community based teacher educators (CBTEs) (Zeichner et al., 2016, p. 12). IBTEs are often seen as those who work solely in a university context and have major responsibility for facilitating sessions for PSTs as part

of ITE. They also usually have a responsibility to complete research based in education and may be involved in teacher professional learning and contributing to the education sector more broadly (being on boards, competing evaluations, etc.). Inspired by the development of school led models of ITE (predominantly in the United States and United Kingdom), SBTEs are often seen as those who work solely in a school context or across school and university contexts perhaps as “dual-role professionals” (White et al., 2015 p. 3), continuing to teach in school classrooms whilst also facilitating teacher learning. They are usually responsible for teacher education in their school; mentoring PSTs on placement, overseeing other mentors, finding learning opportunities for PSTs, and maintaining links with universities. They go beyond the responsibilities of a traditional PST mentor and lead the professional learning of teachers across all stages of career, from pre-service, to experienced. CBTEs are members of the community such as parents, community leaders or elders who bring to light social and cultural issues related to education and support PSTs learning about the role these issues play in education broadly and in classrooms for individual learners.

The three types of teacher educators identified through the literature appear to be bounded by the context of their significant place of employment being institute, school, or community, and perhaps with the assumption that this is also the context for their work in teacher education. For example, in White et al. (2015) research, the SBTE participants were all involved with the School Direct program, had dual roles (teacher and teacher educator) and were,

...involved in planning, leading, and evaluating at least one aspect of the taught course, for instance: subject knowledge development days in school; seminar groups; school-led training sessions and one-to-one tutorials to support students in the directed tasks that focus on developing their subject and professional knowledge for teaching. Some additionally have the role of mentor for a student-teacher in their school (p. 3).

This positions them very clearly as SBTEs with significant teacher education responsibilities that are situated within their school context. White et al. (2015) also identify a subset of SBTEs that they call “teacher tutors” (p. 4), who are responsible for both mentoring and teaching of one student teacher. The authors designation was a deliberate effort to clearly separate the roles of mentoring and teaching in ITE as a way of accounting for the European Commission (2013) acknowledgment that not everyone who teaches teachers will want to identify as a teacher educator and yet, the SBTEs in this subset all identified firstly with the role of mentor, viewing their teaching role as an additional responsibility of their mentoring (White et al., 2015 p. 8). Along with this confusion around their role comes a need for further research into the professional learning needs of SBTEs, which may begin to offer clarity around these roles and what might be offer support to those who fill them. In their

initial exploration of SBTEs professional learning needs, White et al. (2015) found that they include “developing pedagogical approaches suitable for teacher education, especially explicit modeling.” While SBTEs are becoming more prevalent in Australia, the needs of this group have attracted little attention to date (Berry, 2021). This is an area in need of further research as working at the meeting point of teacher education, practicing teacher and academic presents a genuine set of challenges (Reynolds et al., 2013).

Co-teaching

Co-teaching is defined and organized in different ways, and for different purposes. In a co-teaching relationship, teachers are positioned as collaborative equals, with their own set of expertise to drawn upon to co-plan, co-teach, co-reflect, and co-evaluate (Scantlebury et al., 2008). In this study, co-teaching is defined as “two or more teachers teaching together, sharing responsibility for meeting the learning needs of students and, at the same time, learning from each other” (Murphy and Scantlebury, 2010, p. 1). Quality co-teaching utilizes the strengths and expertise of each teacher to provide instruction that is more effective than what either could provide alone (Friend, 2014). Thus, quality co-teaching must be established on the basis of a strong partnership where everyone is engaged and committed to the shared, negotiated outcomes (Rytivaara et al., 2019).

Co-teaching is becoming more common in higher education but is still only found occasionally in the literature. In two United States studies, Bass (2005) and Vasquez-Montilla et al. (2007) it was found that faculty who co-taught valued the opportunity to be creative and reported a sense of fulfillment that they had not experienced before in their professional lives. In ITE, co-teaching is valued as one way of presenting PSTs with models to support development of co-teaching skills (Cook and Friend, 1995; Graziano and Navarrete, 2012), with co-teaching exemplified by mentor teachers at schools and university staff during PSTs school placements (David and Ann Mickelson, 2017). The work of Nissim and Naifeld (2018) who investigated a co-teaching partnership between mentor teachers and university teacher educators found that PSTs who experienced co-teaching at university increased their use of co-teaching while on school placement. As Korthagen (2007) recognized “there is a strong need for researchers and practitioners to build joint communities, bringing together both a research and a practical focus” (p. 304). Responding to Korthagen’s call, published examples of school-based teachers working with teacher educators in university settings have emerged (see examples from Nevin et al., 2009; Downton et al., 2018). While studies are beginning to accumulate about teachers working together in co-teaching roles, it is difficult to find examples of university-based

science Teacher Educators (UBTE) working with school-based science teachers in ITE academic units, a gap this article aims to address.

In this article we have used the term SBCT to describe full-time practicing teachers in secondary schools who take a role in ITE in addition to their work in schools, and who facilitate learning for PSTs at their school and at university. We also use the term University Based Teacher Educator (UBTE) to describe teacher educators who work in universities. In this study SBCTs and UBTEs were co-teaching in science education units as part of an ITE program.

Contextual frame

Boundary crossing and dialogical learning mechanisms

While the TEAMAG report (Teacher Education Ministerial Advisory Group [TEMAG], 2014) attempts to deal with the so-called practice-theory divide that exists between schools and universities, reconsidering the different fields of expertise for teaching school students and PSTs from a boundary crossing perspective allows for a more complex view of what it means to work in academic units in ITE. “Boundary crossing” is a term used to describe the transition and interactions that occur when professionals move between different sites of practice (different institutionalized and social practices) and enter situations that are new and unfamiliar (Akkerman and Bakker, 2011). Importantly, boundary crossing is between sites of practices that are horizontal (rather than hierarchical) systems of networked expertise. In moving between these sites with different institutionalized and social practices, people often “face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid situations” (Engeström et al., 1995, p. 319). Boundary crossing refers to these attempts to bridge points of division amidst disciplinary knowledge structures within and beyond (Akkerman and Bakker, 2011). The learning can be bidirectional and dynamic, and oriented toward both the personal and the collective. In these ways, boundaries can become powerful resources for making connections between sites of practice, such as schools and universities, and the development of intersecting and expanding identities and practices that can be used in different sites.

Boundary objects support the crossing of boundaries and have been referred to as the artifacts that help those people crossing by fulfilling a bridging function (Star, 2010), or in a very different way, as a shared problem space, with the object becoming the motive for shared activity between sites of experience (Edwards and Fowler, 2007). Instead of objects, others promote shared “boundary

experiences” that require open and critical relationships between people from different disciplinary fields, because boundary crossing requires “a confrontation of difference and diversity and establishing a new order of practice” (Clarke et al., 2012, p. 255). Therefore, people, objects, structures, facilities, and equipment can act as tools to bring people together to interact and enable shared decision making to facilitate movement across boundaries (Akkerman and Bakker, 2011). While often difficult to achieve, when such interactions are established and sustained between people who bring different practices together (from different fields), profound and sustained changes in practices and identity can occur.

In Akkerman and Bakker’s (2011) review of 187 studies on boundaries/border crossing, four dialogical learning mechanisms that arise at the boundary were identified, namely: (1) identification of discontinuities; (2) coordination of boundary objects; (3) reflection on practice and identity; and (4) transformation of practice and identity. Akkerman and Bakker (2011) argue that dialogue and collaboration are essential components for learning across boundaries. Each learning mechanism requires a shared dialogue to explore new meanings and enable learning, rather than a monolog where one person gives the information/meaning to another without exploration and clarification of meaning through discussion.

Identification of discontinuities relates to the learning that arises by recognizing the ways one practice differs from another (othering), and the underlying need for legitimating the coexistence of the interpersonal roles, each with different practices and related identities (Akkerman and Bakker, 2011). SBCT recognizing that they are not able to teach in the same way in ITE as they do in school is an example of discontinuity. Both practices differ from each other, with each providing their own intrinsic value and purpose. The learning potential of discontinuities relates to these renewed understandings of practices and identities.

Coordination of boundary objects relates to movement at the boundary of different sites that goes beyond identification, through various coordination processes to make joint work more efficient and routinized. The learning potential of coordination of boundary objects is in overcoming the boundary, rather than reconstructing it, and therefore facilitating future and effortless movement between the different sites (Akkerman and Bakker, 2011).

Reflection on practice and identity relates to a person recognizing something new about their own and others’ practices and involves perspective making and perspective taking. Boland and Tenkasi (1995) refer to perspective making and perspective taking as two complementary processes, these being developing communication that strengthens the unique knowledge of the collective, and developing communication that takes the multiple knowledges of others into account.

This learning mechanism goes beyond comprehending the difference within and between distinctive perspectives and practices of one's own practice and that of others but taking these new perspectives to reflect on their practice in new ways (Akkerman and Bakker, 2011). For example, reflection involves the SBCT making their own perspective explicit, reflecting on it in light of other perspectives, which at the same time taking the other perspectives into account for a more complex understanding. Reflection involves making explicit these expanding perspectives and practices and therefore constructing a new identity that informs future practice.

Transformation of practice and identity, recognizes the learning that leads to a significant new and in-between practice, a boundary practice. Transformation typically consists of several processes, consistently initiated with a problem that forces people with different expertise to reconsider their own practice and how it relates to the other. Confronting these contradictions requires realizing and explicitly noticing the differences to learn about one's own practice and that of others. Recognizing a shared problem space often occurs as a direct response to confrontation, and while recognizing these contradictions between different sites carry strong potential for learning, such recognition is not without its challenges. This process can be difficult because ideas from one field may be conceptually difficult, tacit, or unfamiliar, and requires those involved to let go of their usual way of thinking and practice (Land et al., 2016). Overcoming the problem requires joint action to establish hybrid practices. If this change occurs, continuous joint work at the boundary can lead to significant shifts in learning and lasting change, and which ultimately leads to identity development (Akkerman and Bakker, 2011). The boundary crossing lens is particularly relevant for ITE, and the shifts between teaching and learning to teach in different specialized sites, especially universities and schools.

In this study, people who are specialized working in teacher education and teaching school science come together and take on new roles co-teaching science PSTs as an interdisciplinary co-teaching team. The boundary crossing dialogical learning mechanisms (Akkerman and Bakker, 2011) provide a lens for conceptualizing the process of SBCT learning and related changes in practice and identity from moving across the boundary from one specialized and familiar field to one that is new and unfamiliar. In this case, co-teaching with UBTEs in ITE provides a new and unfamiliar site of practice (different institutional and social practices).

Research question

In this study, as part of a larger project, we are focused on the perspectives of SBCTs who work (co-teach) as part of a school-university partnership with university-based Teacher

Educators (UBTE) as part of an ITE program. In these roles for the SBCT, and a new arrangement of co-teaching between SBCT and UBTE in ITE academic (secondary science education) course, we aim to explore the SBCTs' perceptions of the co-teaching role. In doing so, we consider SBCT learning as a result and the possibility of re-imagining this new site of practice for school teachers to co-teach with UBTE in ITE academic units. Our research was guided by the following research question:

In what ways do school-based teachers perceive their co-teaching role and associated learning within an initial teacher education science program?

Materials and methods

Methodologically, this study is embedded in a small-scale research paradigm (Knight, 2002). Small-scale research is appropriate when a study has a focus on a small number of participants for a specific purpose (Dexter and Seden, 2012). Small-scale research is a purposeful approach to explore a range of ways of thinking about a given phenomenon and is often helpful when time and resourcing is limited, although it has its limitations in terms of generalizing findings (Poulson and Wallace, 2003). For this study, a small-scale approach was appropriate as it provided a way to sense-make four SBCTs views of their learning and practice as co-teachers in science education units as part of an ITE program.

When education research is looking to consider the complexities inherent in teaching and learning and bring to light lived experiences, qualitative methodologies are often the best fit (Atkins and Wallace, 2012). For this study, which is probing teachers' views and considering the influence of an experience on perspectives and practice, a qualitative lens is appropriate and will allow for rich, "thick" descriptions of experiences (Merriam, 1998). A qualitative approach in the traditions of narrative inquiry and analysis methods, has been embraced in this article to represent and critically examine participants' experiences and thinking in a way that reflects and honors the participants' voices (Clandinin and Connelly, 2000). It is acknowledged that the small data set—such as the one in this study with a survey and one-off interviews with four SBCTs—impacts on the ability of this research to offer generalizable outcomes. However, the small sample size provides insights into the participants' perspectives and practices, and by drawing on aspects of narrative inquiry this article forefronts their voices as valued informative sources (Guest et al., 2006). This study does not seek to make generalizations but does look to explore the insights derived from the experiences of the four participants. This section will detail the context and participants involved and how they were selected before describing the data collection and analysis processes.

Context and participants

For our research, we arrived at the term SBCTs because all of our participants are full-time practicing teachers in secondary schools who take a role in ITE in addition to their work in schools. However, our participants' work in ITE goes across contexts; sometimes their teaching in ITE is at the university as part of a formal workshop or lecture and other times, it takes place in their school. Their work also encompassed a shift in perspective, sometimes they were modeling teaching practice as if they were teaching one of their classes at schools, other times they were observed teaching a class at their schools and on other occasions, they were in more of a reflective or metacognitive space articulating the thinking behind their practice. Further, some SBCTs may have a role in mentoring PSTs while they are on practicum, but this is not part of the SBCT role or responsibilities. For instance, in this study only half of our participants were involved in mentoring a PST on practicum. In our research, SBCTs were involved in planning, teaching, and evaluating several aspects of the ITE program they were part of but were not responsible for any assessment of PSTs assignment or teaching practice. A further point of difference is that the SBCTs were always co-teaching with a university-based Teacher Educator (UBTE) and were never solely responsible for facilitating any aspect of the ITE program. SBCTs and UBTEs typically work together in a school—university partnership designed to utilize the best skills, knowledge, and practice of all involved, through a co-teaching arrangement. In contrast, the role of SBCT, as briefly outlined above, co-teaches in the ITE academic units, and therefore needs to transition across different systems (across boundaries) into a new site of practice that may challenge their professional practice and sense of professional identity. This article looks at the learning experience of SBCTs through a lens of learning mechanisms of boundary crossing.

The research took place over one academic year in an ITE program in an Australian university. Four SBCTs were employed on a sessional basis by the university to work with UBTE to inform the design and teaching of four different science method units. Each SBCT supported a different secondary science education unit (see [Table 1](#)). Each SBCT was recruited on the basis of their reputation as an excellent science teacher and their self-expressed interest in working at the university to support PSTs' learning. Preparation and induction were not formally facilitated by the university, it was up to the UBTE and the SBCT for each of the ITE science education units to establish what was needed. The university asked that SBCTs contributions be based on their current knowledge and expertise related to classroom practice, but they also expected each individual UBTE and SBCT to negotiate the role and commitment of the SBCT. However, the university was clear that SBCTs were not to formally assess the PSTs work. In their SBCT role, they were not employed as mentor teachers working with PSTs during school placement. University ethics were applied for and granted prior to the study commencing, and adhered to. For the presentation of the data, pseudonyms were used.

TABLE 1 School based co-teachers experience and science area.

School based co-teacher (pseudonym)	Secondary science unit	Years of experience as teacher	Years of experience as co-teacher
William	General science	36	4
Belinda	Psychology	18	1
Elise	Chemistry	12	2
Lucy	Physics	9	1

Data collection

At the beginning of the academic year, SBCTs completed a survey investigating their views and expectations of their role as a SBCT. The survey was conducted online using Google forms, took 20–30 min to complete, and consisted of five open-ended questions (see [Appendix A](#) for questions). The survey was constructed by three academics, the two authors of the article who were teaching in science education and a colleague who was not part of the teaching team but is an experienced researcher. The questions sought to elicit the SBCTs reasons for wanting to be an SBCT and what they hoped to get out of the experience. At the end of the academic year, each SBCT was interviewed about their co-teaching experiences. Using a semi-structured protocol designed by the same three academics who constructed the survey and was influenced by the data collected from the survey, the SBCTs were asked to consider their experiences, insights and learning about their role, the perceived benefits for different stakeholders and the implications for their teaching practice in relation to learning and teaching science (see [Appendix B](#) for questions). The interviews ranged in length from 45 min to over an hour. They were all audio recorded and then transcribed for analysis. While data may be richer because of the shared context between researcher and participant, we recognize that shared understandings can be problematic when collecting data ([Kanuha, 2000](#)). As a way of acknowledging the potential power dynamic (in terms of the authors/researchers of this article interviewing our own co-teachers), we invited our colleague who was part of constructing our data collection instruments but was not involved with the teaching or the teachers in these units to conduct the interviews.

Data analysis

An inductive thematic approach ([Bryman, 2016](#)) was used to analyze both the survey and transcribed interview data in order to identify views on the practice and learning arising from co-teaching in an ITE program, as described by the four SBCTs. Data analysis took place after the conclusion of the academic year. It is important to state

that each author co-taught with some but not all of the SBCTs, and in all but one, different SBCTs. While insider data analysis has its limitations, we also recognized that our deeper understandings of the contextual elements during the data analysis would produce authentic findings (Corbin-Dwyer and Buckle, 2009). With this in mind, we met regularly to reflect on this aspect and integrate each other's reasoning during the data analysis. In light of the research question, we followed an iterative coding procedure. Initially, the data was analyzed independently by both authors who then compared to confirm agreement. Regular meetings during the analysis were held, and in each meeting, we questioned our assumptions behind each coding decision before reaching agreement on the ways they related to the research question. Six themes were originally identified in the data, and then reconsidered. After an extensive process of meetings to enhance the rigor of our study, five themes were identified in the data.

Findings

The themes identified in the data analysis are now discussed in turn to address the ways the SBCTs perceive their co-teaching role within an ITE science program, and what have they learnt in this role.

Communicating their school teaching experiences and expertise to support the profession

Right from the beginning, each SBCTs perceived their role in the science education program as providing expertise to PSTs. They wanted to share the realities of the “dailyness” of their teaching “I talked about what I was doing in my daily teaching, what was needed” (Lucy, interview) and bring the realities of the science classroom into ITE and “share front line experiences” (Belinda, initial survey). By sharing these experiences, the SBCTs were able to draw on their experience both current and past which they saw as “paying it forward” to the profession in the sense that they were offering their accumulated wisdom from over their career, “I want to give back what I know from 34 years’ experience, to inspire the next generation of teachers. To give what I have learnt over the years, so new teachers start with experience” (William, initial survey). The SBCTs also perceived this an opportunity to share their practice beyond the walls of their school. All the SBCTs were respected members of their school community and were recognized for their high-quality teaching practice. Working with PSTs was seen as a chance to “share knowledge with

more people than just my school” (Elise, interview). In other words, the SBCTs were able to see themselves as knowledgeable, experienced professionals who have something of value to share with PSTs, UBTE and ITE providers. They realized the school teacher expertise that they bring into the new site of practice. They identified the bigger picture of the profession, claiming their part as experienced members of it and working toward shaping how it looks in the future.

Re-examining and articulating their school-based practice

School-based co-teachers soon understood that the co-teaching role required more than communicating their school teaching experiences. It considers how the SBCT saw their role as involving the re-examining and articulating their own school-based practice, and in turn, having their professional knowledge affirmed. To move between school and university sites of practice meant they needed to unpack their teaching for PSTs, and this created new understandings and actions in both sites of practice.

For the SBCTs, their openness and willingness to learn often lead to a reconsideration of their science teaching practice. One of the ways this came about was through being questioned by both UBTE and PSTs and having to articulate their practice, beyond what they did, to reason through the purpose underpinning the pedagogy. Elise explains, “I would be talking to the PSTs about something and I’m like, well, why do I always do it that way? And does that actually have the impact that I want it to have on the students?” (Elise, interview). Considering purpose and analyzing practice was also seen as a benefit for Belinda who, began to question what was implicit in her practice,

We do a lot of things as teachers, which are implicit and that we just do as a matter of course, but we don’t actually break it down and analyze it. I have found that really valuable. Having that underpin . . . I started observing my teaching from that perspective. . . a more analytical point of view (Belinda, interview).

Co-teaching PSTs with UBTE was embedded in these new realizations. For Belinda, the relationship and learning from STE work enabled a language to examine and reinforce what she did in her school classroom:

You’re articulating the structure of teaching. That’s the common language, that’s something I found and as a co-teacher, sort of hearing the concepts. reinforced and made those, enabled those connections, or maybe reminded me of what I do (Belinda, interview).

Similarly, for Lucy, who valued such open display of critiquing her practice:

It helps me share my understanding and add value to someone else or someone else who is learning. It makes me reflect on my teaching so I can celebrate it and show it. It makes me stop and think, “What have I done?” It allows me to look at what didn’t work add share that too because I think there is a lot to learn from what doesn’t work for somebody (Lucy, interview).

Furthermore, co-teaching PSTs was also seen as an opportunity to reconsider and almost refresh practice, using the PSTs new ideas as stimulus, “I think we get quite stale as teachers . . . and having discussions with fresh minds about various aspects of teaching that you have sometimes forgotten . . . has been really good because you stop and think” (Lucy, interview). Working in this new and surprisingly unfamiliar site of practice, the teachers reconsidered their teaching practice with their own secondary school students and justifying their practice as part of their teaching in ITE.

While reconsidering practice was viewed as valuable learning, the affirmation of the SBCTs practice was also powerful. The affirmation of SBCTs’ practice sometimes came as a surprise for the SBCTs and generated a cause for pause and reflection,

You realize there are a whole lot of things you have developed. As so, in terms of a confidence boost. . . I had no idea I had developed so . . . in 6 years [of teaching]. So, it was a good—a pat on the back moment where you go, well, I have developed because I have come a long way and I have answers to all those questions that I wouldn’t necessarily have had at the start of the journey. So that, in terms of confirmation, was really good (Lucy, interview).

For others, it was a moment of validation of their practice and professionalism, “What it has brought is inspiration and validation and reinforcement of what I do” (Belinda, interview). These new understandings about their own school practice likely entails new complexities regarding their professional identities.

Cultivating the school-based co-teacher and university-based teacher educators co-teaching relationship

This theme discusses the ways the co-teaching relationship and practices developed in this new and unfamiliar site for both SBCT and UBTE. The development of an effective co-teaching partnership between SBCT and UBTE was described by Lucy as “a synchronized dance” of sharing expertise where “there’s one

person teaching this aspect of the course with their expertise and then they are passing it [teaching] almost very smoothly to the next person to share their expertise but we are both bound by the same understanding of education” (Lucy, interview).

Initially, Belinda saw her purpose of co-teaching to “share how skills and knowledge in the course might translate within a school environment” and thought she would be “challenged to understand the time required to juggle her roles as a teacher and co-teacher” (Belinda, initial survey). Like Lucy, the expectations of the co-teaching role changed over the year. Belinda discusses how her role as a co-teacher developed overtime, with the initial awkwardness and problem of working out how to make it work in the best possible way:

Initially I came in as more of an observer. I wasn’t 100% sure whether I should jump in at points, as the year has progressed obviously that’s exactly what we do. . . without hesitation. . . We’re bouncing off each other really well. I think that you’ve got that initial stage where you’re assessing, acclimatizing, understanding, then you’re getting into the next stage, which is consolidating what you’re seeing, before you’re able to then take that next step to put it into practice. I think it’s a process. . . I think co-teaching and understanding the role of co-teaching is not an isolated snapshot, I think it is an evolving thing (Belinda, interview).

Interestingly, William who was in his 4 year as a SBCT, identified challenges that did not shift over the year, such as “being a good role model, making sure it is quality time with the PSTs and their learning is quality learning” (William, initial survey). His expectations of his role stayed focused on the learning outcomes for the PSTs, rather than establishing the co-teaching partnership, as seen with the other three SBCTs. For William, his role as SBCT and the interplay between SBCT and UBTE and shifting from school and university sites was already established.

Developing a better appreciation of pre-service teachers learning during Initial Teacher Education and their role in supporting pre-service teacher learning

This theme relates to their learning about the ways PSTs learn while working in this new site of practice. Co-teaching in the ITE programs enabled SBCT to consider the various perspectives of the PSTs, and with that the different starting points and school experiences that they bring to the ITE course and ways to support their learning. For example, Lucy, who is co-teaching 40 PSTs, states, “you have got 40 different experiences that I haven’t had, that I can learn from. . . and everybody

else is gaining from that too, which is fabulous I think and fascinating” (Lucy, interview). Some SBCTs felt like novices working in this new (ITE) site, despite their expertise in the school site. This learning involved reflecting and unpacking assumptions about PSTs journey during ITE. In doing so, the SBCTs gained a better understanding of PSTs learning and ITE programs has offered the SBCTs new insights into the experiences of PSTs at university.

Seeing how preservice teachers are taught from the other side. Seeing the type of pedagogical support that they are getting, getting a better understanding of what sort of types of assessments they are given. . . watching how they work together has been really interesting (Belinda, interview).

William expressed a similar sentiment and connected his understandings of the PSTs university experiences with his role in their learning,

I know where they [PSTs] come from when they come down to teach with me. I’m working with and seeing [the] requirements of the student teachers. . . so it’s this whole linear path you see and it’s all interconnected (William, interview).

Further, this experience helped Elise to reconsider the way she perceived and worked with PSTs when they came to her school on practicum, “Made me realize that they’re just students as well, but they’re just bigger students. . . I just assumed. . . well, you know what you’re doing; just hurry up and get in the classroom and start teaching. . .” (Elise, interview).

For all the SBCTs, co-teaching opened a window into the learning of PSTs, what PSTs focus on in ITE, and the range of placement experiences PSTs can have. For our SBCTs this was a shift in their understanding that took them beyond their often-limited view, which was based on their own experience in ITE or their experiences as a mentor teacher of PSTs on placement experiences in their classroom. Being an SBCT has allowed them to think differently about the ways PSTs learn and develop their professional knowledge for teaching, from a variety of starting points. PSTs do have valuable contributions to make but also require rich conditions for learning that happens in university settings and goes beyond what happens on placement experiences.

Valuing their professional growth and transferring their new learnings

In the previous four themes, the SBCTs’ understandings, and value of co-teaching with UBTE in ITE was evident, including their renewed sense of the value of their school

teaching practice, learnings about ITE and PST learning, and their expanding perspectives and practices from being in the co-teaching relationship. This theme relates to the ways the SBCT value on their own professional growth, including what it means for their transferring such learnings from this new site to their familiar school sites. The SBCTs identified this experience as an opportunity for their own professional growth and learning through working closely with academics in their field, as already discussed. However, opportunities to apply their new learnings from co-teaching to their school sites was possible for some, and difficult for others. Support from school leadership and colleagues varied, and therefore, schools valued their professional growth to various extents.

The SBCTs could see the benefits of a co-teaching working relationship for both themselves and their UBTE co-teachers. For instance, “You’re always learning off each other, you can’t help it. Learned about their philosophy and like I said, we’re pretty compatible” (William, interview) and “She’s got some strengths, I’ve got other strengths, and what we do is we I suppose model, so we’re doing a lot of modeling for our students and to each other. We learn” (Belinda, interview). For Elise, the co-teaching experience enabled her to add to her understandings of contemporary science education research: “I just found it a really positive experience overall. . . working with the university and seeing the new research, the current theories that are out there” (Elise, interview). The co-teaching experience gave Lucy the opportunity to reflect on her professional learning journey throughout her career in new ways: “from my benefit, I think it helps me work out how I have developed my growth” (Lucy, interview).

The SBCTs’ experiences working in ITE were seen by them to benefit their professional growth as Belinda states that she was “Working with my co-teacher to further develop my own teaching and learning expertise and how to share my experiences/knowledge within a university setting.” Belinda also said that co-teachers (which could be the STEs as well as the SBCTs) should “Be prepared to be challenged on your own teaching practice. Be willing to work with your co-teacher, like a partnership.” and in turn, you work to your strengths and “You’re actually developing each other’s skills and it’s actually a really powerful form of professional learning. As long as you don’t have an ego and as long as you don’t feel threatened” (Belinda, interview).

All the SBCTs discussed ways they will or have already used their new learnings in their schools. These new practices relate to their own classroom teaching “it actually inspires me to do another thing and apply it into a different situation” (Belinda, interview). While the SBCT role differs from a school mentor teacher role, discussions also included mentoring PSTs

on school placement, with William now supporting large groups of PSTs at a time and designating them their own room:

“They’ll sit in there and they plan as a team what they’re going to teach, how they going to teach it. They plan their PowerPoints, their booklets and all that together. I’m in another office away from them so they can whine, blame and share and laugh and cry and all that type of stuff. It’s easy to survive as a mob than an individual. Individuals would not ask questions, but others will. And they teach together” (William, interview).

Elise, who now oversees the school’s PST program, summed up the recent changes: “I think we do a lot more to induct them [PSTs] and support them coming into the school, and so, as a result, the program at our school has actually gotten better because we also provide support to the mentors and everyone” (Elise, interview).

For some SBCTs, these affirmations of practice were contrasted with a lack of interest and support from colleagues or senior administration at the SBCTs’ school. Belinda was unable to introduce co-teaching at her school because not all the teachers within the possible subject that was timetabled simultaneously wanted to be involved. She was already concerned about sustaining her relationship with the university. “I know next year, I’m going to be really limited, because my school’s a bit difficult that way” (Belinda, interview). While Elise, was feeling conflicted about her multiple roles and her ability to give enough time to all of her responsibilities,

Some staff actually really didn’t like the idea of me working at Monash as well as working at school and so I had to battle that perception. . . I felt guilty that I wasn’t available as much as I wanted to be for the PSTs. . . it was just finding that balance. . . but it is worth doing (Elise, interview).

Conversely, Lucy was well supported by her school and Principal who viewed her role with the university as worth supporting, “My principal at the time was really positive, trying to give me the keys to the school on a weekend, and I ran the [PST] workshop” (Lucy, interview). From their experiences, the SBCTs came to learn a great deal about themselves, their school communities and learning and teaching science, but also learned a great deal about ITE and PST’s learning to teach science. In summary, the SBCTs learning has been, and continues to be, a transformative experience. It has opened up possible ways to positively transfer their learning to other settings within their school, although not all SBCTs feel enabled to do so.

Discussion

The four SBCTs in this research had clear perceptions about the role, especially in relation to what they could offer and how PSTs would benefit, and in turn, started to articulate their learning as a co-teacher with a UBTE in an ITE academic unit. The five themes identified in the data can be reconsidered with respect to the boundary crossing dialogical learning mechanisms (Akkerman and Bakker, 2011). First, the SBCTs initially recognized communicating their school teaching experiences to support the profession as the key component of their role and identity as a school teacher. This recognition relates mostly to the *identification of discontinuities* with working in this new site (Akkerman and Bakker, 2011), as co-teaching renewed SBCTs understandings of their school science practice and identity. Second, the co-teaching experience created conditions for SBCTs to re-examine and articulate their school-based practice as they navigated the new site of practice. In creating these conditions, the SBCTs established ways to overcome the boundaries to *facilitate movement* between school and university sites as they co-taught in a new site of practice (Akkerman and Bakker, 2011). Third, the SBCTs recognized the importance of cultivating the SBCT and UBTE co-teaching relationship to create new and shared ways of working together. This theme relates to the *coordination of boundary objects* (Akkerman and Bakker, 2011) to practice as co-teachers and reflect on different perspectives in the new ITE site, while seamlessly returning to the school site. Fourth, the SBCTs discussed the ways they had developed a better appreciation of PSTs learning during ITE and their role in supporting PSTs learning. This learning involved *reflection* (Akkerman and Bakker, 2011), and unpacking assumptions about PSTs journey during ITE. Finally, while they all valued the co-teaching experience and professional growth and shared a desire to transfer some of this new knowledge back to their schools, some SBCTs discussed this learning to a greater extent than others, and support from school leaders and colleagues varied. For some, this learning is likely to indicate *transformational change in practices and identity, expanding their learnings from one site to another* (Akkerman and Bakker, 2011). The following discussion will work through the many and significant benefits that were recognized both by and for the SBCTs.

A new form of professional learning for school-based co-teachers

As identified in the literature there are many school—university partnerships and co-teaching arrangements that have been set up as part of ITE programs all over the world (see for example Clarke et al., 2012; White et al., 2015; Downton et al., 2018). They vary greatly in their arrangement but are typically designed to benefit PSTs. Interestingly, this is what

our SBCTs came in thinking too, yet, what the SBCTs came to recognize was that this was a valuable learning experience for them as they worked as a co-teacher in this new and unfamiliar site of practice. As experienced teachers, this was an interesting insight because it afforded them new and different opportunities for learning. With the increased regularity of ITE programs (universities) calling for involvement from schools and practicing teachers, this is important knowledge as it offers insights into what these SBCTs experienced in their role and what an arrangement, such as this one, could offer to other universities, schools, and teachers by way of collaboration and professional learning opportunities. Co-teaching partnerships, such as the one in this study, gives both school-based teachers and university-based teacher educator permission to engage in shared dialogues to explore and clarify new meanings and enable new practices and identity (Akkerman and Bakker, 2011), thereby providing the conditions to enhance SBCTs and PSTs learning. The UBTE and the co-teaching relationship could be seen as boundary objects in that they serve as a bridging function to allow boundary crossing, and as boundary crossers, to advance the scholarship of teacher education and school teaching.

Reflection of school-based co-teachers teaching practice and awareness of pedagogical content knowledge

School-based co-teacher's reflection on their own practice is what really brought their professional learning to the fore; "a sense of am I really doing what I am promoting with PSTs and how well am I doing it?" leading to an affirmation of their teaching practice and thus a greater awareness of their pedagogical content knowledge (PCK). As stated by Carlson et al. (2019) PCK "describes the complex layers of knowledge and experiences that shape and inform teachers' practice throughout their professional journey and, in turn, mediate student outcomes" (p. 82). The important aspects to highlight here are the complex layers of knowledge these teachers already had that were being deconstructed and reconstructed due to their experiences co-teaching PSTs with a UBTE in ITE. The ongoing experiences that then shaped and informed their practice as part of their ongoing professional journey and mediated students' outcomes in their classrooms at school. As this is not a PCK study, any further discussion is beyond the scope of this study. However, it is relevant to point out the PCK insights as we view these as being assisted by the SBCTs' experiences in ITE and in particular, this co-teaching arrangement.

To assist SBCTs to work through the reflection that led to enriched PCK, there needed to be "space" and time made for SBCTs to be supported to reflect effectively on their teaching

practice in light of their experience in ITE. This is where a co-teaching arrangement can be valuable as co-plan, co-teach, co-reflect and co-evaluate (Scantlebury et al., 2008) are central to the relationship and, in this case, to the professional learning of both the SBCTs and the UBTEs (UBTE data is not reported here, but is the focus of a future paper from this project). Ensuring SBCTs are value adding in their area of expertise, provides space for university STEs to be in their best space and provide the best combined and highest quality learning experience for PSTs, but all of this needs to be nurtured through consistent co-reflection and co-evaluation. Such dialogical and collaborative environments allow exploration of new ideas and practices and demands exploration and clarification of meanings through discussion (Akkerman and Bakker, 2011), which pushes everyone's learning in this new site of practice.

School-based co-teachers gain a better understanding of pre-service teacher learning and Initial Teacher Education

The experience of working in an ITE program gave the SBCTs the opportunity to see teaching differently, that is more aligned with a vision for learning to teach teaching. Seeing teaching differently may stimulate the SBCT to re-clarify their role in terms of working with PSTs. All of our SBCTs had a reputation for being excellent science teachers, and many had also been mentor or placement teachers supporting the learning of PSTs while they were on placement in schools. This new role as a SBCT in an academic unit is different again, which necessitates a different view of teaching. It was an opportunity to not only re-think teaching, but to also rethink how you teach teaching and how PSTs learn teaching. The experience presented a chance to better understand teacher education as a whole and move beyond views of ITE formed during their own time as a PST, and shift to a more nuanced view based on current practices in ITE programs; a start at addressing some of the gaps highlighted by Darling-Hammond (2009) and Zeichner (2010). It also provides an opportunity for the SBCTs to keep thinking about their own professional learning and different pathways or focuses for the ongoing professional growth.

With such a range of forms of school-university partnerships, it is easy to see how views of ITE and the level of shared responsibility for ITE vary so greatly and the suggestions of Clarke et al. (2012) are realized. This is not an argument for uniformity, but more a call to nourish open conversations about the opportunities and complexities that arise with genuinely sharing the responsibility for ITE in ways that generate professional learning for all stakeholders. As school—university partnerships become more prevalent, these conversations

become a necessity to ensure clarity around roles and responsibilities and guidance for quality professional learning for SBCTs and UBTE.

School-based co-teachers seeing themselves as teacher educators

We have found (through comparing data from the beginning of the academic year to data from the end of the academic year) that there is a period of transition where some time needs to be spent considering what SBCTs who are coming into university teacher education need to learn and know to begin to see themselves as teacher educators. Our data suggests that there is a need for SBCTs to relax some “teacher like” behaviors (Cooper, 2019) and begin to recognize the different sites of practice they are working in and the different needs and characteristics of students in a teacher education setting. Our SBCTs were keen to share their practice in an effort to almost “give” PSTs their experience and thus, skipping some essential opportunities for PSTs to learn and develop their own practice. SBCTs have been shifted out of their school context and into a university context, but the boundaries are blurry as they are regularly being asked to draw on their school context. The SBCTs came to the role confident in who they were in their current context (school) and ready to “give” their experience and knowledge to the PSTs in their new context (university) as there was value in their experience and knowledge in both their current and new contexts. However, it is important to consider where/how SBCTs can value add to program to assist them to recognize the need for a change from teacher to teacher educator, a move beyond sharing tips, tricks and good activities and a shift into what Korthagen et al. (2005) refer to as the complex dual role of teaching teaching/teaching science. SBCTs need to become aware of and accept the difference between modeling and mimicking which may include a reframing of the SBCTs’ ideas of teacher knowledge, expertise, and pedagogical approaches, which are all areas suggested by White et al. (2015) as being areas of need for professional learning for those working in ITE.

Conclusion

This study shows ways that co-teaching in ITE provides a powerful and positive learning experience for SBCTs as a form of professional learning and a supportive space to reflect on and become aware of their PCK. Crossing the boundary is enhanced through the development of a co-teaching partnership (with UBTEs) that is negotiated and involves a shared understanding of the roles and responsibilities of each co-teacher. Initially, some SBCTs held a view that their contribution was all about

giving back to the profession and sharing experiences from the front line. While this is certainly part of what SBCTs can offer, as they began to see themselves as teacher educators, they also developed an appreciation for the ways PSTs learn to be teachers and the significant contribution they could make to the quality and depth of this learning that would go well beyond providing “tips and tricks.”

Despite the small sample size, this study has indicated that there are some important considerations to make when working with SBCTs in teacher education. It is important to take the time to identify the strengths of the SBCTs and ensure that these strengths are being highlighted in ways that truly add value to the ITE program and to the PSTs experience. There is no point in having SBCTs do exactly what the UBTE are already doing, it should be different, and it should be specific to their expertise. SBCTs need time to become sensitized to the co-teaching and ITE environment. As a co-teacher, UBTE need to play a role in this learning, being open to co-teaching and crossing into a new site of practice and expertise with the SBCT, with the potential to transform and expand both co-teachers practice and identities. Preparation for co-teaching needs to include having STEs and SBCTs arrive at shared understandings of not just the aims of the unit and the ITE program, but of the SBCTs role in the unit and program. If this is not shared and mutually agreed, it could lead to miscommunication and confusion for all stakeholders. Finally, we (the authors) will continue to look for ways to make our SBCTs experience more than the work of an individual co-teacher and will endeavor to get whole schools on board as part of the ITE program, as our data suggests that having the support of the SBCTs school does make things easier and more rewarding for the SBCT. Further research should explore the influences of SBCTs on PSTs learning and on the STEs learning as part of furthering all stakeholders learning about learning to teach science. Future research could also consider the roles and dynamics that occur in the co-taught classes between SBCTs and UBTEs, and whether this effectively makes the most of each individual’s strengths and experiences.

School—university partnerships are an essential part of ITE, but their potential as professional learning sites for UBTE and SBCTs is yet to be fully realized. In this article, we focused on the learning of four SBCTs and highlighted the many ways that their experiences co-teaching in ITE have provoked their thinking about themselves and their practice. Co-teaching gives permission to all participants to bring their knowledge and expertise to the fore and have it valued and sets the conditions for UBTE to work as boundary objects to support transformational learning. The co-teaching relationship is fueled by the dialogical learning mechanisms that provide the conditions for such professional growth. In this way, co-teaching enables knowledge and expertise to be shared as a source for the creation of new practices and identities within this site of practice and beyond (transferring back to the school site of practice).

Pre-service teacher learning is then enriched through the many perspectives that are shown, the way these perspectives are valued and the way they are open and honestly critiqued through ongoing dialogue.

Furthermore, the “magic” of the co-teaching relationship is when something new emerges during teaching in this new site of practice, for which the SBCT found quite satisfying and contributed to their own professional growth, as Belinda summarizes:

“Every so often you meet in the middle, and you diverge again and meet in the middle and diverge again. The reason I say that is that there’s a lot of commonalities in what we do and how we think and the way that we teach, but then every so often there is something that’s divergent and exciting. I think to myself, oh, I haven’t thought about teaching that way” (Belinda, interview).

Data availability statement

The datasets presented in this article are not readily available because of the personal nature of the data. Requests to access the datasets should be directed to RC, rebecca.cooper@monash.edu.

Ethics statement

The studies involving human participants were reviewed and approved by the Monash University Human Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

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

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Conflict of interest

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

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Appendix

Appendix A

Secondary science school-based co-teachers initial survey.

1. Why have you decided to be a SB co-teacher this year?
2. What do you think is the purpose of your role as a SB co-teacher this year?
3. What are you looking forward to the most this year?
4. What do you think will be the challenges within this role?
5. What do you feel you can offer pre-service teachers in the way of knowledge, skills or dispositions?

Appendix B

Co-teacher interview questions.

Background:

- . Subjects/years teaching/types of schools

1. Motivation:

- . Why did you decide to become a co-teacher?
- . Have you had any prior experiences as a co-teacher? If yes, what?
- . Did you have any expectations of what you wanted to learn/gain/offer from taking on this role?

2. Understandings of co-teaching:

- . Can you explain what you think “co-teaching” is?
- . (How) have your ideas about co-teaching changed over your experiences of working in this role at Monash?
- . How did your expectations of the co-teaching role compare to your actual experiences of co-teaching?

3. Understandings of own science/chem/physics (insert specialism here) teaching:

- . How has the experience of working as a co-teacher influenced your own (specialism) teaching? (If at all).
- . Can you identify any changes in your *thinking about* (understanding of) your practice and/or your actual classroom practice? What? Why? (Follow up, press for examples and elaboration).

4. Understandings of learning to teach science (specialism):

- . What, if anything, has changed in your *thinking about* (understanding of) *learning to teach science* from your co-teaching experiences? (Follow up, press for examples and elaboration).
- . Has your approach to working with PSTs in the method classes changed at all over the co-teaching period? If yes, how? Why?
- . Do you supervise any PSTs in your school/support others to supervise PSTs? Is there anything that you do differently or that you would like to do differently to support PST learning based on your experiences as a co-teacher?
- . Can you describe an example of something that surprised/puzzled/made you stop and think about pre-service teachers’ learning to teach science (specialism)? Why did that surprise you?

5. Benefits:

- . What do you think have been the main benefits for you of the co-teaching experience?
- . What are the main challenges of co-teaching for you? What do you think might be the main challenges for PSTs?



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“Will I be molded or crushed?” Artistic representations of student teachers’ identities and emotions

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This article reports on the findings from a cross-institutional study of how arts-based reflection helped teacher candidates to identify and express their thoughts, feelings, and actions regarding the process of learning to teach. Inspired by PostSecret, teacher candidates created anonymous artwork to represent their experiences as student teachers. Through their artwork, candidates highlighted moments of perceived dissonance between their teacher preparation program and K-12 school settings. Additionally, when selecting one piece of art as inspiration for a written reflection, teacher candidates gravitated toward the artwork that provided emotional windows and mirrors into their own experiences. This study holds significance for recognizing and responding meaningfully to the difficult emotional work of learning to teach.

KEYWORDS

teacher education, teacher candidates, teacher identity, arts-based research, emotions

Introduction

Student teaching is an intensive time in the teacher preparation experience. Britzman (2003) asserted, “Negotiating among what may seem to be conflicting visions, disparaging considerations, and contesting interpretations about social practice and the teacher identity is part of the hidden work of learning to teach” (p. 26). Teacher identity development suggests personal transformation and requires teachers to be able to question their own beliefs and instructional strategies in order to reinforce personal agency and self-awareness. According to McKay and Sappa (2020), it also requires creativity where teachers are able to “think outside conventional or usual boxes in order to generate novel solutions to complex dynamics associated with their work” (p. 26).

In recent years, teacher education researchers have demonstrated that visual art forms—collage, self-portraits, drawings, etc.—are particularly powerful and creative approaches to promoting self-reflection and continued teacher identity development

in relationship to these complex dynamics (e.g., Beltman et al., 2015; Culshaw, 2019; McKay, 2019, 2021; Holappa et al., 2021). McKay and Barton (2018) write, “using arts-based approaches can enhance the quality and depth of reflection. When teachers engage with arts-based reflection, it has the potential to reveal valuable information about personal and contextual resources on which they can draw when elements of their work become a threat” (p. 364). Additionally, arts-based reflection allows for deeper understanding of teacher candidates’ emotions and emotional responses throughout the process of learning to teach (McKay and Sappa, 2020).

This article reports on the findings from a cross-institutional study of how arts-based reflection helped teacher candidates to identify and express their thoughts, feelings, and actions regarding the process of learning to teach. Specifically, we—two teacher educators working within not dissimilar 4-year, university-based teacher preparation programs in the American Midwest—explore how a visual arts-based approach to reflection can support teacher candidates during student teaching, a complex time in their learning trajectory. Knowing that professional identity work is part of the hidden curriculum of a teacher candidate’s student teaching experience (Britzman, 2003), we ask: *How might an arts-based reflection help candidates to express their thoughts, feelings, and actions regarding this often invisible process of learning to teach?*

Theoretical framework

Teacher identity is a commonly researched topic (e.g., Clandinin and Connelly, 2000; Beauchamp and Thomas, 2009; Lavina et al., 2020; McKay, 2021; Chen et al., 2022); however, scholars have varying definitions of what constitutes teacher identity. In this study, we understand teacher identity as a narratively constructed and reconstructed response to the question: “Who am I as a teacher?” (Clandinin and Connelly, 2000), where a teacher’s answer is ever-changing and (un)consciously influenced by the audience and the situation in which the story is being told (Uitto et al., 2015). Knowing that teachers live in the midst of different collective narratives about who teachers can or should be, Shapiro (2010) notes that a teacher’s professional identity is also often influenced by the shared “collective memories of educational triumphs, classroom tensions, and—perhaps, most significantly—a secret dread of what we are not doing ‘right’” (p. 617).

The collective dread Shapiro (2010) mentions is indicative of the emotional work of forming one’s teacher identity. Teachers learn through their personal and professional experiences as students, teacher candidates, and early-career teachers that “it is more acceptable to feel and show some emotions in their work than other [emotion]s, and this notion influences their identities as teachers” (Uitto et al., 2015, p. 165). For teacher candidates

in particular, student teaching can be an emotionally-taxing time because, at this stage, the process of defining one’s teacher identity is often characterized by the dissonance individuals feel between who they perceive themselves to be and who they think they need to become to be teachers (Said, 2014; Barkhuizen, 2016). For this reason, teacher candidates’ emotions and their teacher identities are inextricably connected; as Barcelos (2017) explained, “we are shaped by our emotions and beliefs, and these in turn shape the kinds of identities we construct for ourselves” (p. 148).

Teacher identity development implies personal transformation (McKay and Sappa, 2020), and experiences that offer “transformative opportunities to think beyond ‘well-traveled’ approaches by engaging multi-sensory modes of expression widen our creative boundaries” open space for teachers and teacher candidates to explore their emerging teacher identities in a new light (Lavina et al., 2020, p. 416). Thus, in order to better understand the reflective and emotional experiences of teacher candidates in this process, we draw upon the metaphor of *windows* and *mirrors* (Style, 1988; Bishop, 1990), a popular framework developed for understanding the power and impact of children’s stories for promoting empathy and perspective-taking. This framework has also shown effectiveness in relation to pedagogy and teacher education. In the development of her *culturally relevant pedagogy* framework, Ladson-Billings (1995a,b) used windows and mirrors as a metaphor to encourage classroom teachers to critically reflect upon their curricular and instructional practices to ensure that all students, regardless of their race, ethnicity, gender, sexuality, etc., have opportunities to both see themselves and their identities reflected in the curriculum (mirrors) as well as to explore the experiences and practices of persons different from themselves (windows).

Many of the educational and pedagogical frameworks that have grown from Style’s and Bishop’s original conceptions of *windows*, *mirrors*, and *sliding glass doors* (e.g., Ladson-Billings, 1995a,b: *culturally relevant pedagogy*; Muhammad, 2020: *culturally responsive literacy*; Paris and Alim, 2017: *culturally sustaining pedagogy*; Souto-Manning et al., 2018: *culturally relevant teaching*, etc.), posit that all students should have access to both windows and mirrors throughout the curriculum, which often privilege dominant identities over other ways of being. Thus, the metaphor of windows and mirrors in the classroom is directly tied to a student’s sense of identity, value, and self-worth as they experience the classroom. In this study, we extend the utility of the metaphor to examine the ways in which teacher candidates experience K-12 classrooms during their coursework and student teaching. It serves as an important lens for thinking about the ways in which teacher candidates make sense of their emergent teacher identities as part of their teacher education program, where instructional practice and theory are often privileged over discussions of identity and emotion (Chen et al., 2022).

Materials and methods

This study utilizes arts-based educational research (ABER) as a methodology for exploring teacher candidates' emerging teacher identities. Arts-based educational research is a form of arts-based research that utilizes artwork as a means for understanding a particular phenomenon within the context of schooling (Cahnmann-Taylor and Siegesmund, 2017). In particular, arts-based research recognizes the ability of art and artmaking to be generative and meaningful with a comfort in ambiguity and interpretation. Rather than working to build any one particular conclusion, arts-based research "addresses complex and often subtle interactions and [...] makes it possible for us to empathize with the experiences of others [...] because they create forms that are evocative and compelling" (Barone and Eisner, 2011, p. 3). Arts-based education research as a methodology leans into the richness and complexity of the human experience rather than typical scholarly efforts to isolate and explain particular phenomena. This is not to say that one methodology is better or more important than the other, simply that arts-based education research is well-designed to engage in critical scholarly questions around the experiences, feelings, and complexity of classroom spaces.

TeachSecret project

The project, known to our students as *TeachSecret*, draws upon arts-based methodologies in three meaningful ways. First, TeachSecret uses the PostSecret phenomenon (Warren, 2005) as a model for generating meaningful artmaking experiences. The PostSecret project allowed artists to submit their contributions to strangers via anonymous postcards (visit www.postsecret.com for more examples). By broadly ensuring that the artmakers' privacy would be protected, this project allowed space for artmakers to create and share experiences and feelings from their lives that they would not normally be willing to share publicly, even if it was an experience or feeling with which others would likely empathize. Additionally, PostSecret provided space for artmakers to create using the resources available to them with little external pressure to achieve a particular quality or aesthetic that may have hindered artmakers from creating in the first place. Because artwork was sent to an anonymous curator with no specific guidelines for content and quality (other than "tell me a secret"), artmakers were afforded unparalleled space to create as they saw fit, rather than feeling any particular pressure to "be an artist" or create "artwork." Using the PostSecret project as a mentor text, we developed an open-ended artmaking prompt with non-evaluative latitude for teacher candidates to create artwork however they saw fit using whatever modes and mediums made sense to them. While submitting artwork anonymously in a classroom setting is challenging, we also worked to collect and share artwork for class reflection with anonymity in mind, so even though

teacher candidates would be viewing and responding to each other's artwork, they would not necessarily know whose artwork they were responding to unless the artist had chosen to identify themselves.

Second, TeachSecret draws upon arts-based methodologies by allowing teacher candidates to generate and respond to a complex phenomenon through a range of modes. One of the key affordances of arts-based education research is that it provides opportunity for inquiry and scholarship "to become more reflective on the magnitude of entanglement in which we operate" (Cahnmann-Taylor and Siegesmund, 2017, pp. 4,5). While teacher educators recognize that teacher candidates experience a range of emotions as they engage in coursework and field experiences toward licensure, there is typically limited opportunity within teacher education programs for teacher candidates to share and reflect upon those experiences in deep and complex ways. Additionally, teacher candidates may in fact feel wary of sharing their feelings and experiences because they may fear that it will reflect poorly upon themselves and may negatively impact their standing within the education program. By asking teacher candidates to be artmakers, and by prompting them to create artwork that is both open-ended and anonymous, the project utilizes arts-based research to both recognize the complexity of teacher candidates' experiences as well as to provide a safe venue for teacher candidates to engage in challenging and potentially uncomfortable conversations around their experiences, while also validating those experiences as real and worthy of discussion.

Finally, TeachSecret utilizes arts-based methodologies because engaging teacher candidates as artmakers creates space for candidates to share their feelings and experiences beyond the limitations of language and prose (Barone and Eisner, 2011). Though teacher candidates are often asked to produce written text and reflections around their experiences, it is possible that such texts are time-consuming, cumbersome, and evaluative in nature because they are often produced with a specific audience and purpose in mind (e.g., evidence of growth toward a particular objective). In the case of TeachSecret, we wanted to create a space where teacher candidates could meaningfully share their feelings and experiences as teachers without the limitations and expectations of a "course project" or "assignment." Rather, our hope was that by providing open-ended and anonymous responses through a wide range of modes and mediums, teacher candidates would feel better able to create a response that was both meaningful and free of the burdens associated with typical coursework. Just as modeled by the PostSecret project, artmaking provides many opportunities, both textually and visually, for the artmaker to create and share their thinking and feeling in a way that makes sense to them.

Utilizing arts-based methodologies supports both the creation of the TeachSecret artwork and also the utilization of the artwork for drawing meaningful interpretations about the experiences of teacher candidates as they move through their education programs. In this case, the creation of

artwork provides special affordances for reflecting upon and understanding complex perspectives and experiences, such as those tied to identity, because artwork inherently offers opportunities to reflect, create, and interpret nuanced understandings that might be lost or withheld during typical discursive classroom practices (Barone and Eisner, 2011). Indeed, the artwork created for this project, and the visual arts in general, provide windows and mirrors into the experiences of others in ways that allow the creator and observer to make and interpret freely—to literally *see*—using a wide range of tools and means for expressing their thinking and feeling (Leavy, 2015). In the TeachSecret project, artmaking and reflection has provided meaningfully opportunities for both the artmakers themselves and the project curators to better understand the experiences of teacher candidates as they engage in their teacher preparation programs and the wide-ranging feelings and emotions associated with those experiences.

Context

This cross-institutional study explores how arts-based reflections might support teacher candidates enrolled in one of two small, 4-year, university-based teacher preparation programs in the American Midwest. For the purpose of this study, Laura and Kaitlin served in dual roles. First, we were both course instructors working directly with the teacher candidate artists. Second, drawing inspiration from methods of teacher research (Cochran-Smith and Lytle, 1993), we were also researchers of our own practice, deeply embedded in reflecting upon our own pedagogies and the effectiveness of our curriculum and instruction for supporting the growth of teacher candidates. At our cores, we believe in the power of arts-based practices that are both scholarly and pedagogical, and we believe in the importance of creating space specifically for teacher candidates to explore and reflect upon their teacher identities because we see this process as being closely tied to their success and resilience as educators. This project, in very messy and complex ways, is our attempt at bridging our scholarly, pedagogical, and teaching commitments.

In this project, teacher candidates were the artmakers who both generated and interpreted pieces of visual art as part of their coursework in an undergraduate teacher preparation program. Over the course of the 2020–2021 academic year, 110 teacher candidates from across the two institutions participated in TeachSecret. While most were student teaching in local K–12 school districts when they created their artwork, a handful of artists were engaged in pre-student teaching coursework and corresponding field experiences. Collectively the 110 artists represented a full range of potential grade level placements (e.g., elementary, middle, and high school) and content area foci (e.g., math, physical education, English language arts,

special education, music, etc.). Table 1 provides a few key demographic details regarding the teacher certifications our teacher candidates were pursuing.

Data sources

We, the researchers and instructors of record for the teacher candidate artists' courses, felt strongly that all teacher candidates should reflect on their experiences and feelings as emerging educators, which is why the artwork and subsequent written reflections created were designed as part of the teacher education curriculum rather than being generated outside or in addition to the program. That said, both the artwork and written reflections were graded based on completion only, and teacher candidates had the option of withholding their artwork, their reflection, or both from the research study's data set. Hence, the number of artwork and written reflections collected are not identical, nor do they match the number of teacher candidates enrolled in our courses. Overall, we collected 115¹ pieces of artwork and 112 written reflections from 110 students during the 2020–2021 academic year.

1 During the Spring of 2021, teacher candidates in Kaitlin's course created more than one piece of artwork reflecting on their teacher identity over the course of the semester. Therefore, some participating artists included two pieces of artwork in the TeachSecret project.

TABLE 1 Teacher candidate artist demographics.

Certification characteristics		Fall 2020	Spring 2021	Total
Grade level	Elementary school	26	18	44
	Middle/High school	18	17	35
	K-12	23	8	31
Major area of study	Art	2	1	3
	Elementary (all subjects)	26	18	44
	English language arts	11	4	15
	Industrial technology	1	1	2
	Math	1	2	3
	Music	6	4	10
	Physical education/health	0	2	2
	Science	3	3	6
	Social studies	3	7	10
	Special education	14	1	15

Although the majority of our secondary education teacher candidates chose to pursue certification in two subject areas, the data above reflect only their primary area of study.

Artwork

As described above, each of the teacher candidates created visual artwork based on the following prompt:

Taking inspiration from PostSecret (Warren, 2005), you will anonymously share a secret about your (emerging) teacher identity. This secret can represent a moment of vulnerability, victory, fear, laughter, regret, or desire. Reveal anything as long as it speaks to your experiences as a(n emerging) teacher. Use any artistic representation that fits onto a half sheet of paper: collage, poetry, prose, mosaic, sketch, tweet, comic, meme, etc.

We provided teacher candidates with sample artwork to model the different modes and mediums available to artists during their artmaking. These samples came primarily from the PostSecret project (Warren, 2005); however, in the spring of 2021, we also provided artists with a handful of TeachSecret examples created by Fall 2020 teacher candidates.

While the prompt was the same at both institutions, there were a few key differences in the implementation of the activity. Teacher candidates at Laura's institution were enrolled in a fully online course during student teaching. Thus, artists had to supply their own materials, and all artmaking occurred on the candidates' own time. For the teacher candidates at Kaitlin's institution, classes were held in person during the 2020–2021 academic year. Kaitlin provided candidates with materials—paper, colored pencils, markers, scissors, etc.—to use, though artists were welcome to use any tools or technologies that they saw fit. Their artwork was generated through a combination of in-class and outside work time using the prompts and materials described above. In a few cases, teacher candidates created more than one piece of art during the course of the semester: one piece before engaging in a live teaching experience and one after engaging in a live teaching experience.

Reflections

After teacher candidates submitted their artwork, we anonymized each piece and uploaded the artwork into a slidedeck. Candidates then had the opportunity to view their peers' anonymized art through this virtual art gallery, where they were asked to answer the following prompt:

Take a few minutes to review your peers' anonymous artwork. Choose the artifact that speaks to you the most. It may be one that reaffirms your experiences; it may be one that challenges you to see your experiences in a new light. Either way, reflect on the ways in which you are drawn to this particular piece.

This written reflection had no set parameters; some teacher candidates wrote a few sentences; others submitted as many

as two or three pages. Generally speaking, teacher candidates would write about one particular piece of art that stood out to them for a number of reasons: they found it visually and aesthetically appealing; they empathized with the content of the artwork; and/or the artwork raised questions for them that they wanted to explore further. These written reflections were submitted to course instructors as part of teacher candidates' coursework.

Data analysis

While a detailed discussion of the ideational, interpersonal, and/or textual resources apparent within teacher candidates' artwork is certainly warranted, it is beyond the scope of this particular article. We, instead, position the visual art as a catalyst for sparking reflective dialogue among the candidates, and it is the response elicited by the artwork—in the form of written reflections submitted by the artists' peers—that we center here. That said, drawing on Kress and van Leeuwen's (2020) descriptive framework of reading images, we considered each artist's aesthetic choices (e.g., color versus grayscale, found photos versus hand drawn, etc.) as well as their interpretable content (e.g., the visuals, graphics, and/or text, etc.) as an important step in the first phase of a six-part analytic process.

We used thematic analysis (Braun and Clarke, 2006; Clarke et al., 2015) to make sense of the artifacts generated during this study; we engaged in familiarization, coding, searching, reviewing, defining, and writing about the themes addressed within the artwork and reflections. To begin, because this study was conducted across two institutions, it was critical that we spent time familiarizing ourselves with the data set. Each author reviewed the artifacts independently, noting both aesthetic choices and interpretable content within the artwork as well as key ideas within the written reflections. As we reviewed artifacts, we wrote brief memos about our noticings.

Once both authors were familiar with the data set, we met to code the data and search for, review, and name themes. Codes included, but were not limited to, *anxiety*, *time*, *worry*, *fatigue*, *trust*, *conflict*, *purpose*, and *commitment*. Using a spreadsheet to track not only which codes applied to which artifacts but also whether the teacher candidate's artifact addressed the code in a negative, neutral, or positive way, we were able to begin to identify themes within the data set. While most codes were strictly sorted as either positive or negative in their connotation, the code of *time*, for example, was not so straightforward. In some instances, teacher candidates shared they felt behind without enough time or energy in the day to catch up. But other teacher candidates addressed time in a positive way; their artifacts referenced the candidates' growth over time. When organizing codes around emerging patterns, we initially noted trends in the data regarding shared experiences (mirrors) or

new perspectives (windows). However, not all data fit neatly into one of these two themes; we needed a third theme: dissonance. This third theme speaks to the perceived disconnect between teacher candidates' university-based coursework and their field experiences in K-12 classrooms.

In the "Findings" and "Discussion" section, we offer our interpretations² of these three themes using the artwork and subsequent written reflections to illustrate and contextualize the lived experiences of our teacher candidates.

Findings

When reviewing the artifacts (i.e., visual artwork and written reflections) generated by the teacher candidates across our two institutions, we noted that the artwork addressed a wide range of topics including references to instructional tasks associated with teaching (e.g., lesson planning, grading, facilitating online learning, etc.); the relational work of building community with students, families, and staff; the juggling of myriad responsibilities; and the emotional work of developing confidence, professionalism, and a sense of belonging.

More specifically, our analysis of candidates' artwork and reflections revealed three key findings. First, candidates used TeachSecret as an opportunity to enter into challenging conversations around perceived moments of dissonance between their experiences in the university's teacher preparation program and their experiences working within a K-12 school setting. Second, while the artwork addressed a wide array of themes, the written reflections were far more focused. When given the opportunity to select one piece of art as inspiration for their reflection, teacher candidates gravitated toward the artwork that provided emotional mirrors into their own experiences. Third, in some cases, candidates' artwork served as windows for their peers to frame and/or interpret their student teaching experiences in a new light. Each of these findings will be discussed in greater detail below.

Artwork as dissonance

A number of pieces in the virtual art gallery spoke of noticeable shifts in identity, responsibility, and/or philosophy when moving from the university's teacher preparation program

into the K-12 classroom. Candidates used the reflective activity—both the making of visual art and the written reflection—as an opportunity to call attention to the perceived dissonance between the two spaces. For instance, **Figure 1** features a grayscale image of a classroom in the background with the following sentences in the foreground: "It is weird to be in charge. I worked to be in charge of a classroom for 4 years. Now that I am, I feel like I have no idea what is going on."

In this case, the artist used an empty, traditionally arranged photo of a classroom, which is evocative of the quiet time at the beginning of the school day, right before students enter the room and learning begins. At the same time, the artist superimposed contradictory text on top of the picture. While the picture might portray an organized room that is "ready to go," the text itself suggests that the artist felt woefully unprepared to begin even if they present a competent external image. In this artwork, there seems to be a sharp contrast between the way the teacher is perceived on the outside versus how they are feeling on the inside.

This contrast and visual dissonance was noted in teacher candidates' reflections. For example, a teacher candidate responded to this piece of artwork, writing:

It is weird to be the one that the students look to for all the answers. I was only a student not too long ago. [...] School does not prepare you for the chance to be completely in charge of a classroom and it is a weird thing to get used to.

As shown through this reflection, the artwork, "It is weird to be in charge," (**Figure 1**) resonated deeply with the lived experience of this teacher candidate, who is also challenged by the experience of taking over classroom responsibilities. In this case, the artwork allowed the teacher candidate to name their feelings ("it is a weird thing to get used to") around the experience of "being completely in charge of a classroom." Additionally, both the artist and the reflecting teacher candidate point to the fact that, while they have been experiencing classrooms for a long

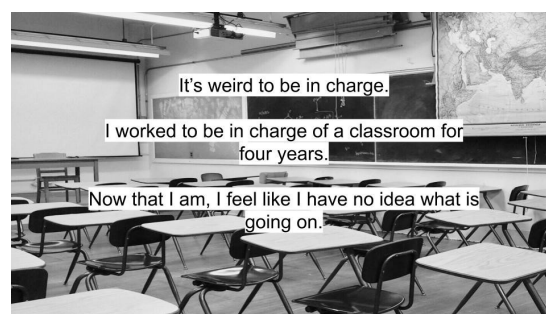


FIGURE 1
It is weird to be in charge, Fall 2020.

² As researchers, we recognize that we viewed and responded to the artwork through the lens of our own experiences as former teacher candidates, practicing teachers, and teacher educators. Our interpretations of the artwork and any findings or conclusions that we draw from them are ultimately based on our subjective understandings, and others who view the same artwork may elicit different interpretations. We do not intend for our interpretations and findings to be the only, or the "best," analysis. Rather, we include them here as an opportunity to start a conversation around a deeply meaningful time in teacher candidates' lives.

time, both as students and as teacher candidates, there has never been a time, up to this point, where they fully felt the responsibility of being the leader. This increased level of responsibility catalyzed the teacher candidate's feelings of uncertainty and disequilibrium, as highlighted in the artwork and reflection.

Other teacher candidate artmakers reflected upon the dissonance between their teacher preparation program and their experiences out in the field in more concrete ways. For example, in **Figure 2**, “Conflicting Ideas,” the artist created a piece of artwork that utilized multi-colored text to draw a stark contrast between their experiences. At the top right of the page, the artist used a blue marker to illustrate the experiences of “Real Life” (e.g., hard to navigate, negative co-workers, standard tests, and rushing lessons). At the bottom left of the page, the artist used a yellow marker to illustrate the experiences of “College” (e.g., new ideas, encouraging peers, motivational books, and personalized lesson plans). In between the two sections, in bold, capitalized text written in black marker are the words: “Conflicting Ideas.”

This artwork creates both a visually stark divide between the artist's perceived experiences in the “real world” of a K-12 classroom versus their experiences engaging in teacher education through their college classroom. Additionally, the artist utilized language in the two sections that was in direct contrast across the “conflicting ideas” divide, including language such as: “encouraging peers” versus “negative coworkers,” “creative projects” versus “standard tests,” and “students as humans” versus “students as only learners.” In this example, the artwork draws a sharp and compelling contrast between what can be described as the rosy nature of teaching and learning in college versus the harsh reality of teaching and learning in a K-12 setting, with clear dissonance and disequilibrium between the two.

This clear contrast between the perceived realities of the college classroom versus the K-12 classroom was also the catalyst for a number of written reflections by teacher candidates. For example, one teacher candidate reflected that:

I am truly confused about why what we are taught in our college classes differs greatly from the reality of teaching and what actually happens. [...] I hope to be different than [my mentor] with my teaching style and change and design my classroom in a way that allows for these concepts to come to life. I fully believe in the benefits of inquiry, multi-sensory learning, and hands-on activities. I just wish I could experience these things in my student teaching.

In this reflection, the teacher candidate is especially interested in not just recognizing the divide between their experiences in the collegiate versus K-12 classroom, but in finding ways to bridge the divide between the two. While this teacher candidate does not necessarily see this divide as

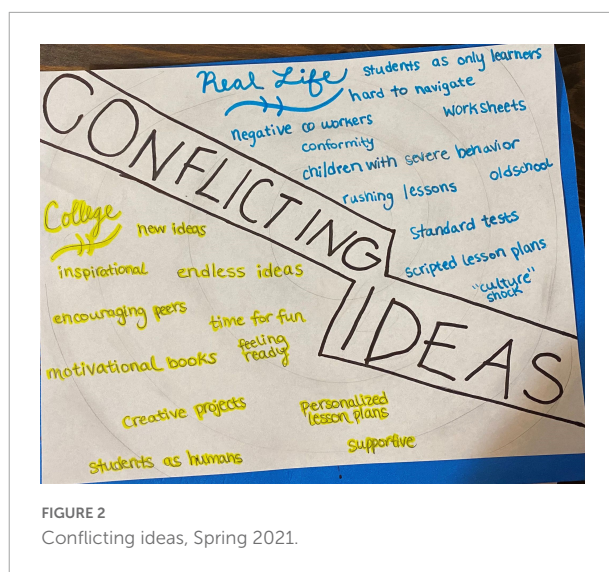


FIGURE 2
Conflicting ideas, Spring 2021.

an insurmountable obstacle (“I hope to be different...” and “I fully believe in the benefits...”), they are also illustrating the perceived lack of flexibility that has stood in the way of their growth through student teaching (“I just wish I could experience...”). For this teacher candidate, it is not simply that there are stark contrasts between their collegiate learning and their K-12 teaching, it is that their experiences in their student teaching have not provided direct avenues for them to speak back to or work around the negative realities witnessed in their preparation program. This theme was echoed by another teacher candidate, who also responded to **Figure 2** by writing:

I found that student teaching has shown me some harsh realities. The more I teach, the more I have to try to balance blind optimism from my college courses with the harsh cynicism I hear at school.

In this reflection, the teacher candidate is also thinking through how to move through and around their dissonant experiences between their teacher preparation program and the K-12 school system. However, rather than viewing the dissonance as an either/or, this teacher candidate reflects upon their efforts to live within the realities of both (“I have to try to balance...”). In both reflections, the artwork and reflections generated by teacher candidates stimulated conversations about the deep unease felt by teacher candidates as they try to find equilibrium between two potentially contrasting realities.

Artwork as mirrors

As one of our candidates explained it in their written reflection, “it is crazy to be living the life of *student* at [my university], *teacher* to my students, and *student* to my mentor”

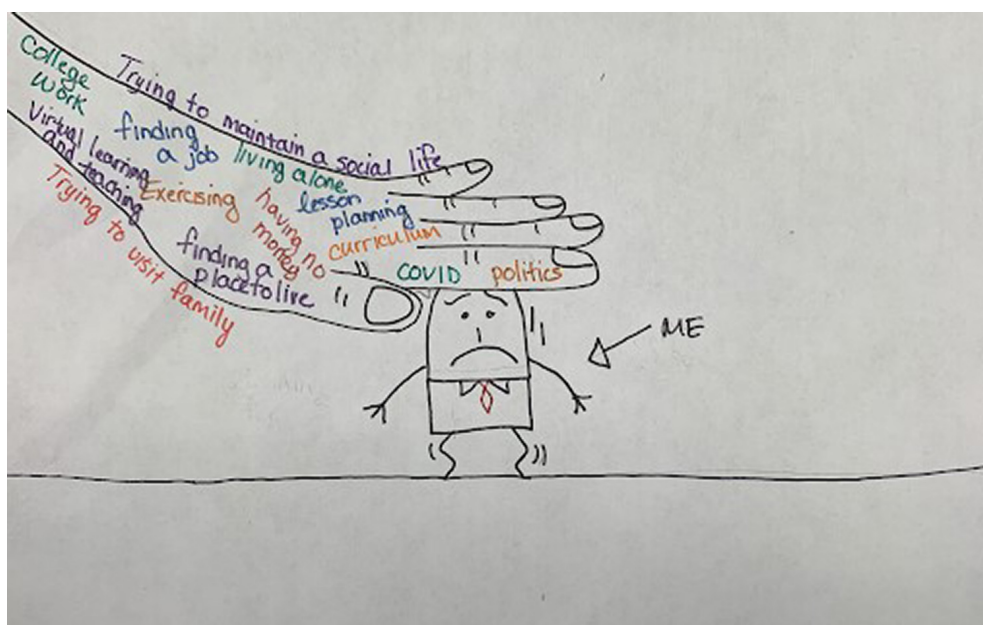


FIGURE 3
Under pressure, Fall 2020.

(emphasis added). If that was not enough to manage, add to the mix their many other possible identities, including child to an aging parent, partner in a new relationship, parent to one or more children, part-time employee with evening and weekend shifts to pay their rent, advisor for a school club, coach of a youth sports team, military reservist, etc. It is a wonder how they can juggle all of these identities without dropping the proverbial ball. Looking across the 115 pieces of artwork, we see some recurring metaphors and imagery related to the managing of multiple professional and personal identities. There were clowns tossing a half dozen or more balls in the air; tightrope walkers struggling to maintain their balance; scales with professional responsibilities far outweighing personal ones; and images of teacher candidates being crushed, overrun, or hanging precariously over a precipice.

These pieces and their messages of struggle, perseverance, and survival served as mirrors reflecting other teacher candidates' own emotional experiences as evidenced by their written reflections. Take **Figure 3** as an example; it depicts an individual feeling the weight of multiple responsibilities (e.g., lesson planning, politics, financial insecurity, COVID-19, etc.) on their head. The artist included details such as shaking knees and beads of sweat to further emphasize the gravity of the situation.

Of the 67 pieces of artwork created in the Fall of 2020, **Figure 3** was the piece most often responded to in our candidates' written reflections. As one candidate shared, "I feel a deep connection to this art because I feel [the pressure] on a

daily basis." It was a feeling that our candidates knew all too well, with some candidates wondering whether or not they could endure the pressure. As another candidate wrote:

I feel like the kid who was dropped off at school for the very first time and told "have a great time". I am, but what is the cost and is there a safety net anywhere? [...] The hand just keeps smashing down. Will it mold me into a teacher, or smash me like a bug?

Figure 3, and many other similar pieces reflected teacher candidates' feelings of being crushed by the weight of the global pandemic and the sudden shift to remote instruction on top of the typical student teaching experience. However, not all pieces mirroring the emotional intensity of student teaching addressed the ongoing pandemic. Take **Figure 4**, for example; it depicts a vehicle, labeled "student," with its headlights on and what appears to be either tears or sweat streaming down the front of the vehicle. In the road ahead stands a deer wearing a nametag that reads "teacher." The caption above the image reads "Like A Deer In the Headlights."

As a mirror reflecting shared student teaching experiences, viewing this piece of art prompted one candidate to share that they experience this feeling of being a deer in the headlights on a daily basis, writing:

I know I am the deer. I feel like everything I do in my personal and professional life is just so busy that when I

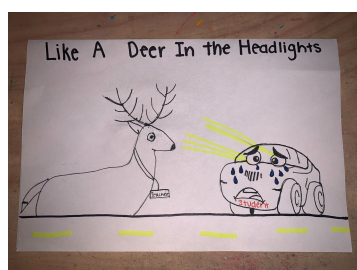


FIGURE 4
Deer in the headlights, Fall 2020.

am paying attention to one, another one sneaks up on me. I am constantly dodging different cars on the same road. I feel like the same cars come by every single day but will not slow down for me.

While **Figure 4** served as a mirror for many of our candidates, for two candidates, it was something else. As one candidate explained, “I knew the deer would be the student teacher, but I never thought the car would be the students. [...] I feel like the car could have been anything, but to make it a student was not what I was expecting.” Similarly, another member of the Fall 2020 cohort observed, “the students look nervous in this image; however, I feel that this experience has been the opposite. I am the one that has been nervously sweating, hoping that I am doing what is best for my students.” For these two candidates, **Figure 4** created an opportunity to imagine student teaching from a K-12 student’s point of view. Was the student teacher the only one who was nervous, or were their students feeling similarly uneasy? This brings us to the third finding of our work: artwork as windows.

Artwork as windows

Some of the pieces of artwork created for the virtual art gallery served as windows into either different experiences or alternative interpretations of similar experiences. These windows invited teacher candidates to consider their experiences from another perspective, to reframe their thinking, to reinvent their story of learning to teach. **Figure 5**, for example, reads “I am just a person. I learn. I grow. I fail. I try. I teach. I inspire. I struggle. I discover. So do you. Let’s do it together.” Note, the artist addresses the audience as simply “you” in this piece. In their written response to **Figure 5**, one teacher candidate understood this piece as “I [student teacher] talking to you [student]”, writing:

One [piece of art] that challenged my perception was the first submission when it talked about teachers and students

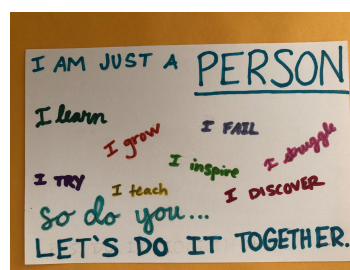


FIGURE 5
Together, Winter 2021.

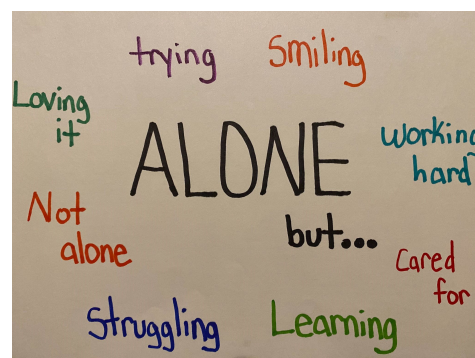


FIGURE 6
Alone but, Fall 2020.

working together to get through challenges. I never really thought about teachers and students working together to learn from each other. In the past teacher and student relationships have consisted of students learning from teachers and not necessarily the other way around.

For the author of the reflection above, the artist of **Figure 5** pushed their thinking in an important way; the candidate who authored the reflection left the virtual art gallery wondering if there was more to the teacher-student relationship than they had previously understood. Could teachers learn either from or alongside their students?

Artwork like **Figure 5** challenged teacher candidates to reimagine the role of a teacher. Another collection of artwork encouraged candidates to reframe their experiences from an asset perspective, focusing on the positives rather than the negatives. For example, as you may recall, **Figure 3** featured an individual’s knees shaking under the pressure of many responsibilities: remote instruction, financial insecurity, lesson planning, etc. While the artist of **Figure 3** was feeling the weight of student teaching when they created their sketch, when they visited the virtual art gallery 1 week later, another artist’s work challenged them to reconsider their

position. **Figure 6** features the words “ALONE but...” in the center of a page with a series of words and phrases evenly spread around the border. Beginning at the top and continuing clockwise around the page, the piece reads: trying, smiling, working hard, cared for, learning, struggling, not alone, and loving it.

In response to **Figure 6**, the artist of **Figure 3** shared that the piece resonated with them because:

It is almost the complete opposite of my own. My piece was made in regards to the many pressures and responsibilities I am facing and feeling at this moment in life. This piece, in contrast, really makes me reflect on all the positives in my life. I may feel alone in navigating the many unknowns during this time. I may feel like I am drowning, or feel that I have no idea what to do next, but I do have a loving, supportive family, supportive peers, and a welcoming environment in which I am teaching.

Figure 6, and other pieces like it, offered a lifeline to teacher candidates who were struggling in their student teaching placements. As another candidate wrote, “it is so easy to feel alone while on this path of becoming an educator,” but “as alone as I feel on this journey, I need to remind myself that [...] I am trying my very best and smiling while doing it.” These messages of affirmation, seen both in the artwork and in the teacher reflections were an important window for many teacher candidates to reflect upon the positive and uplifting emotions many teacher candidates were feeling during their programs. For these teacher candidates, engaging in artmaking and reflection provided both opportunities to articulate the strain and anxiety of their work while also recognizing it as a worthwhile and uplifting endeavor.

Discussion

Inspired by scholars who have recently explored drawing, collage, self-portrait, and other visual art forms as research tools (e.g., McKay and Barton, 2018; Culshaw, 2019; Holappa et al., 2021), this study asked: *Knowing that professional identity work is part of the hidden curriculum of a teacher candidate's student teaching experience (Britzman, 2003), how might an arts-based reflection help candidates to express their thoughts, feelings, and actions regarding this often invisible process of learning to teach?* In keeping with Holappa et al.'s (2021) work into student teacher vulnerability, our teacher candidates, especially candidates who had a challenging student teaching experience, benefited from the opportunity to express these challenges in a low risk environment through anonymized

artwork. As one candidate shared in a written reflection about the activity:

At first, I thought it seemed like humdrum busywork that I did not really want to do. [...] It turned into a great reflective and self-developing experience. [...] The assignment permitted me to unleash how I genuinely feel about becoming a teacher. Seeing the artwork led me to discover that I do not have one prominent feeling about my journey toward becoming a teacher, rather I am overwhelmed by an influx of feelings. My mind is spinning at a mile a minute.

As the candidate above explained, the opportunity for teacher candidates to view and respond to each other's artwork was an important component in this study. In some reflections, candidates framed the artwork as windows into student teaching experiences unlike their own. However, most reflections addressed the mirroring of difficult emotions. One of the Fall 2020 student teachers explained it this way, “Looking at this [artwork] made me feel a lot better about myself. I thought I was the only one who [felt] kind of lost and confused.” The virtual art gallery created space for teacher candidates to recognize that they were not alone in their emotions and experiences; their peers were feeling similarly inundated. As McKay and Barton (2018) suggested, “without this process, the teacher [candidate]s may have remained as silos, each trying to survive independently of one another” (p. 364).

Vulnerable and reflective discussions of the emotions associated with teaching often go overlooked in teacher education programs, and even with practicing teachers as well. Most teacher education curriculum focuses on building strong theoretical and practical knowledge about pedagogy and responsiveness to the needs of students. However, as shown through these artwork and reflections, teacher candidates crave, whether they initially realize it or not, the opportunity to acknowledge, reflect upon, and discuss not just their experiences, but also how those experiences make them feel about themselves and the work that they do in the classroom. These strategies for recognizing and responding to the intense emotions of learning to teach may also support teacher candidates as they enter their first years of teaching. Research has consistently shown that teacher burnout is high for beginning teachers (e.g., Perrone et al., 2019; Pressley, 2021); a teacher's deteriorated sense of engagement with one's work, if not addressed, can eventually lead to the teacher leaving their current school or the profession altogether. In fact, prior to the COVID-19 pandemic, close to 8% of teachers were leaving the profession each year, with new teachers (<5 years) leaving at rates between 19 and 30% (Learning Policy Institute, 2018). In the midst of a nationwide teacher shortage, our experiences with the TeachSecret project have led us to the conclusion

that these sorts of emotional and experiential discussions and reflections with teacher candidates must be an integral part of teacher preparation programs, both so teacher candidates recognize their feelings and see that they are not alone in their experiences, but also so that teacher candidates can develop coping strategies and tools for responding to those emotions in beneficial and empowering ways. While there are many ways to engage in these complex conversations, as teacher educators, we have found the creation and dissemination of anonymous artwork has been a meaningful way for teacher candidates to share, consider, and respond to their experiences and the experiences of others.

Additionally, the dichotomy between teacher candidate's experiences in the field versus experiences in methods classes also raises questions about the role of teacher educators. While teacher educators want to provide the most up-to-date best practices and models for effective classroom instruction, it does lead to questions about what to do when those best practices and/or models are in conflict with what teacher candidates are experiencing in schools. The TeachSecret project affords teacher educators and mentor teachers with the opportunity to reflect upon the emotional dissonance between methods courses and field placements, so that they can play a more active and effective role in ensuring that teacher candidates have opportunities to reflect and ask questions, but also to find synergy between their courses and placements.

The TeachSecret project is one that we see serving several purposes. It has been an opportunity for us, as teacher educators, to build meaningful reflections of teacher identity into our teacher education curriculum to the benefit of our students. Additionally, it has allowed us to curate a large collection of teacher candidate artwork. We see this collection of artwork to be important for two reasons: (1) it allows teacher educators access to a wide range of artwork and reflections that they can use both as models and mentor texts in their own teacher education programs to support students in recognizing, reflecting upon, and building strategies for developing their teacher identity and strategies for coping with the intensive emotional work of teaching; and (2) it provides a collection of windows for mentor teachers and supervisors into the (often unshared) experiences and emotions of their teacher candidates. By viewing this digital gallery, teacher educators, mentor teachers, and student teacher supervisors, can notice trends, common themes, and critical questions in order to decide how to best address these critical issues with their own student teachers (e.g., struggle, burnout, anxiety, etc.). We find these to be important and critical conversations both for the development of teacher candidates and their identity as a teacher as well as for their happiness and longevity as classroom teachers.

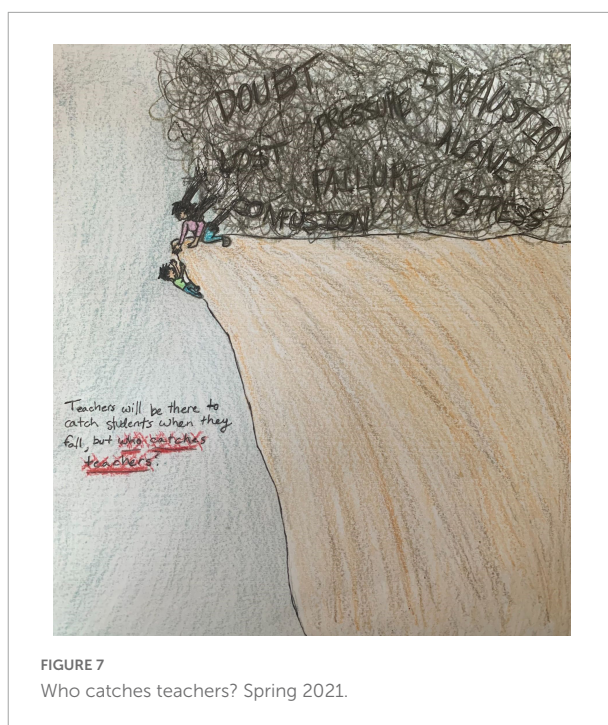


FIGURE 7
Who catches teachers? Spring 2021.

Conclusion

The philosophy behind the PostSecret (Warren, 2005) project, which prizes anonymity, truth-telling, and close-cutting identity work, was a particularly important lens for our ABER project, which valued the opportunity for teacher candidates to reflect carefully on their experiences in the K-12 classroom with limited fear of reprisal from their peers. Sharing artwork anonymously allowed the candidates to share meaningfully from their lived experiences in order to feel heard by the broader community while also protecting their potentially vulnerable emergent teacher identities. Similarly, viewing and reflecting upon their community's artwork provided candidates the opportunity to see their thinking taken up by others while also providing the opportunity to explore windows into the experiences of others.

While the teacher candidates greatly benefited from examining their own experiences and those of their peers, we have chosen to close this article by noting that some of the artists posed questions that we, as a community of teacher educators and teacher candidates, could not easily answer. Figure 7, for example, depicts an individual hanging from the side of a cliff with a cloud of doubt and insecurities hovering overhead. The artist asked "Teachers will be there to catch students when they fall, but who catches teachers?" As teacher educators and teacher education researchers, we must ask ourselves not only (1) in what ways do we support teacher candidates in recognizing

their emotional journey as they develop an emerging teacher identity, but also (2) how do we create opportunities for teacher candidates to voice these often-difficult emotions? This study suggests that through anonymous artistic representation and reflection, teacher candidates can identify moments of emotional windows, mirrors, and dissonance within their community of emerging teachers. The teaching profession is inherently isolating and lonely for many educators, especially during the ongoing global pandemic (Jones and Kessler, 2020; Ramakrishna and Singh, 2022). Thus it is imperative that we recognize this and respond in empowering and uplifting ways.

To that end, we continue to use TeachSecret as an arts-based reflective activity in our teaching. To date, our teacher candidates have generated nearly 250 pieces of artwork depicting their lived experiences of learning to teach. The following URL will lead you to a jamboard featuring 45 of the most reflected upon pieces created by our teacher candidate artists between Fall 2020 and Spring 2022: <https://tinyurl.com/teachsecretartwork>. We welcome you to draw on these pieces in order to launch conversations with your own candidates.

Data availability statement

Access to a limited dataset is available within the manuscript. Requests to access the complete dataset should be directed to LK, lkennedy@nmu.edu.

Ethics statement

This study involving human participants was reviewed and approved by the Institutional Review Boards of Northern Michigan University and Millikin University. Written informed

consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

LK served as principal investigator (PI), conceptualized the study, secured IRB approval for one of two universities, collected and cataloged data, collaborated with her co-author on data analysis, and took the lead in the writing of the final manuscript. KG served as the co-principal investigator, applied for and received IRB approval for the second university, collected and cataloged data, took the lead during data analysis, and contributed to all sections of the final manuscript. Both authors contributed to the article and approved the submitted version.

Conflict of interest

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

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The mediating role of meaning at work in promoting teacher commitment and reducing burnout

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The influence of teachers' commitment and burnout on student learning outcomes and their performance requires astute research to identify the antecedent factors of these two variables. Commitment and burnout are peremptorily related to the positive and negative aspects of performance, respectively. Most of the previous research showed inconsistency; therefore, a new assay is needed to produce more convincing findings. This study aims to identify the antecedent variables of teachers' commitment and job burnout by using meaning at work as a mediating variable. Based on the convenience sampling technique, 304 respondents were selected among the teachers in private primary and secondary education levels in the East Kalimantan Province, Indonesia. A structural equation model (SEM) was used in the data analysis. The results showed that school support, self-actualization, and meaning at work were antecedent variables for teachers' commitment and burnout. The meaning at work also mediates the relationship between school support and self-actualization. Meanwhile, the remaining four mediating roles were not proven in this research. These findings offer a framework for principals to increase commitment and reduce teachers' burnout by increasing school support and self-actualization through meaning at work.

KEYWORDS

meaning at work, school support, self-actualization, teacher burnout, teacher commitment

Introduction

The empirical evidence of teacher's role in student learning outcome (Aliakbari and Amoli, 2016) requires an astute research on the collection of factors associated with a successful educational system (Faskhodi and Siyyari, 2018). A productive teacher has certain characteristics; however, previous research has succeeded in indicating various

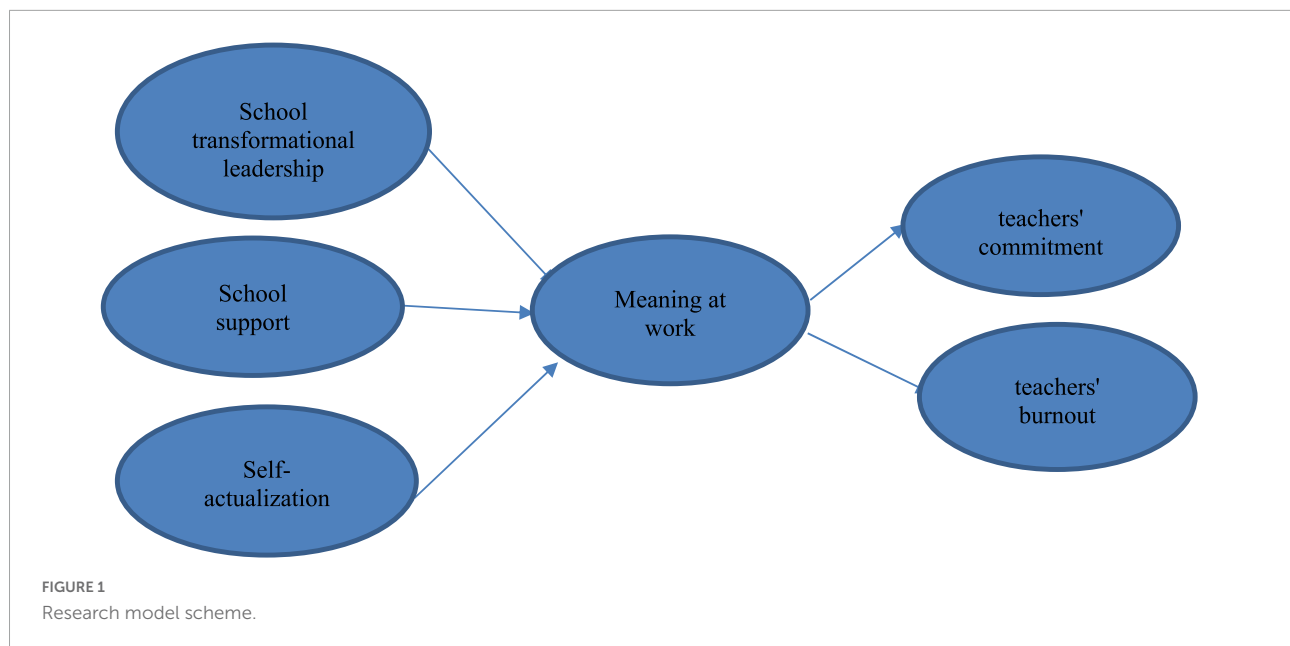
related variables, such as commitment (Tran et al., 2020) and burnout (Hakanen and Schaufeli, 2012), which greatly influence the performance of student learning outcomes (Lee et al., 2011). The personal intervention related to the two variables has a positive effect on their performance and on student learning achievement (Van Wingerden et al., 2017). Commitment and burnout are in correlation with the positive and negative aspects of teachers' performance (Madigan and Kim, 2021).

Commitment is important in maintaining professional motivation and promoting teachers to be responsive to changes in learning practices (Han et al., 2016) and is further classified into two, namely organizational and professional aspects (Lee and Nie, 2014; Ni, 2017). Organizational commitment is the relative strength of teacher's involvement and the willingness to make sacrificial efforts on behalf of the school (Han et al., 2016). Professional commitment describes the teacher's involvement level and the importance of work rendered in general. This research (McInerney et al., 2015) also explained that commitment, both affective and normative, predicts wellbeing, growth opportunities, recognition, and job satisfaction. Contrary to commitment which is a positive aspect of teaching, tutors' burnout is a variable that reduces negative elements related to other performance. Research (Iancu et al., 2018) stated that burnout manifests in all types of work, but it is mainly experienced by teachers because their daily job demands and pressures (McCarthy et al., 2016).

Teachers' burnout is associated with multiple experiences and negative outcomes. The teaching profession is reported as a job with a high risk of burnout (Madigan and Curran, 2021). In the work environment, they often face challenges, such as getting cynicism from co-workers or unpleasant treatment. Emotional exhaustion and mood swings eventually lead to burnout (Hakanen et al., 2006; Capone et al., 2019). This provides a lower impetus in responding to student learning achievements (Madigan and Kim, 2021). Teachers also tend to have a negative relationship with students, for example, getting angry when pupils do not follow instructions and have contradicting views (Pietsch et al., 2019). The burnout that occurs also affects the probability of staying in the job (Ibrahim et al., 2017). This is because it leads to increased absenteeism, lower work commitment, and enhanced desire (Brouwers and Tomic, 2000). Teachers' fatigue also has an impact on students through a contagion effect, where burnout passes from tutors to their pupils (Bakker and Schaufeli, 2000), because learners have a tendency to pick up and imitate emotional cues (Chung, 2019). This implies that students also face direct consequences of burnout, such as decreased achievement (Madigan and Curran, 2021), increased forms of controlled motivation (Zhang and Bartol, 2010), and depression (IsHak et al., 2013). Due to the significance of teachers' commitment and burnout on their performance and pupils' achievement, the antecedents of these two variables are required to be determined.

This research outlined three independent variables, namely transformational leadership, school support, and self-actualization, which are predicted to affect teachers' commitment and job burnout. The empirical relationship between these variables was investigated, but there are still inconsistencies in the results of these studies. In research that expressed transformational leadership as an independent variable, the majority of the results showed a positive effect on teacher commitment. In line with these findings, Pietsch et al. (2019) stated that "teachers who feel that their principals have better understanding of their intrinsic needs, recognize their abilities, develop, and empower them individually are more strongly committed to their schools than their peers." Research with similar results stated that transformational leadership predicts commitment to both organizational and professional commitment (Jeong et al., 2016; Ibrahim et al., 2017; Chung, 2019; Khumalo, 2019; Hosseingholizadeh et al., 2020; Qadach et al., 2020; To et al., 2021). The principal's role as a transformational leader is key in ensuring teacher commitment (Berkovich and Eyal, 2017). Other results (Jeong et al., 2016; Cansoy, 2018; Ninkoviæ and Floriæ, 2018; Zacharo et al., 2018) also showed that when principals act as transformational leaders, teachers feel a higher commitment to the school. Head teacher who applies leadership that builds positive relationships affects commitment (Almandeel and Dawood, 2019) and negatively impacts burnout (Eslamieh and Mohammad Davoudi, 2016). Principal and teacher relationships increase work commitment (Bogler and Nir, 2012). Although many results showed that there is a significant effect of transformational leadership on teachers' commitment and burnout, Freeman and Fields (2020) explored the relationship between teachers' perceptions of principals' leadership and commitment. The results showed that transformational leadership was uniquely associated with organizational trust and efficacy, but not with teachers' commitment. In addition, similar research was also conducted by Cahyono et al. (2020); although the context is slightly different, it showed that, among the four transformational leadership sub-variables, only one affects teachers' commitment (namely intellectual stimulation), while the other three sub-variables (ideal effect, inspirational motivation, and individual considerations) do not affect organizational commitment in higher education. This trend is also supported by Ling et al. (2013), although it has a correlation between transformational leadership and teachers' commitment, but it has a weak effect.

The influence of the second independent variable (school support) on teachers' commitment and burnout also contains inconsistencies. Most research showed that employee perceived support is positively related to adaptability and negatively related to burnout and disengagement (Collie et al., 2018). Organizational support has an impact on several indicators of employee performance, such as decreased absenteeism and increased commitment and job satisfaction (Johlke et al., 2002).



Support and quality of leader relationships affect teachers' commitment and burnout (Ford et al., 2019). Perceived organizational support (POS) serves to meet socio-emotional needs (e.g., rewards, affiliation, and emotional support) and leads to affective commitment (Allen and Meyer, 1990). POS, which involves employees' perception that the organization values their contributions and cares about their wellbeing, is the most strongly associated work experience with the emotional attachment to the establishment (Kim et al., 2016). However, little is known about the effect of POS on education (Bogler and Nir, 2012), which is similar to the self-actualization variable. Several studies have stated that self-actualization affects organizational commitment (Gopinath and Litt, 2020; Gopinath, 2021b), but there is no very convincing empirical evidence about this relationship. Based on the inconsistency of independent influence on the dependent variable, this research used meaning at work as a mediating factor. This is predicted to mediate between the three independent variables on the two dependents.

Based on the above background, this research aims to (1) investigate the effect of transformational leadership, school support, and self-actualization on meaning at work, (2) examine the impact of transformational leadership, school support, self-actualization, and the meaning at work on teachers' commitment and burnout, and (3) determine whether the meaning at work mediates this relationship. These results contribute (1) to filling the gap in the literature on the relationship between teachers' commitment, burnout, and the meaning at work, because there is few empirical research that examines the antecedents and consequences of meaning at work. (2) Based on the education management perspective, teachers' commitment and burnout are important outcomes of school

support, transformational leadership, and self-actualization. Given the importance of commitment and the low level of burnout in education, school management should maintain the commitment by minimizing teachers' burnout. Furthermore, (3) this research used the meaning at work as a mediator; in respect to this model, schools have more opportunities to recruit productive teachers with the assurance of school support and recognizing the teaching profession as meaningful work. The research model scheme is represented in Figure 1.

Based on the research model scheme described in Figure 1, the research hypothesis is formulated as follows:

H1: School transformational leadership increases the teacher's meaning at work.

H2: School support increases the teacher's meaning at work.

H3: Self-actualization increases the teacher's meaning at work.

H4: Meaning at work increases teachers' commitment.

H5: The meaning reduces their burnout.

H6a: Meaning at work mediates the positive influence of school transformational leadership on teaching commitment.

TABLE 1 Demographics of respondents.

Profile	Description	Total respondents	Percentage
Gender	Male	128	42%
	Female	176	58%
School type	Elementary school	107	35.2%
	Junior high school	91	29.9%
	Senior high school	106	34.9%
Education level	Senior high school/vocational high school	40	13%
	Diploma 3	12	4%
	Bachelor degree	224	74%
	Master degree	27	9%
	Doctoral degree	1	0%
Work experience	0–5 years	136	45%
	6–15 years	110	36%
	16–25 years	48	16%
	> 25 years	10	3%

H6b: Meaning at work mediates the positive effect of school support on teaching commitment.

H6c: Meaning at work mediates the positive effect of self-actualization on teaching commitment.

H6d: Meaning at work mediates the negative effect of self-actualization on the burnout.

H6e: Meaning at work mediates the negative effect of school support on the burnout.

H6f: Meaning at work mediates the negative effect of transformational leadership on the burnout.

Materials and methods

Research population and sample

Population is the unit of analysis of which the characteristics are predicted while having more or less similar features. This was the private elementary school (SD)/*madrasah ibtidaiyah* (islamic elementary school (MI) teachers [SD/MI, junior high school (SMP)/*madrasah tsanawiyah* (islamic junior high school (MTs), and senior high school (SMA)/*madrasah aliyah* (islamic senior high school (MA))] in East Kalimantan Province,

Indonesia. The sample was also determined through a convenience sampling technique (Farrokhi and Mahmoudi-Hamidabad, 2012; Etikan, 2016), where 304 teachers were selected for participation with the demographics described in Table 1.

Research instrument

The data collection instrument was carried out using six types of questionnaires representing each research variable, namely (a) the principal transformational leadership adopted from Bass and Riggio (2010), (b) the school support obtained from Lam et al. (2010), (c) student self-actualization adopted from Robbins and Judge (2009), (d) meaning at work obtained from Steger and Duffy (Steger et al., 2012), (e) teachers' commitment adopted from Allen and Meyer (1990), and (f) teachers' burnout level obtained from Dorman (2003). Each variable was developed into several indicators as described in Table 2. The questionnaire was made using a Likert scale from a score of 1–5, with the information collected in the form of interval data. The score of 1 is for “strongly disagree,” 2 for “disagree,” 3 for “undecided,” 4 for “agree,” and 5 for “strongly agree.” These are different for negative statements, that is, a score of 5 for “strongly disagree,” 4 for “disagree,” 3 for “undecided,” 2 for “agree,” and 1 for “strongly agree.” Google forms were also used to facilitate the distribution and filling of questionnaires to the participants.

Data collection procedure

Coordinations were conducted with the heads of the city and district education offices in East Kalimantan to obtain experimental permits before data collection. This was accompanied by the issuance of a notification letter to the principal, permitting the working team to obtain the required data. The study expert was then assisted by the field technical team in distributing the questionnaires created as a Google form. Through the principal, these instruments were subsequently distributed to teachers for filling. In this questionnaire, an ethical agreement was explained, stating that the experiment was voluntary without any element of coercion.

Data analysis

The data analysis used a structural equation modeling (SEM) with the AMOS application (Collier, 2020). The SEM analysis was used to determine the relationship between the principal transformational leadership, school support, and student self-actualization as exogenous variables with meaning at work as mediating variables and teaching commitment and burnout levels as the endogenous. The considerations for using

AMOS as SEM analysis software are (1) the availability of various SEM imaging tools, and (2) accuracy, speed, and ease of AMOS in SEM path analysis (Byrne, 2001). SEM analysis is divided into two, namely the measurement model for explaining the relationship between variables with their indicators, while structural design is used for expressing the relationship between variables (Gerbing and Anderson, 1988). In the AMOS SEM, regression weight output is obtained to determine the acceptable level of the proposed hypothesis.

Findings

Based on data analysis, these findings are divided into three, namely the measurement, structural, and hypothesis model.

Measurement model

The measurement model provides the relationship of values between the observed indicator and the constructs that are designed to be measured (unobserved latent variables). It was analyzed using confirmatory factor analysis (CFA) to produce the validity of the indicator variables (Collier, 2020). The variable indicators described in Table 2 have passed the validity test with CFA analysis on AMOS. The validity of the indicators was determined from the results of the CFA test with the provisions of the CR (critical ratio) > 1.96 and probability or $p < 0.05$. In this research, the validity of each indicator is shown in Table 3.

Critical ratio value > 1.96 and probability < 0.05 from Table 3 show that each variable indicator has met the validity requirements and reflected the variables. The validity test was also carried out by using the standardized loading estimate or factor > 0.5 as shown in Table 4. It shows when the indicator for each variable has exceeded the required loading factor.

Structural model

The structural model describes the relationship between latent variables (Civelek, 2018; Mueller and Hancock, 2018), such as exogenous, mediating, and endogenous. The validity of the structural model is measured by the goodness-of-fit (GOF) value or the feasibility test by using the achievement of the index suitability criteria and the cutoff point (Schumacker, 2017). These indices are GFI, AGFI, CMIN/DF, TLI, CFI, and RMSEA. The GFI and AGFI are references to describe the level of model suitability with a size range of 0 (poor fit) to 1.0 (perfect fit). The GFI and AGFI values are close to 1.0, indicating that the tested model has a good fit (Arbuckle, 2014). The results obtained for the value of GFI 0.915 and AGFI 0.883 proved that the model is a good fit. The CMIN/DF and TLI become indicators to measure the fitness level of the model with the criteria of CMIN/DF 2.0

and TLI 0.95 (Byrne et al., 1989). The analysis indicated the value of CMIN/DF at 1.966 and TLI at 0.935, stating that the criteria for the model acceptance were met. The next two criteria that determine the model acceptance level include (a) the CFI with a value criterion of 0–1, where the closer to 1, the higher the level of acceptance (Arbuckle, 2014), and (b) the RMSEA with criteria of 0.08 (Cudeck and Browne, 1983). The CFI was 0.947 and the RMSEA was 0.058, indicating a high model acceptance level, as described in Table 5.

Based on the analysis as described in Table 5, the resulting research model scheme is represented in Figure 2.

Hypothesis testing

The hypothesis test in the SEM AMOS was carried out using the CR and p -value in the output regression weights table, with the condition that the hypothesis is accepted when the CR value is > 1.96 and $p < 0.05$. The influence between variables is determined by the existing estimate value. The results of the hypothesis testing are shown in Tables 6, 7.

Based on the hypothesis testing shown in Tables 6, 7, the following proofs were obtained:

1. H1.1: There is an effect of the principal's transformational leadership on the teacher's meaning at work. The hypothesis of the effect of TL on meaning at work has a CR value of 0.435 and p 0.663. Therefore, this hypothesis is rejected, because it does not meet the criteria for CR values > 1.96 and $p < 0.05$.
2. H1.2: There is an effect of school support (SS) on the teacher's meaning at work. The hypothesis of the effect of SS on meaning at work has a CR value of 2.708 and p 0.007. Therefore, this hypothesis is declared accepted, because it has met the criteria for CR values > 1.96 and $p < 0.05$.
3. H1.3: There is an effect of self-actualization (SA) on the teacher's meaning at work (MOW). The hypothesis of the effect of SA on meaning at work has a CR value of 2.188 and p 0.029. Therefore, this hypothesis is accepted, because it has met the criteria for CR > 1.96 and $p < 0.05$.
4. H1.4: There is an effect of the teacher's meaning at work on teaching commitment (TC). The hypothesis of the effect of meaning at work on TC has a CR value of 7.086 and p 0.000. Therefore, this hypothesis is declared accepted, because it meets the criteria for CR value > 1.96 and $p < 0.05$.
5. H1.5: There is an effect of teacher's meaning at work on the level of teacher's burnout (TB). The hypothesis of the effect of meaning at work on TB has a CR value of 6.267 and p 0.000. Therefore, this hypothesis is declared accepted, because it has met the criteria for CR > 1.96 and $p < 0.05$.
6. H1.6a: There is an indirect effect of transformational leadership (TL) on the level of teacher's fatigue (TB) mediated by meaning at work. Based on Table 7, this

TABLE 2 Variable indicator.

Variable	Indicator	Code
Principal's transformational leadership	Idealized influence Leaders are perceived as inspiring role models for their subordinates including: consistently acting in accordance with the values adopted by the management of student activities, role model for subordinates, and involving subordinates in designing various school programs	TL1
	Motivational inspiration The leader shares a vision that attracts and motivates subordinates by conducting the following: Direct teachers to focus on the needful, in order to succeed, Makes the teachers work with enthusiasm and optimism, and Encourages subordinates to work hard to achieve common goals	TL2
	Intellectual stimulation Leaders stimulate their subordinates to be creative and innovative by performing the following: Help solve problems based on strong evidence and arguments, rather than unfounded opinions, Makes the teachers tackle problems from a different perspective, and Encourage teachers to attempt new strategies in learning	TL3
	Individual consideration Leaders provide support, reassurance, and guidance to subordinates by paying attention to individual needs, as follows: Treat subordinates as individuals with unique needs and skills Pay attention to the opinions of subordinates in respect to their responsibilities Pay attention to the personal needs of subordinates	TL4
School support	Competence support Provide opportunities and facilities for subordinates to develop competence Provide sufficient training, therefore subordinates have good teaching skills Take into account the workload and sufficient time for subordinates Properly coordinate programs for all parties	SS1
	Autonomy support Formulate school programs, especially those related to the teaching and learning process Listen to the opinions of teachers and use them as material for the development of the learning process Participate in various activities at school voluntarily Schools provide freedom in planning and implementing learning The principal listens to subordinates' ideas	SS2
	Collegial support There is a promotion of enthusiasm among co-workers in dealing with teaching difficulties Sharing resources that support teaching tasks among colleagues Share experiences that support teaching tasks among colleagues Coworkers are interested in each other's difficulties Cooperation is established between colleagues in carrying out teaching tasks	SS3
Student self-actualization	Growth needs The need for achieving one's potential	SA1 SA2
	Self-fulfillment needs	SA3
	Encouragement needs	SA4
Meaning at work	Positive meaning	MOW1
	Meaning making through work	MOW2
	Greater motivations	MOW3
Teachers' commitment	Teaching commitment	TC1
	Organizational commitment	TC2
Teachers' burnout level	Emotional exhaustion	TB1
	Physical exhaustion	TB2
	Depersonalization	TB3

hypothesis is rejected, because the indirect effect of TL on TB mediated by meaning at work has an estimated value (β) of $-0.045 < 0.000$.

7. H1.6b: There is an indirect effect of transformational leadership on teacher's commitment (TC) mediated by meaning at work. Based on [Table 7](#), this hypothesis is

rejected because the indirect effect of TL on TB mediated by meaning at work has an estimated value (β) of $-0.062 < 0.000$.

8. H1.6c: There is an indirect effect of school support on the level of teacher's fatigue mediated by meaning at work. Based on [Table 7](#), this hypothesis is accepted, because the

TABLE 3 CR value and probability on the confirmatory factor analysis (CFA) test.

	Estimate	S.E.	C.R.	P	Label
MOW \leftarrow TL	-0.045	0.103	-0.435	0.633	par_16
MOW \leftarrow SS	0.442	0.163	20.708	0.007	par_17
MOW \leftarrow SA	0.333	0.152	2.188	0.029	par_18
TC \leftarrow MOW	1.130	0.159	7.086	***	par_19
TB \leftarrow TL	0.865	0.138	6.267	***	par_20
TL4 \leftarrow TL	1.000				
TL3 \leftarrow TL	1.211	0.108	11.218	***	par_1
TL2 \leftarrow TL	1.144	0.104	10.990	***	par_2
TL1 \leftarrow TL	1.111	0.104	10.633	***	par_3
SS3 \leftarrow SS	1.000				
SS2 \leftarrow SS	1.393	0.128	10.885	***	par_4
SS1 \leftarrow SS	1.470	0.130	11.269	***	par_5
SA4 \leftarrow SA	1.000				
SA3 \leftarrow SA	1.712	0.206	8.312	***	par_6
SA2 \leftarrow SA	1.342	0.179	7.516	***	par_7
TC1 \leftarrow TC	1.000				
TC2 \leftarrow TC	0.982	0.099	9.890	***	par_8
TB1 \leftarrow TB	1.000				
TB2 \leftarrow TB	0.977	0.092	10.630	***	par_9
TB3 \leftarrow TB	0.893	0.083	10.765	***	par_10
MOW1 \leftarrow MOW	1.000				
MOW2 \leftarrow MOW	0.978	0.136	7.211	***	par_11
MOW3 \leftarrow MOW	0.951	0.141	6.752	***	par_12

***P-value < 0.001.

indirect effect of SS on TB mediated by meaning at work has an estimated value (β) of 0.385 > 0.000.

9. H1.6d: There is an indirect effect of school support (SS) on teaching commitment (TC) mediated by meaning at work. Based on [Table 7](#), this hypothesis is rejected, because the indirect effect of SS on TC mediated by meaning at work has an estimated value (β) of 0.522 > 0.000.
10. H1.6c: There is an indirect effect of self-actualization (SA) on the level of teacher's fatigue (TB) mediated by meaning at work. Based on [Table 7](#), this hypothesis is accepted because the indirect effect of SS on TB mediated by meaning at work has an estimated value (β) of 0.196 > 0.000.
11. H1.6d: There is an indirect effect of self-actualization (SA) on teaching commitment (TC) mediated by meaning at work. Based on [Table 7](#), this hypothesis is rejected, because the indirect effect of SS on TC mediated by meaning at work has an estimated value (β) of 0.266 > 0.000.

Discussion

This study aims to identify the antecedent factors of teachers' commitment and work burnout by using a meaning at work as a mediating variable. The results are divided into two, namely six accepted and five rejected hypotheses.

Hypothesis 2 which showed that school support has an effect on teacher's meaning at work is accepted. Hypothesis 3 which indicated that self-actualization affects the teacher's meaning at work is accepted. Hypothesis 4 which expressed the effect of teacher's meaning of work on teaching commitment is accepted. Hypothesis 5 which explained the effect of teacher's meaning of work on tutor's burnout is accepted. Meanwhile, six hypothesis which showed the meaning of work mediates the relationship between the antecedent and the consequence variables is partly supported and rejected.

The results indicated that the teacher's meaning of work has two antecedent factors, namely school support and self-actualization. School support received by teachers is their general perception about how important it is for institutions to contribute to their interests and wellbeing. Teachers who feel they received more support from the organization recognize the efforts. According to the theory of POS, members who received valuable resources from the organization, for example, in the form of salary increment, opportunities to attend training, and various self-development activities, have a higher sense of responsibility in helping to achieve organizational goals, as a form of reciprocation to the organization according to the norm of reciprocity ([Neves and Eisenberger, 2014](#); [Kurtessis et al., 2017](#)). Organizational support has an impact on several indicators of employee performance, such as decreased

TABLE 4 Standardized loading estimate value.

	Estimate
MOW \leftarrow TL	-0.066
MOW \leftarrow SS	0.562
MOW \leftarrow SA	0.286
TC \leftarrow MOW	0.930
TB \leftarrow MOW	0.685
TL4 \leftarrow TL	0.618
TL3 \leftarrow TL	0.851
TL2 \leftarrow TL	0.851
TL1 \leftarrow TL	0.804
SS3 \leftarrow SS	0.632
SS2 \leftarrow SS	0.806
SS1 \leftarrow SS	0.846
SA4 \leftarrow SA	0.538
SA3 \leftarrow SA	0.844
SA2 \leftarrow SA	0.619
TC1 \leftarrow TC	0.737
TC2 \leftarrow TC	0.696
TB1 \leftarrow TB	0.762
TB2 \leftarrow TB	0.757
TB3 \leftarrow TB	0.732
MOW3 \leftarrow MOW	0.493
MOW2 \leftarrow MOW	0.655
MOW1 \leftarrow MOW	0.603

TABLE 5 The goodness of fit indices.

The goodness of fit indices	Cut-off value	Analysis results	Model evaluation
CMIN/DF	=2.00	1.966	Fit
RMSEA	=0.08	0.058	Fit
GFI	=0.90	0.915	Fit
AGFI	=0.90	0.883	Marginal fit
TLI	=0.95	0.935	Fit
CFI	=0.95	0.947	Fit

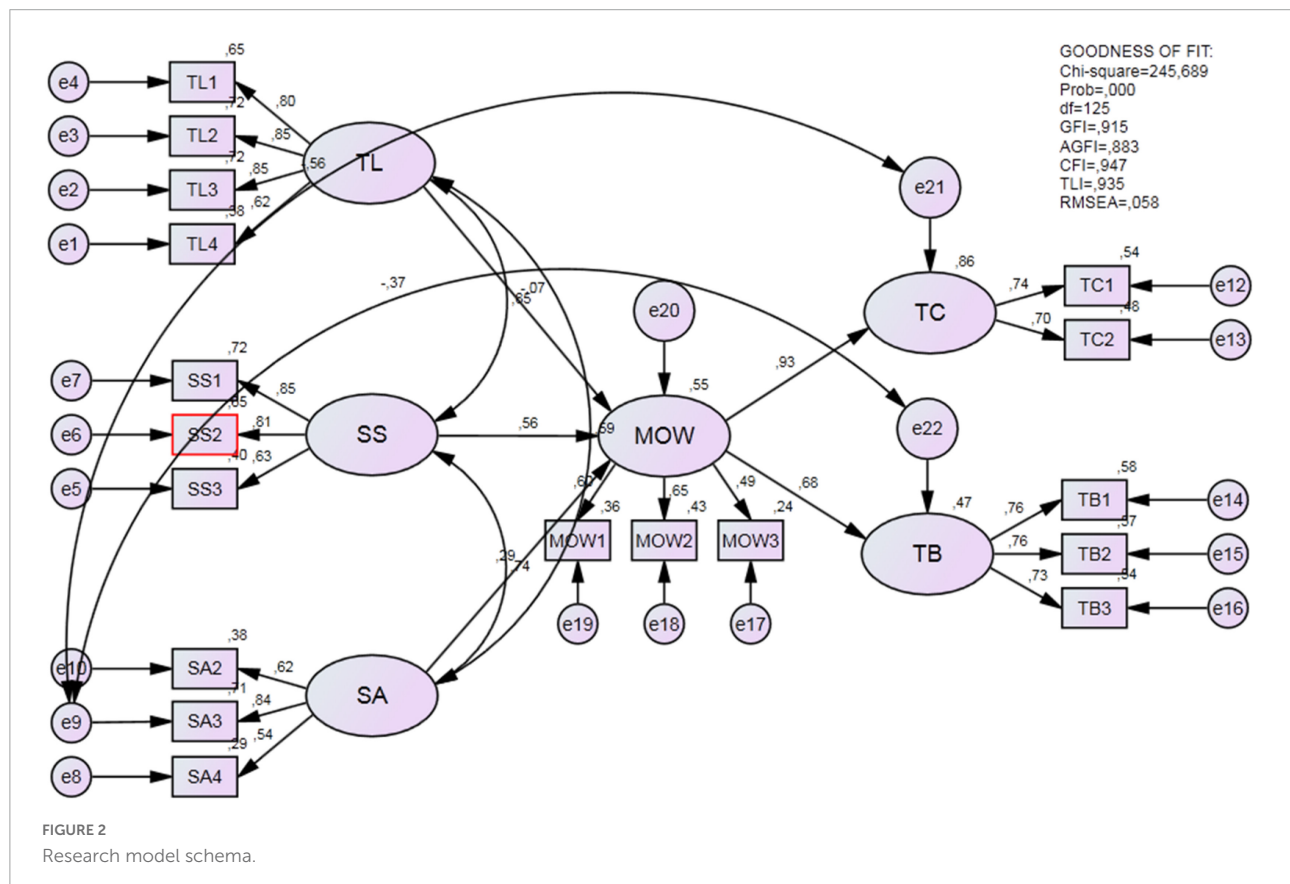


TABLE 6 Regression weight output.

	Estimate	S.E.	C.R.	P	Label
MOW ← TL	-0.045	0.103	-0.435	0.663	par_16
MOW ← SS	0.442	0.162	2.708	0.007	par_17
MOW ← SA	0.333	0.152	2.188	0.029	par_18
TC ← MOW	1.130	0.159	7.086	***	par_19
TB ← MOW	0.865	0.138	6.276	***	par_20

***P-value < 0.001.

absenteeism, increased commitment, and job satisfaction (Johlke et al., 2002). POS is an indicator of organizational concern (Perrot et al., 2014). It makes members feel that the organization is willing to provide the resources they needed, to

support the growth and development in their capacities (Armeli et al., 1998). Based on the conceptual framework of the POS theory, the support felt by teachers from schools is seen as their perception of how the institution values their efforts, cares

TABLE 7 Indirect effects.

	SA	SS	TL	MOW	TB	TC
MOW	0.000	0.000	0.000	0.000	0.000	0.000
TB	0.196	0.385	-0.045	0.000	0.000	0.000
TC	0.266	0.522	-0.062	0.000	0.000	0.000

about their welfare, and appreciates all their performance. Based on the theory (Lee, 2015), this conceptual framework enables teachers to feel positive in carrying out their duties. Feeling positive at work is one of the four critical attributes of meaning at work. Meaning at work is obtained when someone feels that their job is important and has a valuable purpose (Steger et al., 2012). This framework is also related to one of the three aspects of the conceptualization belonging to Hicks and King (2009), which stated that the support they receive from the organization enables an individual to gain sense of meaning at work. Teachers' involvement in school-wide policy-making is positively related to individual professional commitment (Park et al., 2020).

The meaning at work is also influenced by the self-actualization variable, enabling individuals to use their full potential (Özaslan, 2018). According to Maslow, self-actualization is the highest human need (Maslow, 1971). The fulfillment of this need lead an individual to achieve mental health and desired personal goals. For teachers, self-actualization is important after carrying out various activities that boost their potential and competence to become professional educators (Hendriani, 2017). Forms of self-actualization are carried out by building awareness of the main role of a teacher and developing strategic steps to continue to improve their competencies. The research conducted by Nasser and Sarkhosh (2019) showed that self-actualization improved teachers' performance. A self-actualizing individual is able to think about the complexities of life, balance, and integrate emotions into real-life realities. Teachers make choices that support their growth even in difficult conditions. They also overcome various dilemmas they face, such as anxiety, disappointment, and doubt (Compton, 2018). People who have achieved self-actualization become servants of life. These findings are in line with several previous research which explained that self-actualization is a major source of sense of meaning at work (Kenrick, 2017; Suyatno et al., 2020). Research (Delle Fave et al., 2016) explains that self-actualization is a source of meaning at work, which accounts for 8.5% of an individual lifestyle.

The meaning at work also fully supports the consequence variables, namely teacher's commitment and fatigue. This implies that the high meaning of work increases their commitment and reduces work fatigue. In the first case, this finding supports previous research that meaning at work affects one's work commitment (Heintzelman et al., 2013; Trevisan et al., 2017; Sørensen et al., 2019; Suyatno et al., 2021).

It succeeded in confirming a positive relationship with organizational commitment (Maharaj and Schlechter, 2007). According to Morrison et al. (2007) and Leape et al. (2009), the concept of meaning of work has been suggested as an approach to increase one's job commitment. Some literature showed that a person's commitment grows when the values and goals of the organization are identified. The identification enhances a person's willingness to work on behalf of and remain in the organization (Jo, 2014). Awards and support, achievements achieved, and organizational involvement affect a teacher's commitment (Rani, 2019). The meaning of work helps create a school environment that encourages teacher's commitment, prevents dropouts from their profession, and improves the quality of education (Saloviita and Pakarinen, 2021).

Besides fully supporting the commitment of teachers, meaning at work also has a negative effect on burnout level. Those with high meaning at work reduce burnout levels, and vice versa. The burnout level is a description of the gradual process of fatigue and the loss of commitment at work (Madigan and Kim, 2021). The reduced burnout is directly proportional to work involvement, which is a positive factor in performance (González-Romá et al., 2006). It has a lot of negative impacts on teachers, for example, they become more critical and respond slower to student success (Madigan and Kim, 2021), teacher's intention to quit (Liu and Onwuegbuzie, 2012), lower pupils' motivation and academic achievement (Shen et al., 2015; Sutchter et al., 2019), lower job satisfaction (Skaalvik and Skaalvik, 2009), and even detrimental to health (Kovess-Masféty et al., 2007). Furthermore, 19–30% of teachers stop working because of burnout (Pressley, 2021). High burnout is influenced by anxiety, stress, lack of administrative support (Pressley, 2021), and low quality of social interaction in schools (Fernet et al., 2012; Van Droogenbroeck et al., 2014). This research supports several previous findings that low meaning at work is a predictor of teacher's burnout. The fulfillment of existential needs prevents burnout (Loonstra et al., 2009). An individual who is oriented toward achievement and meaningful goals is able to reduce burnout (Devos et al., 2012; Pietarinen et al., 2013). The findings indicated that meaning at work is an important variable in reducing burnout. Meaning at work is influenced by the existence of a calling orientation, where someone works because they perceive the calling (Fouché et al., 2017). Increased meaning at work intensified awareness in daily work (Lavy and Bocker, 2018). Therefore, the results help in establishing schools that promote job satisfaction and the delivery of high-quality education (Saloviita and Pakarinen, 2021).

In contrast to the findings of this research, the hypothesis that considers the effect of transformational leadership on teachers' sense of meaning at work is not significantly supported by the data. This finding is in contradiction with most of the previous research, which showed that transformational

leadership is an important predictor of meaning at work (Bernardo et al., 2020). This makes teachers feel respected and trusted (Yang, 2014). Transformational leaders maintain good relationship with employees and cause perceptions of the organization's reputation to be better (Men, 2012). The four hypotheses linking the mediating role of meaning at work are also not significantly supported by the empirical data. This is because it did not mediate the effect of transformational leadership on burnout and commitment, school support on commitment, and self-actualization on commitment. The reason behind these findings is related to the population. The main objective of this research is to identify the antecedent factors of teachers' commitment and burnout. Considering this objective, this research focuses on teachers in private schools, from primary and secondary education levels. The results of Sun et al. (2017) explained the context of this research, in which the principal's transformational leadership is associated with three sets of antecedents, namely leader qualities (including self-efficacy, values, traits, and emotional intelligence), organizational features, and the leader's colleagues' characteristics (e.g., follower's initial developmental level). In the context of schools in Indonesia, these three sets of leadership qualities are lacking in private institutions compared to the government-owned.

This research has both theoretical and practical contributions. Theoretically, it indicated that teachers' commitment increases when they recognize their meaning at work. This indicates that when teachers complete the important and valuable tasks, they conduct this with all their mind, knowledge, skills, and dedication to the school organization. The meaning at work also reduces teachers' burnout levels. The feeling that their work is meaningful amplifies positive emotions and creates meaningful goals and job satisfaction (Lee, 2015). Therefore, making the level of burnout at work to decrease, which in turn have an impact on their intention to stop teaching (Liu and Onwuegbuzie, 2012), increases job satisfaction (Skaalvik and Skaalvik, 2009), improves mental health quality (Kovess-Masféty et al., 2007), decreases anxiety in teaching (Pressley, 2021), and enhances the care for student learning achievement (Shen et al., 2015; Sutchet et al., 2019; Madigan and Kim, 2021). For sense of meaning at work to increase, there is need for support from school organizations and teacher self-actualization. In this research, these two variables simultaneously increase the sense of meaning at work. Furthermore, the mediating effect is partly supported by this research, which increases the understanding of how school support and self-actualization increase commitment and reduce burnout. The mediating role of meaning at work shows that the teachers' perception of their work is an important factor in determining commitment. The findings supported the argument that meaning at work plays a mediating role in the relationship between school support and self-actualization with teachers' commitment and burnout. Finally, this research

offers a more comprehensive concept of sense of meaning at work and provides empirical evidence that school support and self-actualization lead to higher levels of teachers' commitment and reduce burnout in their profession.

Practically, the findings offer a framework for principals to increase commitment and reduce teachers' burnout by increasing school support and self-actualization through meaning at work. It is observed that school support and self-actualization increase meaning at work; therefore, principals should emphasize that school organizations provide full support and the widest opportunity for teachers to achieve self-actualization. To increase school support, principals are required to create a fair institution climate (Cheng et al., 2013; Jacobs et al., 2014), provide opportunities for growth (Mendelson et al., 2011), and support superiors (Simosi, 2012) and colleagues (Zagenczyk et al., 2010; Ahmed and Nawaz, 2015). Meanwhile, to increase self-actualization, principals should increase teachers' involvement and job satisfaction (Gopinath, 2020, 2021a) and provide freedom of choice (Arslan, 2017), growth opportunities, psychological comfort, and security (Alaghmand et al., 2018). The principal's ability to establish good interactions also predicts the perception of school support toward teachers' wellbeing (Bogler and Nir, 2015).

In this study, the main objective was to identify the antecedent variables affecting teachers' commitment and burnout. A comprehensive understanding of the relationships between these variables and their consequences also helped school administrators and leaders to identify, develop, and implement the strategies to increase commitment and reduce teachers' burnout. However, this experiment had the following limitations: (1) the sample was only the private primary and secondary school teachers, where most of the qualities and characteristics of leadership were not similar with government-owned institutions (Sun et al., 2017), and (2) the sampling process was carried out using a convenience technique, as part of non-probability method having generalized limitations (Farrokhi and Mahmoudi-Hamidabad, 2012). Future studies are expected to fill this gap by using probability sampling techniques with a wider and heterogeneous sample coverage, involving both public and private schools.

Conclusion

Commitment and burnout are two positive and negative aspects contributing to the performance of teachers. In this study, the variables were influenced by school support, self-actualization, and the teacher meaning at work. Furthermore, burnout was influenced by the mediating role of teacher meaning at work. These results provided a framework for principals to increase commitment and reduce burnout, by increasing school support and self-actualization through meaning at work. The generalization on the antecedent

variables of teachers' commitment and burnout was also partially supported. However, some results did not support the total generalizations about the role of principals' transformational leadership on these variables. This was due to the experimental sample, where private primary and secondary school teachers were highly emphasized. Principal transformational leadership was also related to three sets of antecedents, namely leader qualities, organizational features, and the colleagues' characteristics. This proved that private schools did not have sufficient quality than the government-owned institutions in Indonesia.

Data availability statement

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

Ethics statement

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

SS, WW, and DP: conceptualization and resources. SS: methodology, software, formal analysis, and writing—original draft preparation. SS, DP, and AA: validation and investigation.

SS and WW: writing—review and editing. AA: visualization. SS: supervision. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

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

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The structure and evaluation of educational research skills and accomplishments among rural teachers: Data from China

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The practice of educational research by rural teachers is highly valued and very important for their professional development and for the revitalization of rural education. This study explored the components of educational research activities among rural teachers (Study 1). Based on the results, a regional norm for Hunan province was formulated, and discriminant criteria were developed for the evaluation of educational research skills and accomplishments among rural teachers (Study 2). In Study 1, data from 892 Chinese rural teachers working at compulsory education schools in Hunan Province (a representative province in central China), divided into two samples, were found to support the constructs included in the measurement instrument. Exploratory and confirmatory factor analyses of the 33 items of the Rural Teachers' Educational Research Self-rating Scale identified a first-order model with three factors: educational research on basic educational activities (BEA), educational research involving the creation of an educational community (CEC), and educational research involving the refinement and popularization of educational theory (RPE). Based on the results of Study 1, in Study 2, a set of norms for educational research skills and accomplishments among rural teachers was formulated based on the data from Hunan Province. This norm can serve as a reference standard for the evaluation of rural teachers' educational research skills and accomplishments. The components of rural teachers' educational research activities are discussed, and suggestions for the formulation of education policies are provided.

KEYWORDS

educational research, rural teachers, educational research, teacher evaluation, teacher development, regional norm

1. Introduction

As early as 1926, [Buckingham \(1926\)](#) began to discuss the topic of "The Teacher as Research Worker." "Educational research" refers to the activities that teachers engage in and the systematic methods that they employ in order to explore educational phenomena or problems ([Liu, 2015](#); [Zheng, 2019](#)). Teachers' engagement in educational research has several specific and valuable effects, such as enriching human spiritual culture, stimulating organizational vitality, forming organizational cohesion, and continuously improving people's quality of life ([Yang, 2005](#)). In recent years, ways to improve the level of engagement with educational research among teachers has become the focus of China's basic education community ([Meng and Xing, 2001](#)). In contrast with the earlier concept of educational research in China, in which it was regarded as a task for college teachers, educational

research among compulsory education¹ teachers has gradually received more attention. Most scholars assume that the key to improving levels of educational research among compulsory education schoolteachers is their literacy in the domain of educational research. Relevant issues include the components of educational research literacy (Soto Gómez et al., 2019), the current reality of educational research literacy (Jia and Wang, 2009), and the strategies employed to improve the quality of educational research literacy (Dong, 2008). However, the structure of educational research activities has not been sufficiently explored. More importantly, in China, the number of compulsory education students in rural areas accounts for 66% of all students in compulsory education; however, the academic community knows very little about educational research among rural teachers.

1.1. Structural components of educational research

To better understand and evaluate teachers' skills and accomplishments in the domain of educational research, the structural components of educational research must be analyzed. Several structural schemas have been previously proposed. (1) Based on the purpose and theoretical level of educational research, Jia et al. (2011) divided the concept into basic research, applied research, and developmental research. Similarly, Tang and Hu (2015) divided educational research into basic research, applied research, and comprehensive research. (2) Based on the educational research paradigm, Cai (2011) and Wei et al. (2012) classified educational research activities as either qualitative research or quantitative research. While these divisions are directly derived from the structure of "research," they lack the specific pertinence to "education." In addition, "action research" is a form of research that differs from traditional academic educational research (Liu, 2001), in that it is characterized as "research for action, research by actors, research in action" (Chen, 2001) and places the "focus on actors' self-reflection" (Kemmis et al., 1982). This research paradigm has strong applicability for elementary education teachers, which was verified in a pre-investigation that formed part of this study.

It is educationally appropriate to explore the structural components of educational research carried out by compulsory education teachers from the perspective of the action research paradigm. Research targeting individual educational practice (including teaching and management activities) is the most basic and common form of educational research (Kemmis et al., 1982; Cheng, 2011; Nami and Matin, 2017). However, it has been suggested that in addition to educational research targeting teachers' individual educational practices, educational research with collective significance and a community nature, in the form of collaboration and dialog, is also important (Curry et al., 2018). This kind of research best demonstrates the value of criticizing educational science (Carr and Kemmis, 2003), which creates meaning for teaching practice through collaborative reflection. In addition, the processes of compilation and promotion of the educational experience can also be considered as educational research for elementary education teachers. This view emphasizes that teachers can refine theories that can

be popularized based on practical experience (Elliot, 1991; Tang, 2011). In summary, although the above-mentioned objects of educational research have been addressed before (Somekh and Zeichner, 2009; Song, 2021), integrated empirical research on the structure of educational research based on the object of research is still underdeveloped. As a result, existing research findings do not provide a sufficient basis for understanding the structural characteristics of teachers' educational research, evaluating teachers' educational research accomplishments, and guiding teachers to carry out educational research.

1.2. Educational research among rural teachers

Most of the abovementioned studies focus on urban teachers; with regard to educational research among rural teachers, the situation will be very different. Generally, rural teachers seem not to be very interested in educational research, especially in China. The main reasons are summarized below.

The first of these reasons relate to the external environment. First, the workload of rural teachers is heavy. Zhao (2019) surveyed rural teachers in 23 provinces of China and found that these teachers generally suffer a heavy workload despite their low salary. Therefore, they have no time or energy left to accept teaching and research support and often face serious levels of emotional exhaustion. Second, funding for rural education is insufficient. At present, China's compulsory education is funded via a "county-based" mode of investment in education, which means that investment in funding of education depends on the income of the county where the school is located (Qu, 2017). The funds provided to rural schools are therefore far lower than those of urban schools, which makes them inadequate to guarantee that rural teachers will be able to carry out educational research or encourage them to do so.

Other reasons involve factors relating to the teachers themselves. First, rural teachers often lack the motivation to conduct educational research (Swanson, 2011; Richardson, 2017). Second, the ability of rural teachers to conduct scientific educational research involving papers and projects is relatively weak (Lu et al., 2016). Third, in China, most rural teachers have not yet fully realized the value of educational research in resolving their own difficulties (Zhang, 2020).

Given this realistic assessment of the situation, the structure and quality of rural teachers' educational research in China may be distinct from those of other teachers. Important questions are: what do the structural components of educational research carried out by rural teachers in China look like, and how can the educational research skills and accomplishments of rural teachers be measured? Addressing these questions will help to establish a more realistic evaluation mechanism and guidance strategy for educational research among such teachers. This was the purpose of the present study.

1.3. Research objectives

In order to explore the structural components of educational research among rural teachers in the context of China and to assess their current skills and accomplishments in this domain, this study focused on Hunan Province, a large province in central China with a representative educational structure. This study consists of two main parts. First, semi-structured interviews were conducted with rural teachers to collect information on their educational research activities;

¹ Compulsory education includes primary school and junior middle school. The teachers who participated in this study were rural teachers at the compulsory education stage.

subsequently, the structure of educational research was explored and verified, and a scale for measuring educational research among rural teachers was developed. Second, on the basis of rural teachers' current skills and accomplishments in educational research, a set of norms and discriminant criteria were constructed for the evaluation of rural teachers' educational research skills and accomplishments, and a practical evaluation standard for educational research among rural teachers was established.

2. Study 1: Structure of educational research among rural teachers

2.1. Preliminary investigation

The purpose of the preliminary investigation was to collect information on educational research activities among rural teachers in China in preparation for analysis of the structural components of rural teachers' educational research activities and the construction of a scale to measure rural teachers' skills and accomplishments in educational research. Through analysis of the literature and semi-structured interviews with target groups, an initial questionnaire for the evaluation of rural teachers' educational research skills and accomplishments was designed. Two sample interview questions are: "Which methods do you use to conduct educational research?" and "What has your educational research achieved?" The interview content was then transcribed. Analysis of these interview results showed that interviewees generally talked about the methods they used in specific educational situations and the results they obtained. Therefore, educational research activities were described according to the sentence pattern: "method + object + outcome." The results showed that the methods and outcomes of educational research are highly consistent. In particular, interviewees often identified the outcomes of conducting academic research as "publishing a paper" and "applying for funding." However, when the research method reported by the respondent fell under the action research paradigm, their description of the outcomes was transformed into examples of the practical effects of the research, such as effects on the academic performance of students and the classroom atmosphere.

Following this analysis, 45 educational research activities were identified according to the object of the research and its outcomes. These activities were organized into items (including several items referring only to the overall outcome of the research, such as "My students seem to like me"); these items were to be rated on a 5-point Likert scale, with 1 indicating non-conformance and 5 indicating conformance, the response options being arranged in order from 1 to 5. Subsequently, 10 rural teachers were asked to assess the comprehensibility, plausibility, and completeness of the items. Finally, an initial version of the Educational Research Self-rating Scale for Rural Teachers (ERSS-RT), a questionnaire containing 45 items, was formulated.

Initially, 104 of these questionnaires were randomly distributed among rural teachers as a preliminary survey. Responses to all 104 questionnaires were collected, 88 of which were valid (on the basis of responses to lie detection questions and ambivalent demographic data). Preliminary factor analysis showed that nine items under the category of academic educational research were more weakly correlated (<0.3) with other items and had lower loadings (<0.5) onto their respective factors. This indicated that these items were not suitable to be pooled with the other items, suggesting that academic research activities form

a distinct component of educational research among rural teachers, and this component is not suitable for inclusion in a more general discussion. Therefore, 36 of the 45 items were retained for the second version of the scale.

To establish criteria for the evaluation of the validity of such a scale, experts have suggested that the general standards and regulations of professional title evaluation documents can be used as calibration items (Hunan Education Department, 2017). These documents use the honors awarded to teachers in recognition of their practical activities as criteria for the evaluation of teachers' professional titles. After discussing the rationale and universality of these standards with 10 rural teachers, 11 general criteria were selected (these included items relating to the professional standards applied by most provinces, cities, and prefectures). These criteria partly reflected rural teachers' educational research achievements. Subsequently, the wording of the items and the corresponding response options was discussed with 10 rural teachers: for example, for the item "In the teaching competitions I have participated in, the highest-level award I have won is," the response options included "no participation or no award," "school level," "district or town level," "county or city level," and "provincial level or above." Finally, responses were extracted and the first version of the 11-item Educational Research Achievements Questionnaire for Rural Teachers (ERAQ-RT) was compiled.

Prior to the questionnaire-based investigation, several demographic questions, two lie-detection questions, the second version of the ERSS-RT, and the first version of the ERAQ-RT were sent to rural teachers who had not participated in the first preliminary survey or the above-described interviews. A total of 100 responses to the questionnaire were collected, 89 of which provided valid data for the calculation of descriptive statistics and for exploratory factor analysis. The questionnaire was not further revised because the factor loading matrix coefficients of all items were >0.5 , meeting the statistical requirements for factor analysis.

2.2. Formal investigation

2.2.1. Participants and sampling

A total of 850 questionnaires were randomly distributed to teachers; these consisted of demographic questions (7 items), the second version of the ERSS-RT (36 items), the first version of the ERAQ-RT (11 items), and 2 lie detection questions. The teachers who received them worked in four types of schools: village primary schools, central town primary schools, town junior middle schools, and village junior middle schools. A total of 803 valid responses to the questionnaire were collected (for an effective response rate of 94.47%). All data were analyzed using SPSS (version 23) and Mplus (version 8.3). All participants were from Hunan Province, and none of them had previously participated in the preliminary interviews or investigation. The 803 valid questionnaire responses were pooled with the above-mentioned 89 valid responses, producing a total of 892 responses for statistical analysis. Among these, 228 of the respondents (25.6%) were men and 664 (74.4%) were women. The proportions of respondents with no title, a junior title, a mid-level title, and a senior title were 31.3%, 29.7%, 31.2%, and 7.8%, respectively. The distribution of teacher seniority was as follows: 383 respondents (42.9%) had up to 3 years of teaching experience, 126 (14.1%) had 3 to 5 years of experience, 114 (12.8%) had 6 to 10 years, 40 (4.5%) had 11 to 15 years, 50 (5.6%) had 16 to 20 years, and 179 (20.1%) had more than 20 years of experience.

2.2.2. Item analysis

Two forms of analysis were conducted: a qualitative analysis, in which content validity was assessed, and a quantitative analysis, in which item difficulty and item discrimination were considered. Pearson correlation coefficients were calculated as a measure of the correlation between each item and the total score; these results indicated whether each item represented a valid component of “rural teachers’ educational research activities.” Item discrimination was analyzed primarily *via* an independent-samples *t*-test, where the resulting *t* value was the critical ratio. All *p* values of both analyses were highly significant ($p < 0.001$); the correlation coefficients fell within the range of 0.68 to 0.87, and the *t* values ranged from -40.85 to -25.87 . These results showed that these items were valid components of rural teachers’ educational research activities and each individual item had a certain discriminative power.

2.2.3. Exploratory factor analysis

The full set of valid questionnaire responses was equally and randomly divided into two samples. Sample 1 ($N = 446$) was used for exploratory factor analysis, and Sample 2 ($N = 446$) was used for confirmatory factor analysis. An independent-samples *t*-test showed that there was no significant difference between Sample 1 and Sample 2 in terms of total ERSS-RT scores ($t = -0.54$, $p = 0.59$). Tests of the suitability of Sample 1 for exploratory factor analysis showed that the KMO value was 0.98, and χ^2 reached the threshold for significance ($p < 0.001$) in Bartlett’s test of sphericity, which indicated that the data were suitable for exploratory factor analysis. Considering that the pairwise correlations between items reached significance ($r = 0.33$ – 0.87), principal axis factoring with oblique rotation was employed (Tabachnick et al., 2007).

Through exploratory factor analysis, three factors with feature roots greater than 1 were extracted, and the total cumulative proportion of the variance explained was 75.67%. The factor loading of item 25 was the lowest (< 0.4), and items 12 and 24 were cross-loaded onto two factors; all three of these items were removed. Exploratory factor analysis was repeated for the remaining 33 items, using the same steps as described above. The results showed that there was almost no change in the KMO value or the outcome of Bartlett’s test of sphericity, and three factors accounted for 76.4% of the total variance. This indicated that these three factors had the greatest explanatory power in terms of the structure of educational research among rural teachers. The communality of items exceeded 50%, and all coefficients for each item in the factor loading matrix exceeded 0.55 (range: 0.59–0.97). Table 1 shows the factor loadings for each item.

As shown in Table 1, items 1–11 and items 33–36 loaded onto factor 1. These items mainly reflect educational research activities and their effectiveness in terms of daily teaching, student management, and home–school cooperation, as well as other educational situations. Items 13–23 loaded onto factor 2. These items mainly reflect educational research activities and their effectiveness in terms of helping with the development of colleagues, teaching and research offices, schools, villages, and other educational communities. Finally, items 26–32 loaded onto factor 3. These items mainly reflect educational research activities and their effectiveness in the educational context of the further refinement and popularization of the respondent’s own experience.

According to the factor loading values and existing theoretical research, the three factors were defined as follows. Factor 1: educational research on basic educational activities (BEA), which includes carrying out daily teaching work, management work, and home–school

cooperation. Factor 2: educational research involving the creation of an educational community (CEC), which involves understanding rural culture and carrying out various educational activities based on its characteristics. Factor 3: educational research involving the refinement and popularization of educational theory (RPE), which involves developing curricula, writing educational papers, and designing teaching plans. The teaching and research level of rural teachers is reflected in various kinds of knowledge products that they create in their daily educational activities.

2.2.4. Confirmatory factor analysis

Mplus 8.3 was used to analyze the Sample 2 data to test the rationale underlying the structural components of educational research carried out by rural teachers and the structural validity of the scale. The structural fit indices for the three-factor model each reached an acceptable level ($\chi^2/df = 3.8$, $p < 0.01$; CFI = 0.92; TLI = 0.91; RMSEA < 0.08). Exploratory factor analysis showed that the proposed structure was an ideal model of educational research activities among rural teachers. In addition, the second-order factor model was equivalent to the first-order three-factor model because of their equal degrees of freedom. Psychological plausibility and a good model fit led to the selection of the first-order model.

The underlying structure of questionnaire items according to this model is shown in Figure 1.

With regard to measurement errors, a possible cause may be the overlap in content and expression between items 9 and 10, between items 13 to 15, between items 21 and 22, and between items 33 to 35. In addition, these items were presented consecutively in each case, meaning that respondents could easily have become stuck in a certain mindset when filling in these sections of the questionnaire. Considering that each of these item has its own emphasis, all of them were retained. However, in subsequent use of the scale, it is important to reorder the items to split up those that are closely related.

2.2.5. Further examination of the structural components of educational research

Given the high importance of validity in examining measurement models, the reliability and validity of the resulting factors were assessed following the establishment of the measurement model. Prior to this assessment, in order to test whether significant common method bias was present, Harman’s single-factor test was conducted under principal components analysis and confirmatory factor analysis. The cumulative variance contribution rate of the first factor was 49.61%, which is below the standard threshold of 50%, as proposed by Hair et al. (1998). Fit indices showed a relatively poor model fit for the one-factor model, $\chi^2/df = 14.04$, CFI = 0.65, TLI = 0.64, RMSEA = 0.13 (Wen et al., 2004). In conclusion, the dataset was not strongly affected by common method bias.

A reliability assessment requires estimates of composite reliability (CR) and average variance extracted (AVE) for each variable. The values of CR and AVE should be ≥ 0.70 and ≥ 0.50 , respectively. Thus, in a measurement model, a construct is considered reliable if its loading value is at least 0.50 (Bagozzi and Yi, 2012). As shown in Table 2, CR scores for each construct ranged from 0.94 to 0.97 and AVE scores ranged from 0.70 to 0.72, both exceeding the suggested cut-off values of 0.70 and 0.50, respectively (Table 2).

Discriminant validity represents the extent to which a particular construct in the model is uniquely different from other constructs (Hair et al., 2014). The discriminant validity of each construct was

TABLE 1 Exploratory factor loadings for each item in Sample 1 (N =446).

Item	Factor 1 (BEA)	Factor 2 (CEC)	Factor 3 (RPE)
1. I continue to study teaching methods, so that teachers and students can interact harmoniously in the classroom.	0.722		
2. I actively study and use new teaching software (technology or platforms) to achieve better teaching.	0.728		
3. When teaching, I am good at planning and diligent in reflection.	0.775		
4. I have a comprehensive understanding of students and teach students according to their aptitudes.	0.653		
5. I lead students to achieve better academic results.	0.774		
6. I have mastered classroom dynamics and improved classroom management.	0.854		
7. I patiently think about the reasons for students' lack of discipline and guide students who are not disciplined.	0.854		
8. In classroom management, I constantly think about management methods, and predict and solve management problems.	0.812		
9. I carefully explore methods of educating people so that they develop a good character.	0.768		
10. I pay timely attention to the psychological dynamics of students and help them grow up healthily.	0.816		
11. I have explored effective ways to communicate with students' parents.	0.589		
13. Through observation and exploration, I have gained a deeper understanding of local rural culture.		0.659	
14. I weave rural elements into the classroom.		0.819	
15. I organize class activities based on rural culture.		0.832	
16. I am concerned with and think over certain problems in the development of rural education and have independent opinions.		0.836	
17. Under my guidance, my students come to better understand and love the countryside.		0.808	
18. I have explored ways to help my colleagues improve their professional level.		0.728	
19. I actively provide suggestions for teaching, research offices, and schools.		0.701	
20. I constantly adjust, realize, and surpass the original role orientation of teachers in practice.		0.685	
21. I have witnessed problems in school management and actively seek strategies for improvement.		0.773	
22. I actively participate in the future planning of the school.		0.611	
23. I use rural resources to make and develop teaching tools to promote teaching.		0.591	
26. I have developed and implemented a school-based curriculum.			0.677
27. My educational papers, research reports, and experience introduction have been promoted.			0.737
28. I have been invited to demonstrate my teaching ability in various open classes and demonstration classes.			0.849
29. I am often invited to share my experience in moral education and management activities.			0.847
30. I have performed well in refresher courses or heterogeneous forms for the same subject.			0.836
31. My teaching plans and course materials are often used as a reference by colleagues.			0.811
32. I share educational essays through various channels (blogs, WeChat circles, etc.).			0.700
33. My students seem to like me.	0.926		
34. My colleagues seem to recognize my professional ability.	0.966		
35. My students' parents have a high overall evaluation of me.	0.850		
36. I think I am a rural teacher who continues to explore and grow.	0.793		

BEA, educational research on basic educational activities; CEC, educational research involving the creation of an educational community; RPE, educational research involving the refinement and popularization of educational theory.

tested by comparing the square root of the AVE with the correlations among latent variables. The results of a comparison between all correlations with the square root of the AVE (as shown in Table 3) indicated that discriminant validity was established, as the values of the square root of the AVE (diagonal elements) exceeded those of the construct correlations (off-diagonal elements; Fornell and Larcker, 1981). These findings show that the measurement model was both valid and reliable.

2.2.6. Analysis of the reliability and validity of the scale

Previously presented results have highlighted the excellent reliability and validity of the scale: Cronbach's α values were above 0.95, as shown in Table 2, indicating that the reliability of the scale in terms of internal consistency was high; the scale development process indicated that the scale had reliable content validity; and the data presented in Sections 2.2.2–2.2.5 show that the scale had good structural validity.

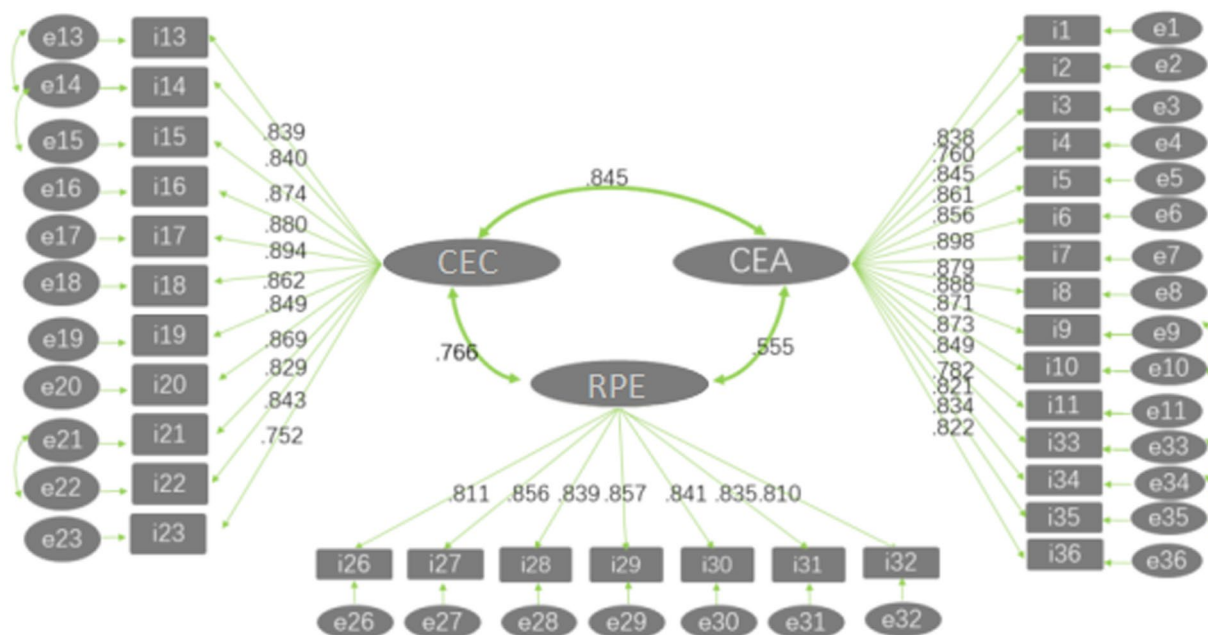


FIGURE 1
Structure of the scale.

TABLE 2 Reliability and validity tests.

Construct	Cronbach's α	Composite reliability	Average variance extracted
BEA	0.972	0.974	0.716
CEC	0.967	0.966	0.721
RPE	0.952	0.942	0.698

To further verify the reliability and effectiveness of the ERSS-RT scale developed in this study, ERAQ-RT scores were used to calibrate the ERSS-RT and the relationship between these scales was examined. Although the ERAQ-RT is an ordinal scale, scores on this scale were statistically analyzed by treating ordered categorical variables as continuous variables (Johnson and Creech, 1983). Factor analysis was conducted on data from Sample 1 and Sample 2, which did not differ in terms of total scores ($t = -0.47$, $p = 0.64$). The results showed that the items of the ERAQ-RT can be treated as falling into a single factor ($KMO = 0.92$; Bartlett's test of sphericity coefficient = 0.000; total variance contribution rate = 46.97%). The results of confirmatory factor analysis ($\chi^2/df = 3.1$, $p < 0.01$; CFI = 0.96; TLI = 0.95; RMSEA = 0.07) indicated a good model fit. However, the communality of item 10 (relating to publishing papers, monographs, etc.) was below 0.3. After this item was removed, the results of exploratory factor analysis and confirmatory factor analysis produced higher fit indices ($KMO = 0.93$; total contribution rate of variance = 48.9%; $\chi^2/df = 2.96$, $p < 0.01$; CFI = 0.97; TLI = 0.96; RMSEA < 0.07); the selected internal consistency coefficient of calibration items was 0.90; and the reliability was good. These findings upon removal of item 10 also indicate that abstract and theoretical achievements (such as papers and monographs) are not the main form of educational research achievements among rural teachers. Analysis of the correlation between the ERSS-RT and the ERAQ-RT

TABLE 3 Test of the discriminant validity of potential variables.

Potential variable	Mean	SD	BEA	CEC	RPE
BEA	4.130 ^a	0.765	0.846^b		
CEC	3.775	0.919	0.821	0.849	
RPE	3.142	1.188	0.546	0.740	0.836

^aThe scale was reverse-coded (1 = very inconsistent; 5 = very consistent).

^bThe bold diagonal elements are the square roots of each AVE; construct correlations are shown off-diagonal.

showed that both factor scores and total scores (hereafter referred to as ERSS) on the ERSS-RT were positively correlated with total ERAQ-RT scores ($r_{BEA} = 0.262$; $r_{CEC} = 0.268$; $r_{RPE} = 0.224$; $r_{ERSS} = 0.206$; all p -values < 0.001), indicating that the calibration validity was good.

Overall, the ERSS-RT scale developed based on the structural components of rural teachers' educational research was found to have good reliability and validity, and it can be used as a tool to evaluate rural teachers' educational research skills and accomplishments.

3. Study 2: Formulation of criteria for evaluation of rural teachers' educational research skills and accomplishments in the Chinese context

In Study 1, the theory that action research is the more suitable form of educational research for rural teachers was verified, and it was found that rural teachers' educational research involves three types of activity with different objects of research. In Study 2, norms and criteria were constructed on the basis of the levels achieved by rural teachers in these three types of research. It is worth pointing out that the relationships

TABLE 4 Regional norms for educational research skills and accomplishments among rural teachers in Hunan Province.

Scale/subscale (one-way analysis of variance)	Teaching experience	Number of respondents	Average score	Standard deviation
BEA ($F = 35.86^{***}$)	Early-career	383	58.49	11.331
	Mid-career	240	63.28	11.157
	Senior	269	65.68	10.529
CEC ($F = 19.60^{***}$)	Early-career	383	39.38	9.796
	Mid-career	240	41.85	10.276
	Senior	269	44.29	9.730
RPE ($F = 4.21^*$)	Early-career	383	21.13	8.117
	Mid-career	240	22.22	8.585
	Senior	269	23.01	8.256
ERSS ($F = 23.32^{***}$)	Early-career	383	119.01	26.066
	Mid-career	240	127.35	27.350
	Senior	269	132.99	25.413

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

between the seven demographic variables mentioned above and the rural teachers' educational research skills and accomplishments were not specifically reported, because (with the exception of length of teaching experience), none of the other variables were found to have a stable causal relationship with educational research scores. However, ERSS-RT total scores and individual factor scores of the scale were confirmed to be affected by years of teaching experience ($F_{BEA} = 35.86$, $F_{CEC} = 19.60$, $F_{RPE} = 4.21$, $F_{ERSS} = 23.32$; all p -values < 0.001). Therefore, sub-group norms were established for three groups according to years of experience (early-career teachers: less than 3 years of experience; mid-career teachers: 4–10 years of experience; senior teachers: more than 10 years of experience). Norms and criteria were formulated separately for each stage of teaching experience.

3.1. Establishing a regional norm for educational research accomplishments among rural teachers in China

A total of 892 valid questionnaire responses were obtained from teachers working in China's Hunan province, which is located in central China, a large province in terms of education provision, and a source of representative educational data. This sample can be considered to suitably reflect the level of rural teachers' educational research in Hunan Province and the average level across China. On this basis, the regional norm for each stage of teaching experience in Hunan Province was established; the results are shown in Table 4.

As this research is pioneering, there is currently no norm to which rural teachers can refer directly. The primary criteria for evaluation of rural teachers' educational research skills and accomplishments were their average scores on the BEA, CEC, and RPE dimensions and overall ERSS scores. According to the results of the data analysis, rural teachers across all three groups scored on average 3.9–4.4 points on the 15 BEA items, 3.6–4.0 points on the 11 CEC items, and 3.0–3.3 points on the 7 RPE items. Overall, rural teachers across all three groups scored an average of 3.6–4.0 points per item on the full 33-item ERSS. Based on the response options provided for each of the items, a score of 3 represents general conformance, 4 represents comparative conformance,

and 5 represents complete conformance. The average score of rural teachers was more than 3 points. Therefore, it can be inferred that educational research skills and accomplishments among rural teachers in China are good, and their level increases with increasing teaching experience.

3.2. Classification of rural teachers by educational research skills and accomplishments and discrimination of their level of accomplishment

To clarify the role of the norms developed above in evaluation of rural teachers, the topic of classification and discrimination of educational research level was explored to help teachers judge their relative educational research level more readily. Standardized scores on each of the three factors, plus total scores, were taken as clustering variables for a k-means cluster analysis. The sample of rural teachers was divided into three clusters on the basis of educational research level; the distance between the cluster centers was found to be extremely significant for scores on all three factors and total scores ($p < 0.000$). This indicated that it was feasible to divide rural teachers into three classes on the basis of educational research level. Class I respondents had low scores on each of the three factors and thus belonged to a low-level group; Class II respondents had mid-level scores and thus belonged to a mid-level group; and Class III respondents had high scores and belonged to a high-level group. The proportions of respondents within each cluster falling into each group in terms of length of experience are shown in Table 5.

The results presented in Table 5 show that more than half of Class I respondents were in the initial stages of their teaching career, and nearly 40% of Class III respondents were in the senior stage. This indicates that the teaching experience affects teachers' overall level of educational research accomplishments.

Taking scores on each factor and total educational research achievement scores as discriminant variables, discriminant functions were constructed for each of the teaching experience groups and for all groups to enable interested individuals or organizations to quickly judge

TABLE 5 Cluster-based classification of rural teachers on the basis of educational research skills and accomplishments, and the distribution across teaching experience groups within each cluster.

Classification	Center value				Teaching experience distribution by cluster		
	Z(BEA)	Z(CEC)	Z(RPE)	Z(ERSS)	Early-career	Mid-career	Senior
Class I	−1.196	−1.202	−0.910	−1.244	57.87%	23.62%	18.50%
Class II	0.137	0.059	−0.121	0.043	41.84%	26.53%	31.63%
Class III	1.017	1.147	1.133	1.216	29.27%	30.89%	39.84%

a teacher's level of educational research achievement. In the process of constructing these functions based on individual factor scores, two canonical discriminant functions were found to effectively classify the respondents ($p = 0.000$), but the index of the first function was much larger than that of the second (the first function explained 99%, 98.7%, and 98.9% of the variance among the early-career, mid-career, and senior teachers, respectively). Therefore, only the first function was analyzed. Table 6 provides the specific functions generated.

In order to calculate the educational research level of a rural teacher, their original score on the scale is converted to a standardized score in accordance with the table of norms (Table 4), and this standard score is then substituted into the three functions to obtain an output value (Table 6). Teachers are classified according to the maximum value of the function. For example, if a teacher has the highest function output value among the high-level group, his or her level of teaching and research accomplishments is very good.

In addition to the construction of discriminant functions, this type of analysis also produces other interesting findings. First, analysis of the standardized discrimination coefficient and structural coefficient corresponding to each discriminant variable in the first discriminant function indicated that CEC was the strongest discriminating factor. This means that CEC provides the best representation of overall educational research level among rural teachers. Second, the data show that the functions constructed on the basis of both factor scores and total scores were effective (the correct classification rate exceeded 96%). Analysis of the Fisher function based on factor scores showed that the collinearity of the classification coefficients of BEA, CEC, and RPE for each function was very high. This further corroborates the equivalence of the first- and second-order models of educational research achievement.

4. General discussion

4.1. Structural components and level of educational research among rural teachers

In this study, the structure of rural teachers' educational research was explored by categorizing the methods used in their educational research, the objects of this research, and the outcomes of this research. The structural components of rural teachers' educational research activities were explored from the perspectives of research paradigm, object of research, and research outcomes. The results of the initial data analysis ruled out the universal applicability of the academic research paradigm to rural teachers. Rural teachers' circumstances may not be suitable to enable them to carry out traditional academic research because of various barriers they encounter (Xu, 2021). Therefore, it is more scientifically valid to study educational research achievements

among rural teachers from the perspective of action research that they carry out in the course of their educational practice. Our analysis corroborated the suitability of the action research paradigm as a means of exploring the structure of educational research among rural teachers.

More importantly, educational research activities carried out by rural teachers were successfully divided into three structural components according to the object of research. These components were: educational research on basic educational activities (BEA), educational research involving the creation of an educational community (CEC), and educational research involving the refinement and popularization of educational theory (RPE). This proves that educational research among rural teachers consists of three components: teachers' individualized education practices, with teaching and management as the object [the focus of Kemmis et al. (1982)]; teachers' educational research in the domain of collective development, taking the form of collaboration and dialog [the focus of Capobianco et al. (2006)]; and education research involving the compilation and promotion of educational experience by teachers [the focus of Elliot (1991)].

This research on the structure of educational research among rural teachers has shown that, although rural teachers face difficulties such as a heavy work burden, limited resources, and a lack of skills, when their educational research achievements are evaluated by linking educational research to their educational practice, rural teachers are not so lacking in educational research accomplishments. They too engage in rich and effective educational research. Of course, the widespread absence of academic research also indicates that there is room for further development of rural teachers' educational research skills.

Regarding the level of educational research accomplishments among rural teachers, data from Hunan Province in China show that this level is generally good. Average scores across items representing individual types of project ranged between 3 and 4 (where 3 represents general conformance and 4 represents comparative conformance), and the average score on the BEA dimension exceeded 4, representing a relatively high level of accomplishment. Although there is still much room for the development of rural teachers' educational research level, their current level is much higher than the general impression within the field, provided that they are evaluated *via* a method that is in line with the reality of rural teachers' circumstances.

4.2. Evaluation criteria for rural teachers' educational research accomplishments

The results of this study highlight the need to weight the criteria used to evaluate educational research achievements among rural teachers toward practical achievements. In China, the current evaluation criteria reflect this weighting. For example, of the 11 indicators extracted

TABLE 6 Discriminant functions for classification of rural teachers based on educational research skills and accomplishments.

	Fisher function based on standardized factor scores	Fisher function based on standardized total scores
Early-career (98.2%)	$F(1) = -4.25 * Z(BEA) - 2.72 * Z(CEC) - 2.34 * Z(RPE) - 6.28$	$F(1) = -8.31 * Z(ERSS) - 6.17$
	$F(2) = -0.16 * Z(BEA) + 0.30 * Z(CEC) - 0.22 * Z(RPE) - 1.11$	$F(2) = -0.03 * Z(ERSS) - 1.10$
	$F(3) = 3.64 * Z(BEA) + 2.40 * Z(CEC) + 3.35 * Z(RPE) - 6.29$	$F(3) = 8.31 * Z(ERSS) - 6.17$
(99%)		
Mid-career (98.3%)	$F(1) = -2.47 * Z(BEA) - 4.99 * Z(CEC) - 1.87 * Z(RPE) - 6.7$	$F(1) = -8.24 * Z(ERSS) - 6.42$
	$F(2) = 0.65 * Z(BEA) - 0.23 * Z(CEC) - 0.36 * Z(RPE) - 1.19$	$F(2) = 0.13 * Z(ERSS) - 1.10$
	$F(3) = 2.41 * Z(BEA) + 3.98 * Z(CEC) + 2.36 * Z(RPE) - 5.93$	$F(3) = 7.75 * Z(ERSS) - 5.8$
(99.6%)		
Senior (98.9%)	$F(1) = -3.65 * Z(BEA) - 3.1 * Z(CEC) - 2.92 * Z(RPE) - 6.57$	$F(1) = -8.64 * Z(ERSS) - 6.55$
	$F(2) = 0.85 * Z(BEA) + 0.26 * Z(CEC) - 0.27 * Z(RPE) - 1.26$	$F(2) = 0.85 * Z(ERSS) - 1.15$
	$F(3) = 3.59 * Z(BEA) + 2.82 * Z(CEC) + 2.97 * Z(RPE) - 6.2$	$F(3) = 8.33 * Z(ERSS) - 6.17$
(96.3%)		
All experience levels (99.4%)	$F(1) = -3.67 * Z(BEA) - 3.18 * Z(CEC) - 2.36 * Z(RPE) - 6.28$	$F(1) = -8.31 * Z(ERSS) - 6.27$
	$F(2) = 0.32 * Z(BEA) + 0.23 * Z(CEC) - 0.28 * Z(RPE) - 1.14$	$F(2) = 0.29 * Z(ERSS) - 1.11$
	$F(3) = 3.28 * Z(BEA) + 2.91 * Z(CEC) + 2.89 * Z(RPE) - 6.08$	$F(3) = 8.12 * Z(ERSS) - 6.04$
(98.2%)		

F(1) is the function for the low-level cluster, F(2) is the function for the mid-level cluster, and F(3) is the function for the high-level cluster.

in this study from multiple documents used for evaluation and grading, only 1 indicator was based on academic achievement. However, based on the results of this study, there is still extensive room for improvement in the current evaluation criteria.

First, among the three types of research, research on BEA accounts for the largest proportion, and rural teachers' accomplishments are greatest in this domain. The BEA dimension also includes the teacher's self-evaluation and their overall evaluation by students, parents, and colleagues, which means that these unofficial evaluations are more closely related to teaching and management skills in daily practice. This is consistent with the finding that the current index-based evaluation system focuses greatly on day-to-day teaching and management. Regarding the clustering of these evaluations and teachers' teaching and management activities, a possible explanation is that these evaluations largely reflect teachers' enthusiasm for and attitude toward their work (Jiao, 2004). This is closely related to their self-efficacy and directly impacts their job satisfaction (Wang et al., 2020). The perception of being evaluated positively provides favorable conditions for teachers to actively carry out educational research in their daily teaching and management activities. However, educational research activities falling under the BEA dimension have strong "process" characteristics, which is particularly clear in the fourth item: "I have a comprehensive understanding of students and teach students according to their aptitudes." At present, the evaluation indicators used in China focus almost exclusively on the "awards" that teachers have won in teaching and management, i.e., the "results" of their work, while ignoring their focus on the "process" of educational research. This insight could prompt education evaluation authorities to incorporate more "process"-based research carried out by teachers in the domains of teaching and management into the evaluation system.

Second, the CEC dimension was identified as the fundamental factor in differentiating rural teachers on the basis of their level of accomplishment in educational research. In other words, CEC is the key to distinguishing rural teachers from one another in this domain. Carrying

out educational research in the area of collective educational practice means that individuals within the collective constantly think about and learn from others' experience, ideas, opinions, and suggestions (Li and Zhao, 2011). They absorb the wisdom of many actors, which has a twofold impact on the development of individuals and the collective. However, in the evaluation indices used to evaluate rural teachers, CEC has not received the attention it deserves. For example, only one of the 11 indicators extracted in this study from multiple documents used in evaluation and grading was related to collective activities. Inadequate incentives and guidance from authorities, in part, have led to several problems: low willingness to cooperate, a weak atmosphere of collaborative construction, single community member structure, and an imperfect system with imperfect mechanisms underlying its construction (Cai et al., 2020). Therefore, education evaluation authorities should provide more incentives and support for teachers to engage in educational research in their collective activities and achieve accomplishments in this area.

Third, although this research shows that academic papers and monographs are not a suitable criterion for the evaluation of educational research accomplishments among rural teachers, this does not mean that rural teachers do not have the ability to compile their experience for presentation *via* these modes of publication. The results show that rural teachers can also promote their practical experience through educational papers, research reports, and experience introduction. It is worth noting that overall RPE scores were the lowest among all three factors. For a considerable length of time, rural teachers have felt that educational theory is not for them. A series of educational dilemmas have caused teachers to ignore RPE. However, experience compiled and presented by rural teachers is more suitable for education and more conducive to the promotion of sustainable development of rural education. It is important for rural teachers to solve practical problems, and the development of such solutions is an important aspect of rural teachers' professional development (Zhao, 2018). Therefore, adding the refinement and popularization of their educational experience as evaluation criteria for educational research accomplishments will

encourage more rural teachers to join research teams that transform practical experience into theory and also promote this experience.

5. Limitations and outlook

Because the experts and respondents who participated in this study were mainly from Hunan Province, the representativeness of the data generated *via* the questionnaire is limited. Moreover, because this research focused on exploration of the structure of educational research activities among rural teachers, rather than the current situation with respect to educational research accomplishments among rural teachers, rural teachers' teaching and research accomplishments were not compared with those of other groups (such as urban teachers, rural teachers in other countries, or rural teachers in previous years).

Based on this study, the following research directions are feasible for future work: (1) research on the factors influencing educational research among rural teachers and paths by which this influence occurs; (2) research on the improvement pathway followed by rural teachers in terms of their educational research skills and accomplishments; (3) comparative research examining rural teachers' educational research skills and accomplishments in China as compared to other countries.

6. Conclusion

First, educational research carried out by rural teachers is more likely to take the form of action research than academic research. Under the paradigm of action research, rural teachers' educational research can be divided into three components: educational research on basic educational activities; educational research involving the creation of an educational community; and educational research involving the refinement and popularization of educational theory.

Second, the levels of skill and accomplishment in educational research among rural teachers are generally good, especially in relation to educational research in the domain of basic educational activities. Therefore, the educational research accomplishments of rural teachers deserve more recognition and praise.

Third, rural teachers' levels of educational research skills and accomplishments increase with increasing teaching experience. When evaluating rural teachers' educational research skills and accomplishments, their career stage should be taken into account.

Fourth, rural teachers can be divided into three classes according to their educational research skills and accomplishments: high-level,

medium-level, and low-level. Engagement in educational research activities involving the creation of an educational community plays an important role in this classification.

Fifth, the criteria used to evaluate educational research skills and accomplishments among rural teachers should be reformed accordingly. The "process attribute" of research on BEA, the overall improvement of accomplishments in CEC, and the self-consciousness of rural teachers in relation to RPE should receive more attention.

Data availability statement

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

Author contributions

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

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Conflict of interest

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

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Assessing and comparing alternative certification programs: The teacher-classroom-community model

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Alternative certification programs (ACPs) differ from traditional teacher certification programs in their target populations, duration, tools they employ, their pedagogy, and subject matter curricula. Given the acute shortage of excellent teachers, especially in STEM, significant efforts and resources are invested in ACPs so they prepare highly qualified teachers. Yet, novice teachers face difficulties during their initial integration into the school system. To better understand the state of affairs, we investigated and compared the integration into the school system of graduates of five major Israeli ACPs that are tailored for diverse student-teacher target audiences. The study goals were to (1) investigate and compare the integration of graduates of the five ACPs into the teaching profession with respect to five teacher-related aspects: (a) self-efficacy, (b) commitment to the teaching profession, (c) challenges encountered, (d) leadership roles, and (e) teamwork; (2) identify ACP characteristics that support the graduates' integration into the teaching profession. The teacher-classroom-community model we propose, holistically connects three aspects: affective – the teacher, the teaching profession – the classroom, and peer interaction and leadership – the school community. The model provides a common language for comparing how the different ACPs prepared their graduates toward the teaching profession. The model is instrumental for identifying ACP characteristics that support graduates' integration into teaching and facilitating ACP evaluation by connecting several aspects of teachers' professional lives. The study employed a mixed-methodology in which 506 graduates responded to a closed- and open-ended questionnaire and 71 interviews were conducted with graduates (novice teachers), ACP directors, school principals and mentor teachers. The findings depict a complex picture that reflects the different ACPs' characteristics targeted at diverse audiences. For example, graduates of STEM-oriented programs perceive the different kinds of knowledge, including content knowledge, pedagogical knowledge, and pedagogical content knowledge, as most important to their roles in schools. They undertake fewer roles, and the ones they do assume are discipline-related. Graduates of the more social-leadership-oriented programs identify developing leadership skills as most beneficial and they undertake more leadership-related roles. The research highlights key aspects that teacher education leaders should consider and use for self-evaluation of their ACPs. The strength of this study stems from proposing and applying the teacher-classroom-community model for evaluating teacher certification programs in several contexts and for diverse groups along with their integration into schools.

KEYWORDS

teacher certification programs, alternative certification programs, teaching profession, integration into schools, the teacher-classroom-community model

Introduction

Alternative certification programs (ACPs) have ceased to be marginal in education systems (Brantlinger and Smith, 2013; Edmondson et al., 2022) but they are less common in Europe (Carver-Thomas and Darling-Hammond, 2019; Werler and Tahirsylaj, 2020). ACPs are designed to attract people into the teaching profession, and commonly are shorter than traditional programs. Other differences between ACPs and traditional teacher certification programs (TCP) include the tools provided to graduates, and emphasis on pedagogy and subject matter curricula (Karge and McCabe, 2014; Darling-Hammond, 2016). ACPs vary considerably-what is classified in one state or country as alternative certification is considered a traditional program elsewhere (Aragon, 2016). ACPs in science, technology, engineering, and mathematics (STEM) education need special attention given the lingering worldwide shortage of STEM teachers (Edmondson et al., 2022).

Prompted by the establishment of various national-level ACPs in Israel, we set out to understand their influence on their graduates. These programs, referred to as *unique teacher certification program(s)*, aim at “attracting high quality professionals and/or offering a second career to individuals with industrial and hi-tech experience in response to shortage of teachers in some fields” (Ministry of Education, in Hebrew)¹. These programs are not necessarily shorter than traditional undergraduate or post-graduate TCPs.

Current studies of such programs reflect specific goals of teaching and learning (Richmond et al., 2019). For example, some studies focus on teachers’ knowledge and skills acquired in the program, while others focus on student performance or on the school environment (Avargil et al., 2013; Thomas, 2018). This poses a dilemma, as programs strive to achieve diverse goals, leading to lack of coherence among programs and teachers graduating with different types of knowledge, skills, beliefs, and classroom experience (Tatto et al., 2016; Bartell et al., 2019). To assess the integration of graduates of the ACPs into the teaching profession, we propose a teacher-classroom-community model (see following), which encompasses a broad scope that views the teacher holistically, as an active component of the educational system. It is based on the premise that TCPs and ACPs and the teachers who graduate from them should be evaluated in three contexts: affective aspects, such as teachers’ self-efficacy (Kahveci et al., 2018), performance in the classroom (Darling-Hammond et al., 2012), and interactions with the school community (Hunzicker, 2017). Despite diversity among the ACPs operating in Israel, each with particular professional objectives, all generally aim at preparing high-quality teachers that will serve as agents-of-change in the educational system. The model proposed here is specifically tailored to holistically assess the effects of ACPs on graduates. It aspires to close the current gap in modeling ACPs in terms of various attributes, including focus, enrolled student population, duration, graduates’ integration into the school system, and the quality of the integration process. Diversity in ACP attributes offers a fruitful substrate to compare among the various ACPs. Moreover, our model can be applied to traditional programs as well.

Due to the acute shortage of excellent teachers in subjects of high demand, especially in STEM (Edmondson et al., 2022), significant

efforts and resources are invested in these ACPs. Yet, novice teachers face challenges during their initial integration into the school system (Fresko and Nasser-Abu Alhija, 2009; Wong and Luft, 2015; Schwartz and Dori, 2020).

With this in mind, in this research, we assessed and compared five major national-level ACPs that are tailored for diverse target audiences, aiming to prepare them to become highly qualified teachers and leaders in the school community. We propose a suitable, holistic teacher-classroom-community model for evaluating the impact of ACPs (elaborated in the Theoretical Background).

The goals of this study were:

- (1) Investigating and comparing five major ACPs conducted in Israel and their graduates’ integration into the teaching profession with respect to the following five teacher-related aspects: (a) self-efficacy, (b) commitment to the teaching profession, (c) challenges encountered, (d) leadership roles, and (e) teamwork.
- (2) Identifying ACP characteristics that support graduates’ integration into the teaching profession.

The contribution of this study is in its presentation of the teacher-classroom-community model and its application to assessing and comparing five ACPs in several contexts and for diverse audiences. The model is instrumental for identifying ACP characteristics that support graduates’ integration into the teaching profession, and it facilitates the evaluation of ACPs by connecting several circles of teachers’ professional lives. Additionally, in the context of evaluating teacher certification programs, assessing teachers’ involvement in the school community, based on interactions with colleagues and leadership initiatives, is new; only few studies have investigated this aspect (Bastian et al., 2018; Edmondson et al., 2022) thus the model may contribute to both traditional and alternative programs.

Theoretical background

Herein we describe existing frameworks and models for evaluating TCPs, providing the grounding for the teacher-classroom-community model. We, therefore, focus on the affective aspects of teaching, elements of performance in the classroom, and interaction with the school community.

Evaluating teacher certification programs

There are several evaluation systems for TCPs in general and ACPs in particular. One example is the classroom assessment scoring system and the framework to support teaching (Marzano et al., 2011). It is aimed at assessing teachers’ teaching skills, including teachers’ and students’ subject-matter knowledge, and teachers’ ability to connect students’ prior knowledge with new learning experiences, implement a variety of teaching and assessment methods, and manage student behavior and classroom procedures (Pianta et al., 2008). Other works focused on assessing teachers’ efficacy, persistence, or student achievements (Canrinus et al., 2012). We concur with Bartell et al. (2019), who claimed that while these studies are valuable for assessing the quality of TCPs, they have several shortcomings (Bastian et al., 2018; Bartell et al., 2019), including: (a) their focus on events that occur in the classroom only, (b) relation to practices of the specific teaching

¹ <https://poh.education.gov.il/merhavminhali/hachsharahitmachutknisalehoraa/pages/specialprograms.aspx>

profession they assess, and (c) they do not enable connecting the graduates' teaching quality with the characteristics of TCPs that need improvement.

In an effort to address these issues, we and others argue that when evaluating TCPs and ACPs, it is important to view the teacher as both a professional and a member of the school community (Bronfenbrenner, 1977; Bastian et al., 2018). Being part of a school community and contributing to it are essential for improving the quality of teaching (Ado, 2016). Furthermore, taking an essential part in the school community increases teachers' sense-of-confidence in the educational system and enables them to express their own opinions, thus increasing their motivation to remain in the teaching profession (Bartell et al., 2019). One model suggested by Bronfenbrenner (1977, 2009) is rooted in human development from childhood throughout adulthood and presents several circles including individual, microsystem, and macrosystem. Later, this model was adapted to educational systems (Basham et al., 2010; Shapira-Lishchinsky and Ben-Amram, 2017). To fully comprehend the features of the preparation program and understand how their graduates are integrated into the school system (Bastian et al., 2018; Warren, 2018), we must consider teachers' interactions in their work environment, not only the classrooms, but the whole school as a community.

The teacher-classroom-community model for evaluating alternative certification programs

In this study, we present a three-circle model (Figure 1) for assessing ACP graduates' integration into the school system. The inner circle represents the individual, the ACP graduate—the novice teacher. The next, classroom circle, refers to professional aspects of teaching as they play out in the classroom. The outer circle in our model addresses the teacher's interactions in the broader school community, such as peers

and school management. The model accounts for challenges novice teachers (ACP graduates) encounter in both affective and professional aspects during their integration into the teaching profession.

The significance of our study and the model we propose stems from its holistic perspective of the teachers' involvement in the school, from the individual to the community level, such as, leadership and interaction with peers. Increasing literature documents novice teachers taking leadership positions. Research has examined the contribution of TCPs to the development of leadership skills and assessed the conditions required to facilitate formal and informal leadership (Ado, 2016; Cheng and Szeto, 2016; Meirink et al., 2020). Yet, we found little evidence on actions that develop teachers' leadership during their preparation programs.

Affective aspects of being a teacher

The teacher-classroom-community model accounts for traditional measures related to affective aspects of teaching, including self-efficacy, satisfaction for the profession, and attrition over time (Redman, 2015). Enhancing teachers' self-efficacy during their preparation program can increase their motivation to integrate into the school system and implement innovative teaching and assessment methods (Kahveci et al., 2018; Schwartz and Dori, 2020). Teachers' efficacy is associated with their beliefs about instruction and job satisfaction (De Neve et al., 2015), students' self-efficacy and motivation (Öqvist and Malmström, 2018), and students' achievements (Tschannen-Moran and Barr, 2004). It is important to develop teachers' self-efficacy because it is an essential tool for preparing effective, committed, and motivated teachers (Kahveci et al., 2018). Research has focused on teachers' attrition worldwide (Geiger and Pivovarova, 2018). Teachers were more likely to persist in teaching if they received solid pedagogical foundations, including observations of their lessons followed by feedback, and if they were engaged in practical and authentic experiences in the classroom with active teaching during their preparation (Unruh and Holt, 2010; Ingersoll et al., 2014).

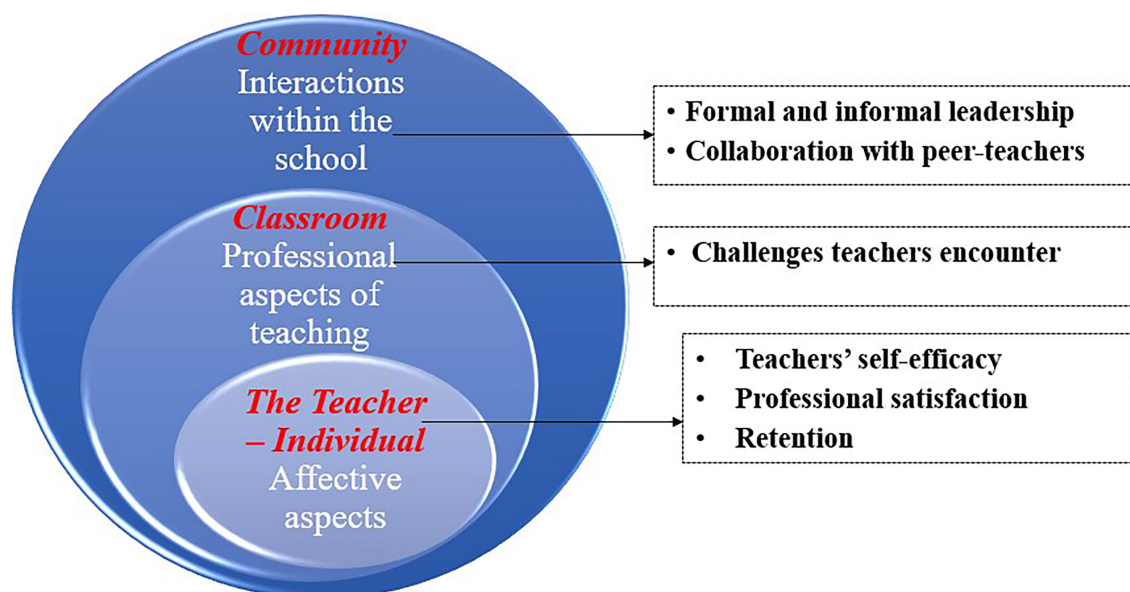


FIGURE 1
The teacher-classroom-community model for evaluating the effect of teacher certification programs on their graduates.

Performance in the classroom

Teachers' performance in the classroom involves content knowledge (CK), pedagogical knowledge (PK) with an emphasis on teaching strategies, pedagogical content knowledge (PCK), technological knowledge (TK) (Kramarski and Michalsky, 2015), knowledge about the curriculum, knowledge about school administration and classroom management. Wolff et al. (2021) proposed a definition for classroom management scripts based on expert vs. novice teachers' knowledge and how teachers react in response to events in the classroom. These scripts help clarify differences between how teachers handle the events based on their expertise. Their model makes visible the cognitive processes teachers exercise in classroom management, which can improve their awareness of overlooked factors in classroom management. They emphasize the centrality of sustained learning when managing a classroom. Saad and Bou Jaoude (2012) investigated the relationship between teachers' knowledge and beliefs about science and inquiry and their classroom practices. They found that teachers had diverse views of science and attitudes about inquiry, but they did not find links between teachers' views and classroom practices. Schwartz et al. (2021) have found that teachers' PCK and assessment knowledge (AK) vary with their classroom experience.

Leadership and teamwork: Interaction with the school community

Exhibiting leadership in the school community refers to any action that has a collective influence which benefits the students and the school and exceeds the classroom boundaries or the specific teaching discipline or connects the school with society (Fairman and Mackenzie, 2015). Leadership includes formal positions, such as administrative roles, professional disciplinary or interdisciplinary roles, mentoring and supporting other teachers, and management positions, all involving coordination of tasks and routines (Muijs et al., 2013). Informal leadership includes leading teams and evaluation processes, initiating innovative projects, such as extracurricular activities, design of learning-materials, and organizing projects (Muijs et al., 2013; Meirink et al., 2020).

Poekert et al. (2016) defined three areas of teacher leadership: individual, teams, and organizational. Previous research has shown that novice teachers are often highly motivated and passionate to contribute to improving education inside and outside the classroom (Levenson, 2014). A study of 16 schools participating in the "Teach First" program in England identified a consensus among ACP graduates and program directors that the teachers make a significant contribution to schools through informal initiatives and roles they take (Muijs et al., 2013). Both formal and informal teacher leadership improve schools in diverse ways and increase students' learning outcomes (Nappi, 2014). Teacher leadership contributes also to the school's commitment, personal empowerment of teachers, increased motivation, and reduced attrition (Muijs et al., 2013; Ado, 2016; Meirink et al., 2020). However, it is not always easy for novice teachers to enact their leadership in their first year of teaching. Their ambitions might collide with colleagues less open to changing their practices or accepting their ideas (Grimseth et al., 2008) and who consider these leadership roles a distraction from the teaching itself.

Within our model, another aspect of the graduates' integration into the school community addresses teamwork and collaboration with colleagues. From a pedagogic standpoint, teamwork enables teachers to create a cohesive group in which they can exchange ideas, share teaching materials, brainstorm about best practices, and give feedback to one

another about the lessons they teach. Teamwork allows teachers to create a community in which discourse that contributes to shaping their views as teachers is created (Nappi, 2014; Patton and Parker, 2017). This teamwork fosters teachers' professional growth and their sense of belonging to the school community, leading to the development of common values and teaching principles (Svanbjörnsdóttir et al., 2016; Wiyono, 2018). Teamwork may be influenced by the nature of the preparation programs attended by the teacher (Dori et al., 2019). Findings on the ability of ACP graduates to collaborate with colleagues are inconsistent and even contradictory. A study conducted in the United States found that ACP graduates found it difficult to communicate with their colleagues, resulting in professional isolation. Furthermore, they were not accepted by the school community as equal partners (Brown et al., 2004). Teachers also felt unsatisfied by inadequate opportunities to socialize with colleagues in the school community due to uncomfortable working conditions and strict school policies (Unruh and Holt, 2010; Redman, 2015).

We employed the teacher-classroom-community model to investigate the five ACPs and their graduates' integration into the teaching profession addressing the following dimensions: (a) self-efficacy, (b) challenges they encounter, (c) leadership roles, (d) teamwork, and (e) commitment to the teaching profession.

Methods

The study employed a mixed-methods approach which combines the advantages of qualitative and quantitative research methods (Creswell, 2014). To obtain different but complementary information on the same phenomena, the study was based on a Triangulation Design (Creswell, 2006), within which we implemented the Convergence Model, which uses quantitative and qualitative data, collected, and analyzed separately, toward the same research goal. During the interpretation stage, the various findings were combined and compared.

The qualitative data obtained from the interviews and the open-ended questions in the questionnaire contributed to understanding teachers' integration into the teaching profession from the affective, classroom, and school community perspectives. The quantitative data enabled us to compare the influence of the different programs on the graduates' sense-of-preparedness as teachers and generalize the findings to offer conclusions (Shekhar et al., 2018).

Settings and participants

We investigated the five major ACPs offered by institutions of higher education in Israel, including universities and colleges of education. These ACPs are conducted parallel to traditional teacher certification programs in the same institutions. The ACPs chosen represent diverse characteristics, targeted audience, and geographical locations. All the programs meet the basic standards defined by the Israeli Council for Higher Education and aim to attract high-quality candidates who will (a) become excellent teachers who implement outstanding teaching in their classrooms, (b) pursue leadership positions in their schools, and (c) lead changes in their school community. The programs differ in their screening processes, duration, curriculum, nature of preparation, and the guidance and support they provide their graduates later on in their careers. Following is a brief description of the programs, pseudonymed for anonymity.

- **STEM-ed:** A two-year, post-graduate, two-days-per-week program that strives to increase the quantity and quality of teachers in science and technology disciplines. Tuition is covered by the institute. Graduates receive an additional Bachelor or Master degree, based on prior degree and the coursework as well as high school STEM teaching certificate.
- **PostDF:** A one-year, post-graduate, two-days-per-week program designed for retired officers from the Israel Defense Force, that aims to prepare high-quality teachers for leadership positions in schools. Tuition is covered by the Ministry of Education pending 2 years of teaching. Graduates receive a high-school teaching certificate.
- **STEM-clinic:** A one-year, post-graduate, two-days-per-week clinical education program for second-career students with a STEM background. The program aims to prepare high-quality teachers in mathematics and science subjects. Tuition is covered by a philanthropic foundation; might require one year of teaching. Graduates receive a high school teaching certificate.
- **SocLead:** A social oriented educational leadership program consisting of a 5-week boarding school, introductory preparation followed by one-year of in-service preparation along with a day of courses per week. Tuition is covered by the Ministry of Education pending 2 years of teaching. Graduates receive a high-school teaching certificate.
- **ExcelUnd:** A merit-based, three-year, five-days-per-week program that strives to recruit undergraduate (honors) students with high abilities and prepare them to become leading teachers and outstanding educators. The program is an exclusive undergraduate program; tuition is covered by the institute conditional on a full year teaching. Graduates receive B.Ed degree. These students are characterized as highly motivated to the teaching profession and are high-level performing students and therefore they are comparable to their peers from the graduate ACPs. Furthermore, this program is defined by the Ministry of Education and the Council of Higher Education as an ACP.

To achieve a comprehensive picture of a teacher's integration into the school, participants represented different roles and positions in the ACP pipeline: teacher educators, novice teachers (graduates of the programs), other practitioners, such as mentors, and school principals.

The majority of the research population was ACP graduates who are novice teachers. We focused on ACP graduates with a teaching experience of 5 years or less because novice teachers can better reflect their experiences and the practices they acquired during their ACP, enabling us to link and evaluate the characteristics of each program and its impact on the teachers' integration.

The sample of graduates was obtained *via* the following procedure: An online digital questionnaire (described below) was distributed by the institution directors of the participating ACPs to ~3,000 graduates who had graduated during the 5 years prior to this study. A total of 506 graduates responded (17% response rate of). According to Fossnacht et al. (2017), this is a reliable rate if the sampling includes at least 500 participants. Since graduate's response was voluntary, the sample is not statistically representative. Table 1 provides background data of the ACP graduates that responded to the questionnaire.

Interviews were conducted with 30 of the participating graduates (novice teachers) who consented in the questionnaire to be interviewed. 41 additional interviews were conducted with ACP directors (14), principals (11), and mentors (17) in schools in which

TABLE 1 Background data of ACP graduates.

Variable	Category	ACP
		N (% within program type)
Total		506
Gender	Female	311 (61.7%)
	Male	193 (38.2%)
Previous academic degree	Undergraduate	308 (60.9%)
	Master's	186 (36.8%)
	Doctorate	10 (2.0%)
Ethnic group	Jewish	462 (91.7%)
	Arab	30 (6.0%)
	Druse	4 (0.8%)
	Bedouin	3 (0.6%)
	Other	5 (1.0%)
Age (years)	19–24	77 (15.3%)
	25–29	139 (27.6%)
	30–39	147 (29.2%)
	40–49	79 (15.7%)
	≥50	61 (12.1%)
Teaching as a career	First career	260 (51.6%)
	Second career	196 (38.7%)
	Second career parallel to first	32 (6.3%)

the novice teachers work. Figure 2 presents the participants by data collection instruments.

Ethics statement

This study and research instruments were first approved by the ethical committee of the Institute, which serves as the review board for studies in behavioral research (approval number 2017-25). Additionally, since our research was conducted with teachers, we obtained approval from the Office of the Chief Scientist in the Israeli Ministry of Education (approval number 9545-2017). All participants gave their full consent. To ensure that all data remained confidential, we use pseudonyms, and any other identifying details were removed.

Research tools

The *Questionnaire* included close-and open-ended questions, congruent with our model as it addressed affective perspectives of being a teacher, practices implemented in the classroom, and teacher's integration into the school community.

The questionnaire comprised the following sections:

- (a) *Demographic and personal data:* gender, age group (19–24, 25–29, 30–39, 40–49, 50+), ethnic group (Jewish, Arab, Druse, Bedouin, other), existing degree upon entering teaching studies (undergraduate, Master, Doctorate), discipline of instruction, institution of teaching

Research Participants		The 5 Alternative Certification Programs				
		ExcelUnd	STEM-ed	PostDF	STEM-clinic	SocLead
Interviewees	ACP graduates - questionnaire respondents	185	54	55	74	138
	ACPs graduates	5	5	7	8	5
	School principals	0	3	3	3	2
	Novice teachers' mentors	0	5	5	2	5
	Program directors	3	2	2	5	2

FIGURE 2
Research participants by tool, school role, and ACP.

studies, and status of teaching career relative to previous career (teaching as first/s career, teaching as second career parallel to another first career).

- (b) *Program contribution to sense-of-preparedness in professional aspects of teaching* – This section, adapted from Feigin et al. (2015), included 10 items focusing on the extent to which the program contributed to them as teachers, based on a five-point Likert-type scale (1 = not at all to 5 = to a great extent). Example items: (1) The program provided me with basic teaching tools and skills, such as lesson planning, classroom management, and coping with learner diversity. (2) The program helped me understand the role of the teacher. This section had an internal reliability of $\alpha = 0.883$.
- (c) *Self-efficacy as a teacher* – This section was based on the Teacher's Sense of Efficacy Scale (TSES) designed by Tschannen-Moran and Hoy (2001). Graduates were asked to rank the extent to which they agree with 12 statements relating to their teaching ability on a Likert-type scale, in three categories consistently identified by the TSES questionnaire: engaging students, instructional practices, and classroom management. Participants rated their extent of agreement (1 = disagree, 3 = agree to some extent, 5 = strongly agree) with statements concerning their abilities in these three categories. This section had an internal reliability of $\alpha = 0.881$.
- (d) *Leadership and initiatives* – The participants ticked professional roles (homeroom teacher, subject coordinator, grade-level coordinator, social-involvement coordinator, school committee member, management roles, regional instructor, belong to the national principal's preparation program) they take on in addition to teaching.
- (e) *Professional commitment and satisfaction* – To examine graduates' satisfaction with and commitment to the teaching profession, they were asked (1) whether they intended to teach in the following year, and (2) the likelihood of choosing teaching again given the opportunity to choose a career again. Both questions included a close-ended response with three options (yes, no, maybe).
- (f) *Challenges encountered as novice teacher* – In this open-ended section, the graduates were asked to describe challenges they encountered in their integration into teaching and school life.

In the last part, we asked the respondents their willingness to be interviewed. From those who agreed, we chose a representative group of interviewees based on gender, age, former education, and instructional discipline.

Interviews

Semi structured interviews (a) examined how graduates perceive the quality of their ACP preparation, mapped the strengths and weaknesses of their ACP, as well as challenges they faced, and (b) assessed characteristics of the graduates' integration into the school system from a variety of perspectives of the other stakeholders. The interviews lasted about one hour, were audio-recorded and transcribed.

Data analysis

Qualitative data analysis

Interviews were thematically analyzed in several cycles. Coding began by breaking down the data into small segments that were later used to identify major themes and corresponding categories. Each statement focused on a single idea. Later, an in-depth discussion was held to corroborate the classification (Fraenkel et al., 2012). This process allowed for sensitive, insightful, and rich exploration of the text, exposing structure and underlying patterns (Guest et al., 2011). Open coding was performed by three experts, each one coded the interviews individually. The experts shared and revised their categories and discussed the possible interpretations of the data, reaching a consensus of 90%. This approach enabled mapping the implicit and explicit ideas within the text (Thomas, 2006).

Examples of the coding procedure are provided in Appendix A.

Frequency of challenges the graduates encountered (open ended section of questionnaire) – The frequency of each challenge out of the total number of challenges raised by the graduates in each program was calculated as follows. For example, if a total of 500 challenges were identified in program X, 10 of which related to overload in the teaching profession, the percentage of this challenge encountered in program X

was 2%. This enabled to both identify each program's characteristics and compare among the different programs.

Quantitative data analysis

Statistics were conducted with SPSS-20. For the closed-ended sections of the questionnaire (program contribution to sense-of-preparedness for professional aspects of teaching and self-efficacy) one-way ANOVA and Tukey's Test (*Post Hoc*) were conducted to examine the differences among the five ACPs regarding their graduates' perceptions of their program's contribution to the teaching profession.

Findings

The findings are organized in subsections according to the teacher-classroom-community model. We also present attributes of the ACPs that support the graduates' integration into the teaching profession.

The individual – affective aspects (the inner circle)

This subsection addresses teachers' self-efficacy and their satisfaction with and commitment to the teaching profession as they integrate into the school system during their first 5 years of service.

Self-efficacy scores for all the ACP graduates were high (mean score range 3.99–4.28; SD 0.50–0.62), indicating the participants' strong sense of efficacy to implement diverse instructional strategies, engage their students and manage their classrooms. Interviews with mentors corroborated these findings. One SocLead mentor noted: *"Watching the ACP graduate in the classroom, her teaching exhibits variety of methods, inclusiveness of all the students in the class, and creativity. However, from the class management perspective, there is chaos. When I asked the teacher about the noise in the classroom, she responded that this is 'learning noise'. I interpret this as SocLead teachers' high motivation and the desire to be considered 'cool' by their students."* A mentor of an ExcelUnd novice teacher reported: *"He is not content with mediocracy; he puts a high bar for himself and thrives to get there...this requires talent, motivation, and self-efficacy, as well as knowing where and how high the bar should be set."* This and other quotes support the quantitative finding of high ACP graduates' self-efficacy.

A significant difference was found only between PostDF graduates, who reported the highest self-efficacy (which can be attributed to their previous leadership positions as military officers) and graduates of the STEM-clinic clinical program for second career students with STEM backgrounds, who reported the lowest self-efficacy (*Post Hoc* $F=2.79$, $p<0.026$).

Professional satisfaction and commitment

Figure 3 presents the likelihood of "choosing teaching again." In all but one ACP, over 55% of the graduates responded that, given the opportunity, they would choose the teaching profession again, and only a minority responded negatively. This may reflect the fact that most of these programs are directed to second-career students – individuals with a specific interest in making the change from their previous career to the teaching profession. This is also expressed in their explanations which reflect a sense-of-mission in their new profession. For example, a STEM-ed graduate wrote: *As a teacher, I feel that this profession inspires me, and I enjoy the diversity and the deep meaning this profession embodies.*

Graduates of three programs, ExcelUnd, STEM-ed, and STEM-clinic, were hesitant, ticking the "maybe" option about choosing a teaching career again. Workload and unfavorable employment conditions in the teaching profession, primarily salary, were common reasons for their hesitation. Also, graduates did not anticipate the amount of work and responsibility they would have as full-time teachers. One graduate emphasized: *I work a lot of hours and I feel like it never ends; students, teachers, parents, e-mails, grading tests, etc.* An ExcelUnd graduate wrote: *"I am expected to be available all the time, but they would not pay me for that time... devoting myself to teaching is one thing but living in constant stress is not a legitimate expectation."*

Graduates of the STEM-oriented programs (STEM-clinic and STEM-ed) expressed criticism of the school's fixation and limited flexibility toward innovative projects and new approaches, emphasizing their disappointment in their school colleagues' and administration's attitudes towards their motivation to implement a variety of teaching methods. One STEM-clinic graduate said: *"During my first year at school, I seriously considered leaving the teaching profession because I felt that the school system did not know how to use my abilities properly."*

Regarding commitment to the teaching profession, explored via the participants' intention to teach in the following year, the majority (64–75%) of ACP graduates responded positively.

Classroom – Professional aspects of teaching and challenges teachers encountered (middle circle)

The graduates described a variety of challenges and difficulties they faced in the classroom as novice teachers despite their reported high sense of self-efficacy. They addressed various challenges related to content knowledge (CK) and pedagogical knowledge (PK), including instructional strategies and classroom management, as well as pedagogical content knowledge (PCK), technological knowledge (TK)—incorporating technology into teaching, knowledge about school administration, and knowledge of the curriculum. Figure 4 shows the percentage range of challenges from the total number of challenges participants mentioned, by knowledge types. Classroom-management-related PK poses the highest percentage of challenges (23–46%) that graduates of all ACPs experienced, followed by instructional-strategies-related PK (1–10%).

Knowledge about school administration also posed a challenge, especially among SocLead and PostDF graduates, who expressed difficulties in understanding how to navigate within the educational system in general and in the school environment in particular. One graduate expressed this feeling during his interview: *"I had difficulty from an administrative point of view; What was required from me? To whom should I report if a lesson is canceled? Who can help me organize and schedule field trips? All kinds of administrative aspects that I did not know, and I had to learn on my own."*

Insufficient CK (taught as part of the program) was mentioned mainly by SocLead graduates, who stated that this aspect of their program should be better addressed in the program. While praising the novice teachers' functioning in the classroom, mentors also pointed out challenges they identified in their integration into teaching. As observed by one mentor of graduates of this program, *"She defines this as an experimental period to check out if it suits her. She has acclimation difficulties that characterize new teachers. I hope she can withstand them, as the first year in teaching is a hard year, and [the novice teacher's name] entered as a substitute teacher, replacing a teacher on maternity leave, which, in itself, is difficult."*

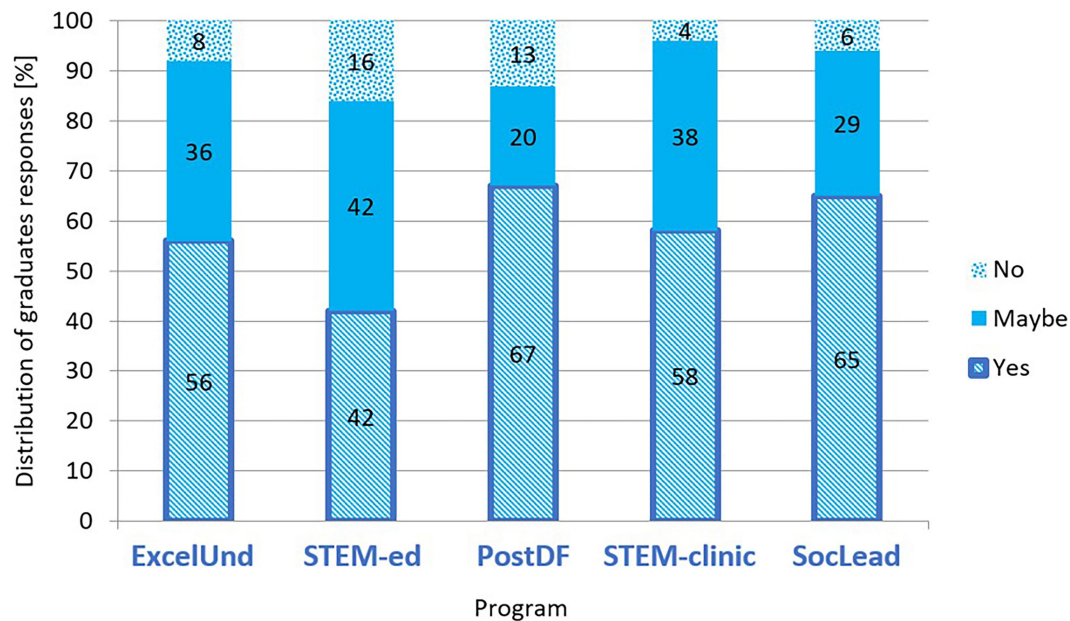


FIGURE 3
Distribution of ACP graduates' responses regarding re-choosing the teaching profession (N=506).

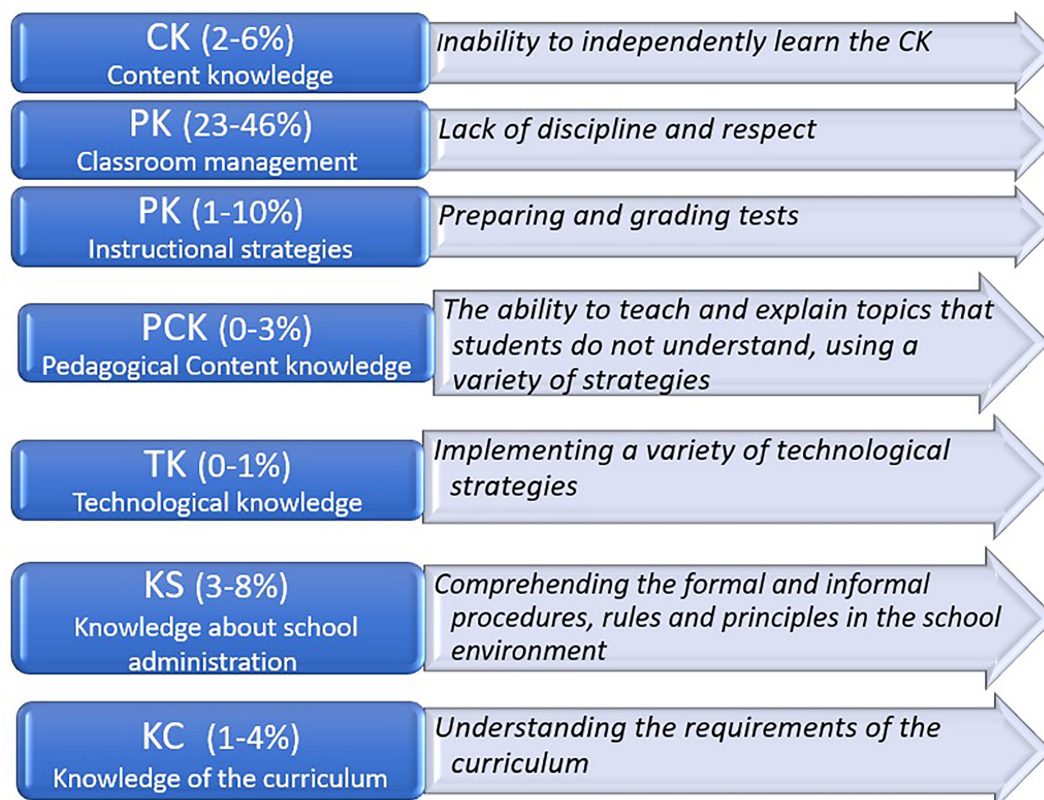


FIGURE 4
The reported percentage of challenges by knowledge types out of all the challenges.

Conversely, STEM-ed graduates were confident in their CK but less so in class management. Indeed, a STEM-ed mentor said: “their CK is excellent, and they know to enrich their students’ knowledge

and foster their curiosity and interest in science...however, when it comes students’ behavioral problems, many of these STEM-ED teachers have hard time coping with them. This causes novice

teachers' frustration, as the school management is not always helpful in this regard."

Interactions within the school community (outer circle)

Teachers' integration into the school community was assessed from three aspects: taking on roles additional to teaching, leadership, and teamwork.

Roles

Data analysis revealed that despite being novice teachers, many ACP graduates took responsibility on various roles in the school community in addition to teaching their subject. Table 2 shows the percentage of graduates in different positions in the school.

The most common role was, expectedly, homeroom teacher (64%), followed by subject coordinators (29%) and 13.3% members of a school committee (13.3%). In Israel, all grade levels have homeroom teachers, and in middle-and high school they serve as liaisons between the student, other teachers, and the parents. Some graduates undertake more than one role (explaining why the total percentage is >100%). PostDF is the program in which graduates undertook the highest number of roles, likely reflecting their previous experience as retired military officers in leadership positions.

These graduates took large-scale roles, such as head of a grade-level student cohort, which is not typical of a novice teacher, as evident in graduates of the other programs. A principal of a school with several PostDF graduates shared the following: *"They come mature, and very quickly they find themselves moving into roles that require a lot of responsibility and discipline. Two of my PostDF teachers are responsible for coordinating 300 students. Their experience in military positions enables them to cope with pressure and time management issues."*

SocLead graduates also undertook several roles within the school community, which is consistent with the high sense of mission emphasized by graduates of this social-educational leadership program and their aspirations to change the school system. One graduate shared: *"What did we learn in our preparation program? I think that something about the 'state of mind' – that you are becoming an agent of change, and that you are part of a group that shares this purpose."*

Supporting evidence for the career aspirations of SocLead graduates comes also from mentors of this program: *"They have great, focused goals...they really want to move forward and become professionals."* One mentor even criticized this tendency and described graduates who were oriented toward overachieving this goal and skipping the necessary steppingstones of being novice teachers. Consistent with this, SocLead graduates reported difficulties with time management, possibly explained by the large number of positions they hold in school in addition to being full-time teachers. One of the school principals who was interviewed about SocLead graduates in her school claimed: *"I expect SocLead graduates to contribute to the school community in any possible way, including taking upon themselves different roles."*

In the subject-oriented STEM programs, STEM-ed and STEM-clinic, we saw substantial contribution to the professional aspects of teaching, such as serving as a subject coordinator of a specific STEM discipline (STEM-ed), taking responsibility for assessment methods in the school, or being an educational technologies advisor (STEM-clinic).

Noteworthy, the views regarding taking on additional responsibilities to teaching as novice teachers were inconsistent. Several graduates and mentors voiced that a novice teacher should not fulfill additional roles but rather focus on teaching one's subject. As stated by one graduate, *"I consciously chose not to take on roles in the school in my first year. My feeling is that my educational activity is not at the organizational political level, but at the level of the child and what happens in the classroom, and I decided to dedicate my time to this."* This approach was also voiced by a mentor of the SocLead program, (Teach First) who critiqued the program for requiring, in her opinion, over-involvement of the novice teachers that can lead to excess pressure and a sense of failure: *"The message this program puts forth is dangerous...their first year is not one in which they should be overloaded. Each SocLead graduate that comes in, they load on him a million and one things. This is not right. If I want this teacher to persist in the school as a teacher, which is beneficial to us all, I need to protect him from all the excess things requested of him. In the end, he burns out and experiences failure."* A principal voiced the opposite: *"There are those who claim the need for acclimation, only their subject, after that homeroom teacher – not from the beginning. I think the exact opposite. If they have the dream to be a coordinator, let them start right away."*

TABLE 2 Distribution of graduates in different formal positions in the school (Sum of categories is not 100% since an ACP graduate may select more than one role).

Program Role (%)	ExcelUnd (N=84)	STEM-ed (N=24)	PostDF (N=37)	STEM-clinic (N=27)	SocLead (N=106)
Homeroom teacher	81	25	67	52	68
Subject coordinator	27	54	30	22	21
Responsible for assessment methods in the school or for technology applications	8	25	30	30	17
School committee member	12	4	13	7	16
Grade-level	2	0	19	0	8.5
Social involvement coordinator	5	0	3	0	7
Management roles	1	0	3	4	2
Total percentage	136	108	165	115	139.5

Leadership

An element indicative of graduates' leadership and integration into the school community is their initiation and promotion of projects and initiatives. The graduates were asked about the opportunities they had to lead such initiatives and described several of those in more detail. In four programs, 63–77% of the graduates promoted initiatives in their school community. Only in the STEM-clinic program, less than half reported on their initiatives in school. The initiatives were diverse and included leading the organization of ceremonies and school events in, incorporating educational technology, establishing a school website, implementing leadership projects, such as editing the school newspaper, conducting educational field trips, and conducting community projects, such as volunteering.

While the graduates did not describe leadership as a challenge in itself, they identified various difficulties: (1) lack of confidence to initiate as novice teachers: *"In the beginning, you need inner courage to share your ideas. If you do not have a sense of belonging to the school, you do not know if anyone will listen to you. Therefore, you do not always have the motivation to initiate projects."* (2) time management issues: *"This year I am a homeroom teacher, and I do not really have the time to contribute outside my classroom."* (3) lack of support from colleagues and the administrative staff in school: *"In theory, there are opportunities to initiate, but in practice, there is no support or assistance from the management."*

Teamwork

Successful integration into the school community is dependent, among other things, on novice teachers' ability to collaborate with colleagues and feel comfortable to turn to them for assistance or advice. All the respondents identified this aspect significant. A higher percentage of the Excel-Und, STEM-ed, and STEM-clinic graduates reported this as a challenge (8–9%), while fewer SocLead (Teach First) and PostDF (the retired military officers) graduates did so (4–5%). For example, a STEM-ed graduate said: *"From the social perspective, I find it difficult to position myself among my colleagues. I have a certain perspective that does not match theirs. I sometimes feel isolated not knowing who I can ask for help, so the process of connecting with colleagues on the personal and professional level is slower for me."*

Principals expressed the following perspectives regarding the ability of second career teachers to cooperate with their colleagues: (1) Greater potential of ACP graduates to apply teamwork due to their first-career experience and ability to lead and work in teams: *"These graduates have extraordinary communication skills and experience in leading teams and projects."* (2) Difficulties of ACP graduates to apply teamwork due to ego issues: *"Those who come from hi-tech have some ego issues because of their knowledge and experience, it gets in the way of listening to other perspectives and working in teams."*

Difficulties reported by SocLead graduates in working with their colleagues were related to their sense of posing a threat to the experienced teachers, who were not interested in the changes and the projects they offered. Some graduates emphasized that the ability to connect and work with colleagues is dependent on the organizational culture inside the school. As shared by one graduate who switched schools after her first year of teaching: *"In the second school I taught, I felt much better with the teachers because the school atmosphere was different. They were more open to other perspectives and ideas, and this was the foundation for my interaction and communication with colleagues."*

Alternative certification programs characteristics that support graduates' integration into the teaching profession

The aspect the graduate interviewees perceived most significant in contributing to their teaching is PK. This finding is particularly prominent in the STEM programs (STEM-ed and STEM-clinic) and PostDF, the program for retired military officers. For graduates of these programs, different types of teachers' knowledge (CK, PK, and PCK) and TK were central to their teaching.

Professional identity was most important to SocLead graduates. Enhancing teachers' leadership skills was also identified by these graduates, reinforcing our findings regarding their leadership roles in their schools. The interviewees emphasized the importance of developing leadership skills during the preparation program to their teaching practices. Graduates of PostDF indicated low contribution of the program to developing their leadership skills, most likely due to their previous military leadership experience. Excel-Und graduates displayed a more balanced contribution of the different components to their teaching. This may be explained by the fact that this is an undergraduate program, thus its students are less experienced than the second career students of the other programs.

Contribution of the programs to the graduates' sense-of-preparedness in specific professional aspects of teaching was explored in the close-ended section. Table 3 compares the contribution to specific components of the graduates' sense-of-preparedness among the different programs.

Each ACP exhibits a different set of strengths. SocLead scored highest for its contribution to CK, professional identity, and teamwork. In line with this, enhancing teamwork skills during the program helped graduates integrate successfully into the school community as one mentor commented: *"SocLead novice teachers arrive at school with a belief that they can change the world, and this belief is clearly reflected in their leadership..."* The STEM-oriented STEM-ed program contributed most to the graduates' PCK and TK.

Figure 5 links the programs' characteristics to graduates' citations regarding affective aspects, classroom performance, and their interactions with the school system community. Our model enables presenting the contributions of ACPs in all three aspects: the individual teacher—self-efficacy and professional commitment, the classroom—acquired knowledge and challenges teachers face, and the school community—teamwork. Developing teacher's knowledge types was significant for the graduates' self-efficacy and classroom performance. Leadership skills developed during the program contributed to all the three circles of the novice teachers' experience in the schools.

Discussion

Concerns regarding the role of evaluation and assessment in teacher education are shared by policymakers, researchers, and teacher educators (Richmond et al., 2019; Edmondson et al., 2022). Given the significant variation among different ACPs in Israel and the students they admit, this study presents a teacher-classroom-community model that is inclusive with respect to the various ACPs and enables novice teachers to express their experiences and may, thus, guide ACP directors in improving their programs. The

TABLE 3 Comparison of the contribution of various ACP characteristics to the graduates' sense of preparedness in professional aspects of teaching among the ACPs.

ACP attribute	Highest score	Lowest score	<i>F</i>	<i>p</i>	<i>Post Hoc</i> (significance among groups)
CK	SocLead 4.50 ± 0.56	PostDF 3.04 ± 1.40	7.133	0.000	SocLead > ExcelUnd
					SocLead > STEM-clinic
PK	SocLead 3.50 ± 1.01	PostDF 3.34 ± 0.92	0.409	n.s.	-
PCK	STEM-ed 3.62 ± 1.01	PostDF 2.75 ± 1.18	6.613	0.000	STEM-ed > ExcelUnd
					STEM-ed > PostDF
					STEM-ed > SocLead
					STEM-clinic > PostDF
					STEM-clinic > SocLead
TK	STEM-ed 3.78 ± 0.95	PostDF 2.84 ± 1.17	3.773	0.002	STEM-ed > PostDF
					ExcelUnd > PostDF
					STEM-clinic > PostDF
Professional identity	SocLead 3.81 ± 1.07	STEM-ed 3.06 ± 1.08	5.113	0.000	SocLead > STEM-ed
					ExcelUnd > STEM-ed
Teamwork	SocLead 3.63 ± 1.24	PostDF 3.00 ± 1.20	3.539	0.004	SocLead > PostDF
					SocLead > STEM-clinic
Leadership	ExcelUnd 3.36 ± 1.23	STEM-ed 2.60 ± 1.13	7.347	0.000	ExcelUnd > STEM-ed = PostDF
					ExcelUnd > STEM-clinic
					SocLead > STEM-ed
					SocLead > STEM-clinic
					SocLead > PostDF

comprehensiveness of our model has enabled to present an accurate depiction of the various ACPs, differences among them, and ways in which these programs can improve the integration of their graduates into the school system.

The study investigated the five leading national programs. Despite the diversity of the target audience and the characteristics of the different programs, our proposed model enabled us to elicit a common language for the leaders of teacher education programs.

Developing a common language across teacher certification programs

Comparing data across the five ACPs indicates that these programs have prepared novice teachers with different knowledge, skills, beliefs, and classroom experiences for their profession. For example, graduates of the STEM-oriented programs (STEM-ed and STEM-clinic) perceive types of knowledge – (CK, PK, and PCK) as the program components that were most significant in their contributing to them, while graduates of more socially-oriented programs (SocLead and ExcelUnd) described leadership skills as the most beneficial. These differences are also reflected in how graduates of these programs integrated into the school community: STEM-oriented (STEM-ed and STEM-clinic) graduates took on fewer roles, and these focus on more discipline-related roles, while among SocLead, PostDF, and ExcelUnd graduates, being homeroom teachers and heads of age cohorts was more common. This variation reflects - certain programs' focus on the development of the interpersonal domain, which involves teamwork, collaboration, and leadership skills while others emphasize building teachers' knowledge

and expertise as subject-matter specialists from the CK and PCK aspects, similar to that reported in other studies (Rosenberg and Sindelar, 2005; Redding and Smith, 2009). These findings indicate different teacher preparation approaches: it may be argued that offering a variety of programs, each with its specific focal areas, has merits to the educational system given the wide variety of integration-attributes and the increasing professional requirements of schoolteachers. However, ACPs would benefit as well by creating a common language that shares their goals and beliefs about what teachers should know and be able to do after graduating from the program (Tatto et al., 2016). Such teachers' knowledge facilitates their development as excellent and motivated professionals who advance student learning and are committed to the school community.

Teacher-classroom-community model – connecting alternative certification programs characteristics to its graduates' integration into the school system

Figure 6 situates the major program characteristics graduates identified as supporting their integration into teaching within the circles of the model.

Data collected through our research tools and guided by our framework enabled connecting the contribution of each ACP to the integration of its graduates into the teaching profession. Self-efficacy was rated high (4.0–4.3) as was CK (3.0–4.5), while pedagogical knowledge scored lower: PK < 3.5 is conservatively intermediate, and PCK scored in the range 2.8–3.6 with the highest variance, indicating large differences

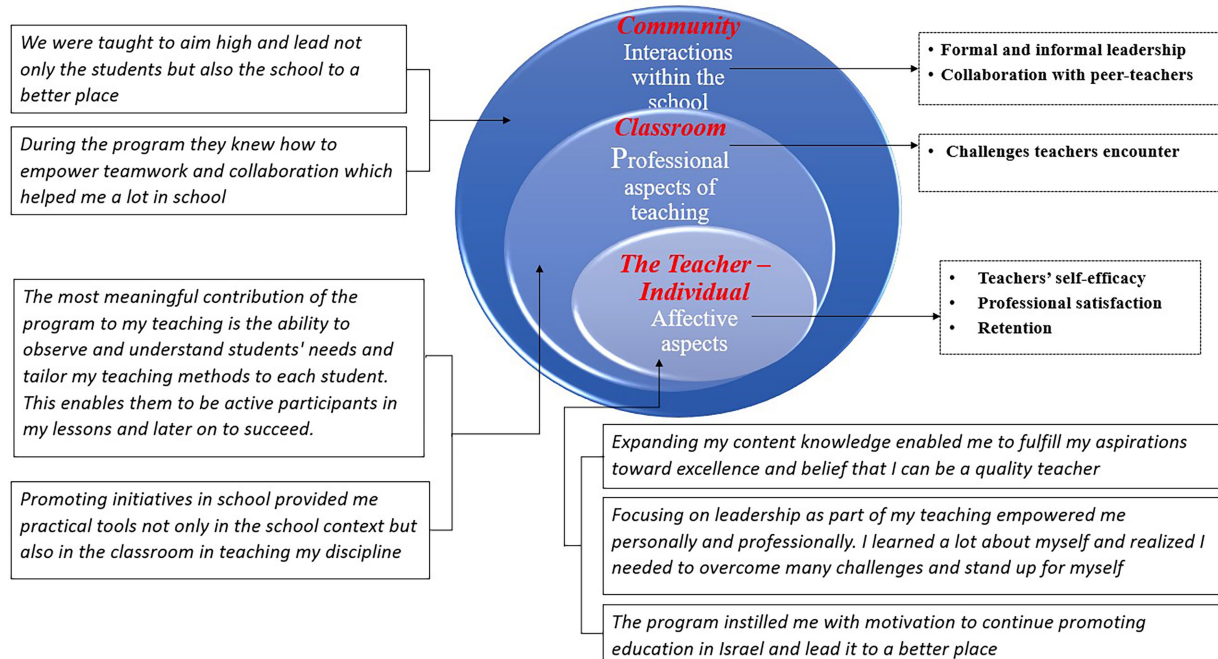


FIGURE 5
Graduates' citations regarding the three circles of our model.

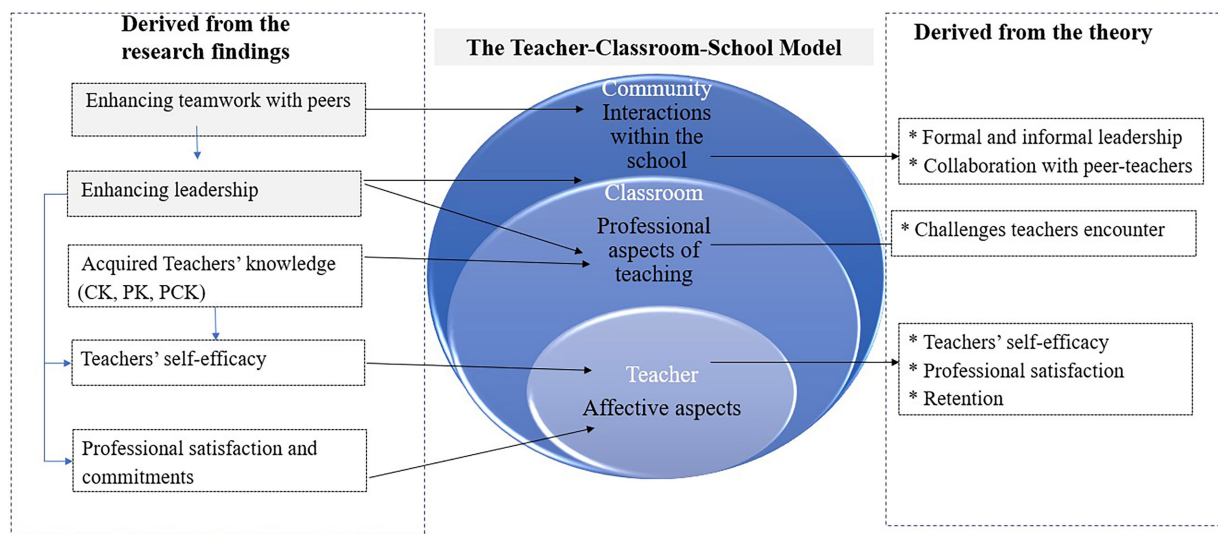


FIGURE 6
ACP characteristics that support graduates' integration into schools and their links to the circles of the model.

between the ACPs in this component. Teamwork ranked intermediate (3.0–3.6), and leadership scored lowest (2.6–3.4). Overall, these findings indicate a gap between the graduates' high self-efficacy, which can be attributed to their high internal motivation, and other components related to the outer circles of the model, which the participants perceived as having medium to conservative contribution. Another influential characteristic was the teachers' level of three knowledge types—CK, PK, and PCK. These improve teachers' classroom performance, self-efficacy, and professional satisfaction. Teachers are empowered in their school assimilation by high levels of these characteristics.

Integrating the findings within the model reveals that promoting and enhancing leadership skills within the program has a 'systemic effect' as it positively impacts most if not all integration aspects. Thus, specifically focusing on teacher leadership (elaborated in the following) should become a central element in all ACPs.

Leadership

Teacher leaders, as described in the literature, are uniquely positioned to promote change within schools; they have the potential to lead the school community by increasing teacher collaboration,

implementing best practices, encouraging teachers' professional development, offering assistance to colleagues or novice teachers, and focusing on content-specific issues (Leithwood et al., 2008). In this study, more than half of the ACP graduates, despite having less than 5 years of experience, reported taking on various positions and leading various projects in the school community, and some reported taking on more than one role. This was more prevalent among SocLead and ExcelUnd graduates, who attributed their propensity for leadership to their preparation program. As seen in Figure 6, graduates emphasized that enhancing their leadership skills contributed not only to their integration into the school community, but also to their classroom practices and to affective aspects, such as self-efficacy, satisfaction with and commitment to teaching. In view of this, we claim that assessing the quality of teachers' leadership is essential for evaluating teacher certification programs—ACPs as well as TCPs. These programs must explicitly consider how to prepare teachers in ways that allow them to develop leadership skills and implement them in the school context, with the aim of increasing their sense-of-belonging and aspiration for further professional development (Watt and Richardson, 2008; Ado, 2016). Many studies show the positive influence of teachers' leadership and initiatives on students' achievements, as well as on teachers' sense of self-efficacy and professional identity (Muijs et al., 2013; Ado, 2016). Concomitantly, it is important to emphasize that various challenges, such as lack of support from colleagues, time management, and low self-confidence, came up as obstacles that prevent novice teachers from demonstrating leadership qualities. Therefore, teacher certification programs should provide a foundation for teachers to understand the realities of the school context they will enter and cultivate competencies for taking initiative within this context (Honawar, 2007).

Teamwork

Regarding teamwork with colleagues, teachers create a professional community with their colleagues by taking an active part in reflective dialogs, engaging in discussions about teaching and assessment methods, collaborating, consulting, and receiving feedback about their teaching. Teamwork contributes to teachers' professional growth and sense of belonging to the school community, leading to the development of common values and teaching principles (Svanbjörnsdóttir et al., 2016; Wiyono, 2018). Furthermore, becoming a more effective teacher by engaging with colleagues increases the likelihood of persisting in the profession (Bartell et al., 2019). In this study, graduates of all programs noted that teamwork was a challenge for them. Some of the graduates attributed this challenge specifically to the ACP, and criticized the prestige associated with ACPs graduates or with their prior careers in industry or the army that in their opinion, seems to pose a threat to their colleagues. This finding corresponds to other studies in which ACP graduates reported experiencing difficulties collaborating with colleagues, often finding themselves in professional isolation (Brown et al., 2004). Other graduates mentioned that successful teamwork became possible thanks to the teamwork skills they acquired in their preparation program, or their school organizational culture that is supportive of novice teachers' integration and ideas. This finding shed light on the importance of not only experiencing and implementing teamwork during teacher certification programs, but also to explicitly paying attention to: (a) how to actively develop professional relationships

with peer-teachers, and (b) how to access this relationship in the context of the school environment. Addressing these aspects not only enhances teacher's collaboration with colleagues but also lays the foundations for becoming leader teachers (Burke et al., 2015). Given the increased expectation for teamwork in schools and its wide-ranging contribution to various professional aspects of teaching and integration, our findings suggest that ACPs should consider connecting teamwork to understanding what leadership entails. Stated otherwise, teamwork should be regarded in ACPs as a dimension of teacher leadership. Facilitating collaborations among teachers, creating communities of teachers who jointly engage in various aspects of professional development is a central attribute of teacher leadership (Fairman and Mackenzie, 2015).

Teacher's self-efficacy and commitment to the teaching profession

Enhancing teachers' sense of self-efficacy during their preparation program can increase their motivation to integrate into the school system and implement innovative teaching and assessment methods (Kahveci et al., 2018). Concerning self-efficacy, the findings of this study present a complex picture. ACP graduates reported having high self-efficacy, but at the same time they described several challenges they experienced, mainly related to classroom management and pedagogical knowledge. This result highlights the importance of evaluating teacher's affective aspects of the teaching profession, alongside professional (classroom) aspects, as conducted in our framework.

Challenges faced by novice teachers are well-documented in the literature (Chaaban and Du, 2017; Wolff et al., 2017), and teacher certification programs can help pre-service teachers cope with these challenges by practicing teaching scenarios in a 'real-life' authentic setting (Gray and Taie, 2015; Dori et al., 2019). However, the short duration of these programs and resulting fewer opportunities to be in the classroom, could be a disadvantage of ACPs.

The graduates emphasized the importance of acquiring teacher's knowledge for their sense of self-efficacy (see Figure 6). According to the graduates, acquiring the relevant knowledge instilled confidence in them and provided an opportunity to integrate a variety of teaching methods into their lessons. Incorporating these aspects into the preparation programs provides the foundations for teachers' successful integration into the teaching profession (Lee and Lampert, 2011).

Extensive literature has addressed the issue of low retention and high teacher attrition among novice teachers (e.g., Rosenberg and Sindelar, 2005; Redman, 2015; Zavelevsky and Shapira Lishchinsky, 2020). The characteristics of teacher preparation program acknowledged by graduates, such as the pedagogical tools they receive and their acquired knowledge, are main factors influencing teachers' commitment to the teaching profession (Gray and Taie, 2015). In this study, over 60% of the graduates of all programs indicated that they intend to continue in the teaching profession. Those who were not sure, attributed their uncertainty to various frustrations in navigating the school and the educational system. These challenges should be addressed in teacher certification programs by providing teachers with strategies for navigating the school context during the integration process. Speaking directly and openly about the challenges the educational system may pose, while building a foundation for leader teachers, may increase the level of teachers' commitment and dedication to the profession and resilience to withstand challenges (Unruh and Holt, 2010; Redman, 2015).

The need for alternative certification programs parallel to traditional teacher preparation programs

The acute shortage of teachers in general, and STEM teachers in particular, mandates that society capitalizes on its human resources of qualified and experienced people as teachers. The scarcity of STEM teachers is so significant that no program should be discontinued; conversely, the ACPs should recruit more students and maintain open channels to openly discuss strengths and challenges each ACP experiences, so these programs can continuously improve through self-and peer assessment. ACPs must be nurtured so they continue to thrive alongside and in addition to the traditional four-year programs, ideally cross-fertilizing each other with new ideas.

Each ACP has its unique characteristics, audience, and contribution. The teacher-classroom-community model has enabled us to identify the uniqueness, strengths, and shortcomings of each ACP. Employing this model may provide insights for ongoing reflection and improvement of teacher preparation programs toward alleviating the widespread issue of shortage of teachers.

Limitations, strengths, and further research

Tools for assessing teacher preparation programs include observations, analysis of teachers' artifacts, such as designed assignments, and self-reports (Goe et al., 2008). One limitation is that our research is based mainly on self-reporting by the participants, and their perception of their preparedness. This may not reflect their actual practices or their successful transition into the teaching profession. Despite this, the model employed in this study and the factors investigated in each of its circles, offer a rich and holistic depiction of the novice teachers' experience in school life, which, in turn enables to obtain information regarding the characteristics of teacher's preparation programs, and evaluate their impact on preparing teachers, including focus on classroom experiences from the teacher's point of view. Sharing the challenges identified in this study with the ACP directors can aid teacher educators address them during the program and transform them into learning opportunities that will later shape the graduates' beliefs and professional identities (Pillen et al., 2013).

The strength of this study lies in several aspects of its methodology: (a) its application of the comprehensive teacher-classroom-community model for evaluating teacher certification programs in several contexts and with diverse groups of participants. The model may contribute toward a systematic analysis of novice teachers' immersion in schools. (b) The research tool we adapted and modified—the holistic questionnaire for assessing the characteristics of ACPs and teachers' efficacy for successful integration. The advantage of this questionnaire over observational tools is that it is less demanding in terms of time and resources. Together, these enabled to highlight important aspects that teacher education leaders should consider and use for self-evaluation of their programs.

A methodological limitation pertains to its participants. Despite the high number of participants, the graduates' response to the questionnaire and participation in the interview was voluntary. This may lead to self-selection bias.

We recommend applying this model on a diverse population of ACP graduates in other countries. Further research is also needed to find

ways of using similar data and encourage program directors to collaborate toward program improvement (Bartell et al., 2019). Future studies that apply our teacher-classroom-community model may include (1) comparative analysis of ACPs and traditional programs, (2) investigating the motivation and demographic variables of the entering ACP attendees as they relate to the three circles of our model, (3) longitudinal studies that examine different points in time along the preparation and integration of graduates into the teaching profession.

Data availability statement

The datasets presented in this article are not readily available because we are not allowed to share the raw data. Requests to access the datasets should be directed to yjdori@technion.ac.il.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics committee of the Chief Scientist, Ministry of Education, approval # 9545. Behavioral Sciences Research Ethics Committee at the Technion. The participants provided their written informed consent to participate in this study.

Author contributions

YJD led the research, the design of the model, the qualitative data analysis, and the paper authoring. DG led the quantitative data analysis and was one of the leading authors of the paper. GS led the data collection, participated in both the quantitative and qualitative data analyses, designed the graphics, and wrote the first drafts of the paper as part of her PhD. NL-A participated in the data collection and qualitative analysis. AS participated in the data collection and quantitative analysis. TT participated in the data analyses and contributed to authoring the paper. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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

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Appendix A

We present a few examples of the way we classified responses into category and sub-category:

1. *“Teaching the basics of chemistry and enriching the content knowledge beyond the curriculum enabled me to feel comfortable in the classroom. I particularly remember solving in ‘real time’ the matriculation exam that high school students complete during their chemistry studies, and it helped me a lot to be in the position of the students and understand what is required from them [Category: Teachers’ acquired knowledge; Sub-category: Content knowledge]. Yet, I understand I did not spend enough time in the classroom to comprehend everything that comes with it. I would like more practical experience in the classroom and less ‘pretend play’ ... for example, actually teaching a laboratory class to high school students ... as a teacher, it was difficult for me to cope with 20 students in one laboratory [Category: Program methods; Sub-category: Practicing teaching in real-life context]” [ICA].*
2. *“... I am used to working in teams from my previous job, but I felt that it was different, because I felt comfortable sharing my point of view and listening to others’ views and approaches to teaching... It was an open space for me to express myself” [Category: Program methods; Sub-category: encouraging teamwork].*
3. *“...It was a mission to influence the next generation and contribute to adolescents from my own knowledge and experiences.” [Category: Program outcomes; Sub-category: professional identity].*



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Witnessing well-being in action: Observing teacher well-being during field experiences predicts student teacher well-being

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Social cognitive theory posits that observing others' behavior can influence our thinking, behavior, and learning. The present study examines whether this principle also applies to teacher well-being. It investigates whether student teachers' well-being is linked to the well-being of in-service teachers they closely observe during field experiences. For that purpose, 222 student teachers were assigned to conduct three classroom observations of three different teachers using a dedicated observation tool that focused on in-service teachers' positive emotions and positive student interactions. Longitudinal data from 666 classroom observations and student teachers' well-being data were analyzed. It was hypothesized that the mean scores from all three independent classroom observations are most predictive of student teacher well-being. The results revealed significant associations between seven indicators of student teacher well-being and the observed well-being of in-service teachers. Interestingly, it was not the mean of all three observation scores but only the score of the third and final observation that contributed significantly to student teacher well-being. This brief research report seeks to inspire discourse about the benefits and challenges of observational learning in teachers' well-being education.

KEYWORDS

teacher well-being, student teacher, field experience, observational learning, recency bias, classroom observation

1. Introduction

Teacher well-being is highly relevant for teachers' work and students' outcomes (Carroll et al., 2021). According to Viac and Fraser (2020) it can be defined as "teachers' responses to the cognitive, emotional, health and social conditions pertaining to their work and their profession" (p. 18). The occupational well-being of teaching professionals requires good working conditions and the individual's active involvement (Toropova et al., 2020; Dreer, 2022). The latter is dependent on knowledge, skills, and self-efficacy beliefs which can develop through training, intervention, and experience (McCallum and Price, 2016). There is widespread scholarly agreement that practical phases during initial teacher education involve experiences relevant to future teachers' well-being and well-being education (e.g., Price and McCallum, 2015; Cherkowski and Walker, 2018; McCallum, 2020; Dreer, 2021). Because such phases enrich classroom learning by providing authentic experiences and learning opportunities, teacher education programs worldwide mandate field experience in their curricula (Zeichner, 2012). Prospective teachers are expected to develop their competencies by observing lessons and important processes in school. Often, they are supposed to engage in intensive job shadowing

and to systematically observe professionals in core areas of teaching before their own teaching trials. Among other forms like problem-based or reflective learning, observational learning plays an important role in teacher education (Chernikova, 2018). In terms of teacher well-being, this could include observing how teachers deal with daily stressors like unforeseen situations, obstacles, and classroom disruptions. Furthermore, observations could target teacher behavior that elicits positive reactions among colleagues and in the classroom and thus supports teacher well-being. Recent studies from personality research indicate that individuals who experience higher rates of happiness exhibit several positive behaviors that can be easily observed by others, even in brief social exchanges. For example, research suggests that happier people tend to smile more, engage in more eye contact, use more positive language, and display open and approachable body language. These behaviors can not only create a positive impression on others, but they can also foster more positive social interactions and relationships (e.g., Gardiner et al., 2022).

Observational learning regarding well-being should therefore follow the basic principles posited by social cognitive theory, holding that skills and behavioral patterns can be acquired by watching others (Bandura, 1977). Research has substantiated that observations have a moderate positive effect on cognitive skill acquisition (Crissman, 2006), while Van Tongeren et al. (2018) reported that powerful models can help bolster prosociality and perceived meaning in life among university students. In teacher education, observational learning was established to contribute effectively to the development of student teachers' lesson planning and teaching competencies (Chernikova, 2018). Further evidence suggests that observational learning is effective in real-life situations (Gettinger and Stoiber, 2014). In addition, research on teacher self-efficacy indicates that watching in-service teachers at work can help strengthen the beliefs of future teachers in their ability to succeed in mastering certain requirements (e.g., Clark and Newberry, 2019).

Observing the excellence and skills of others can also elicit emotional responses. Algoe and Haidt (2009) distinguished three emotional reactions when witnessing excellent others: (1) elevation (response to moral excellence), (2) gratitude (response to generosity and thoughtfulness), and (3) admiration (response to skill, talent, and achievement). While gratitude and elevation drew people out of themselves and inspired them to do good for others, admiration inspired people to emulate the admired person and work harder on their own development. The authors' experiments led them to conclude that when watching others, participants experienced strong positive emotions that inspired them to improve themselves, their behavior, and their relationships. Accordingly, research on mentoring showed that mentor well-being and emotional support are connected to student teacher well-being (Hobson et al., 2009; Squires, 2019; Hobson, 2020). In addition, studies conducted in classrooms indicate that emotional contagion makes non-verbal and verbal teacher behavior influence the emotions and behavior of recipients (Mottet and Beebe, 2000; Becker et al., 2014; Houser and Waldbuesser, 2017).

The present study examines whether student teacher well-being is connected to the well-being of the in-service teachers they observe during practical phases. Based on social cognitive theory and prevailing knowledge on observational learning, it is hypothesized that (H1) student teacher well-being is positively linked to the observation of in-service teacher well-being. It was also hypothesized that (H2) when observing multiple teachers, it is the overall experience that is most strongly

connected to student teacher well-being. H2 was formulated based on findings of studies investigating the mere exposure effect. It is a central finding of this research that frequently observed behavior is assumed to be familiar and influences personal preference, especially when there is a motivation for social connectedness (e.g., Kwan et al., 2015).

2. Method

2.1. Participants and procedure

To test the hypotheses, an exploratory study gathered data from a 15 week field experience among two subsamples of student teachers from two successive university semesters. The first subsample (summer semester 2022) contains 53 student teachers in their last year of Master of Education studies. This sample contained 43 women (81%) and 10 men (19%). The mean age was 25.5 years ($SD = 3.39$, $Min = 23$, $Max = 39$). Participants included student teachers at both primary (76%) and secondary (24%) levels. The second subsample (winter semester 2022/23) contained 169 student teachers in their last year of Master of Education studies. This subsample included 133 women (79%) and 36 men (21%). The mean age was 27.3 years ($SD = 3.29$, $Min = 23$, $Max = 42$). Participants contained student teachers at both primary (87%) and secondary (13%) levels. Because data were collected as part of student coursework, there were no missing data in both subsamples. Gender and school type ratios were representative of the population of student teachers at the German university where the study was conducted. Moreover, both subsamples did not differ significantly in the well-being related variables, i.e., job satisfaction ($M_{S1} = 3.90$, $SD_{S1} = 0.68$, $M_{S2} = 3.92$, $SD_{S2} = 0.66$, $t = -0.21$, $p = 0.83$), emotional exhaustion ($M_{S1} = 1.89$, $SD_{S1} = 0.67$, $M_{S2} = 1.79$, $SD_{S2} = 0.62$, $t = 1.11$, $p = 0.34$), positive emotions ($M_{S1} = 3.69$, $SD_{S1} = 0.47$, $M_{S2} = 3.59$, $SD_{S2} = 0.45$, $t = 1.24$, $p = 0.53$), engagement ($M_{S1} = 3.78$, $SD_{S1} = 0.49$, $M_{S2} = 3.88$, $SD_{S2} = 0.52$, $t = 1.34$, $p = 0.43$), relationships ($M_{S1} = 3.88$, $SD_{S1} = 0.51$, $M_{S2} = 3.79$, $SD_{S2} = 0.46$, $t = 1.84$, $p = 0.55$), meaning ($M_{S1} = 3.69$, $SD_{S1} = 0.51$, $M_{S2} = 3.70$, $SD_{S2} = 0.75$, $t = 0.99$, $p = 0.24$), and achievement ($M_{S1} = 3.79$, $SD_{S1} = 0.46$, $M_{S2} = 3.79$, $SD_{S2} = 0.42$, $t = 0.71$, $p = 0.64$). Consequently, the two subsamples were merged into one data set which was then used to conduct the subsequent analyzes.

The observation assignment was part of a dedicated teacher well-being course. It aims to familiarize student teachers with the topic and to encourage them to explore and reflect their well-being during field experiences at schools. The course is divided into three phases. In the first phase, student teachers are provided with knowledge about teacher well-being. This includes concepts, theoretical frameworks and important results of research on the matter. In the second phase, student teachers are encouraged and enabled to observe teacher well-being and potential outcomes of teacher well-being at their schools. Furthermore, they are supported to engage in activities that potentially enhance their well-being within the professional context. In the third phase, student teachers are supported in reflecting their impressions and experiences and to seek ways of integrating their insights into their future professional practice (for more information see Dreer, 2021). As part of their course requirements, student teachers had to conduct three classroom observations with three different teachers at their internship school during the second phase of the course. Each observation was to last for a full school lesson (45 min), and all needed

TABLE 1 Overview of applied measures.

Concept	Scale/subscales; number of items (<i>item example</i>)	α
Observed teacher well-being	Teacher well-being observer (see footnote 1); four observation items with several observational indicators (<i>sample behavior</i>)	0.73–0.81
	Positive emotions The teacher utters credible statements with positive connotations that reflect positive emotions (verbal); e.g., “I am happy to work with you today” (<i>happiness</i>). The teacher shows positive emotions through body language (non-verbal); e.g., <i>the teacher smiles</i> .	0.77–0.80
	Relationships The teacher expresses empathy toward the learners (verbal); e.g., “I can understand your situation.” The teacher uses relationship-supportive body language (non-verbal); e.g., <i>the teacher mirrors the child’s posture</i> .	0.79–0.82
	Teaching satisfaction scale (Ho and Au, 2006), five items <i>I am satisfied with being a teacher.</i>	0.88
	Emotional exhaustion subscale from the Maslach Burnout Inventory (Maslach et al., 1996), nine items: e.g., <i>I feel emotionally drained by my work.</i>	0.83
Student teacher well-being	Adaptation of German version of PERMA Profiler, 15 items (Wammerl et al., 2019)	0.79
	Positive emotions, three items <i>How often do you feel joyful at work?</i>	0.78
	Engagement, three items <i>How often do you become absorbed in what you are doing at work?</i>	0.79
	Relationships, three items <i>To what extent do you receive help and support from others at work when you need it?</i>	0.79
	Meaning, three items <i>To what extent do you perceive your work to be purposeful and meaningful?</i>	0.83
	Achievement, three items <i>How much of the time at work do you feel you are making progress toward accomplishing your goals?</i>	0.83

to be completed within 2 weeks but with at least 1 day between each observation. Student teachers received a standardized observation tool and were briefed on using it in classrooms. After all three observations, 222 student teachers submitted their observation protocols for data digitalization: 666 observation protocols from 666 lessons. One week after the observation period, student teachers were asked to complete an online questionnaire assessing seven well-being related variables.

2.2. Measures

Teacher well-being is operationalized by the PERMA model of well-being (Seligman, 2011). It comprises the five dimensions (P) positive emotions, (E) engagement, (R) relationships, (M) meaning, and (A) achievement. To examine the hypotheses, two types of data were collected with regards to the theoretical model (Table 1). First, observational data were recorded by student teachers using the teacher well-being observer¹, an observation tool based on the PERMA well-being model to assess in-service teachers’ verbal and non-verbal behavior regarding positive emotions and interactions with students through classroom observation. The tool was provided with a briefing, a standardized rating scale ranging from one (*not observed*) to five (*extensively observed*), and rating rules.

Second, student teacher well-being was assessed using a complementary self-report approach featuring seven variables. On

one hand, student teacher well-being –based on Seligman’s (2011) PERMA model – was assessed using the German version of the PERMA profiler (Wammerl et al., 2019). Survey scales assessing (P) positive emotions, (E) engagement, (R) relationships, (M) meaning, and (A) achievement were adapted to the teaching profession. On the other hand, student teacher well-being was assessed using Warr’s (1999) concept of workplace well-being and operationalized by assessing teaching satisfaction (Ho and Au, 2006) and emotional exhaustion (Maslach et al., 1996). The items were translated into German, with quality assurance provided by a translation service. Items were assessed on a five-point Likert scale ranging from one (*does not apply*) to five (*applies fully*). The internal consistencies of the scales used in this study were adequate (Table 1).

3. Results

Prior to hypothesis testing, scales were tested for internal consistency, while means were computed for all student teacher well-being constructs. Observation scores were computed by summing the individual values from the four observation items of each of the three protocols. Additionally, a mean score was computed over all three observation scores ($M = 11.06$, $SD = 2.32$).

The mean observation scores for the three observations (observation 1: $M = 10.39$, $SD = 3.13$; observation 2: $M = 9.77$, $SD = 3.26$; observation 3: $M = 9.74$, $SD = 3.21$) are very similar, with only a slight decrease over time. The results of correlation analyzes (Table 2) revealed that the observation scores from the three separate

¹ Dreer, B. Observing teacher well-being in the classroom: a feasibility study.

TABLE 2 Correlations between observed in-service teacher well-being and self-reported student teacher well-being.

	1	2	3	4	5	6	7	8	9	10	11
1. ITW –Mean O Scores	1	0.63**	0.65**	0.69**	0.10	−0.17	0.24*	0.25*	0.24*	0.33**	0.31**
2. ITW –Score O-1		1	0.01	0.04	−0.06	−0.09	0.03	0.12	−0.11	0.00	0.10
3. ITW –Score O-2			1	0.21	−0.11	−0.10	0.04	0.13	0.18	0.12	0.14
4. ITW–Score O-3				1	0.34**	−0.37**	0.35**	0.41**	0.27*	0.39**	0.36**
5. STW –Job satisfaction					1	−0.79**	0.70**	0.49**	0.49**	0.57**	0.56**
6. STW –Emotional exhaustion						1	−0.67**	−0.42**	−0.54**	−0.51**	−0.56**
7. STW –Positive emotions							1	0.56**	0.52**	0.68**	0.64**
8. Engagement								1	0.56**	0.63**	0.53**
9. STW –Relationships									1	0.57**	0.43**
10. STW –Meaning										1	0.66**
11. STW –Achievement											1

* $p < 0.005$, ** $p < 0.001$; ITW, in-service teacher wellbeing; O, observation score; STW, student teacher well-being variable.

observations were not significantly linked, indicating that each classroom observation was a separate incident and that observations were not systematically connected to a given observer.

As an initial step in testing the two hypotheses, correlation analyses were conducted (Table 2). The results indicated that the mean of all three observation scores was correlated with positive emotions ($r = 0.24$, $p = 0.002$), engagement ($r = 0.25$, $p < 0.001$), relationships ($r = 0.24$, $p = 0.002$), perceived meaning ($r = 0.33$, $p < 0.001$), and achievement ($r = 0.31$, $p < 0.001$). However, only the score from the third observation was significantly linked in the manner expected to student teacher well-being. This includes associations between observation three and teacher job satisfaction ($r = 0.34$, $p < 0.001$), emotional exhaustion ($r = -0.37$, $p < 0.001$), positive emotions ($r = 0.35$, $p < 0.001$), engagement ($r = 0.41$, $p < 0.001$), relationships ($r = 0.27$, $p = 0.003$), perceived meaning ($r = 0.39$, $p < 0.001$), and achievement ($r = 0.36$, $p < 0.001$). Notably, connections to student teacher well-being were not detected in observer scores from observations one and two.

In a second step, seven separate multiple regression analyses were fitted to the data, each predicting one of the seven student teacher well-being variables by the three observation scores and the mean of all three. The results again showed that only the third observation was relevant in predicting student teacher well-being. It significantly predicted job satisfaction ($\beta = 0.40$, $t = 3.28$, $p < 0.001$), emotional exhaustion ($\beta = 0.35$, $t = -3.08$, $p < 0.001$), positive emotions ($\beta = 0.27$, $t = 2.41$, $p = 0.001$), engagement ($\beta = 0.41$, $t = 2.99$, $p < 0.001$), relationships ($\beta = 0.24$, $t = 2.79$, $p < 0.002$), perceived meaning ($\beta = 0.29$, $t = 2.42$, $p < 0.001$), and achievement ($\beta = 0.27$, $t = 2.89$, $p < 0.001$). None of the first, second or overall observation scores were significantly predictive of any student teacher well-being variable.

4. Discussion

The outcomes of the analyses generally indicate that all of the PERMA domains of student teacher well-being are predicted by observing in-service teachers during school lessons, albeit with small effect sizes. This is congruent with H1, which is derived from social cognitive theory, and the general tenet that watching others can influence a person's emotion and cognition. The relationships discovered are of plausible direction: if student teachers witness teachers they attribute with higher rates of well-being, they report higher well-being rates across various domains one week after their observations. Conversely, if student teachers witness teachers they attribute with lower rates of well-being, they report lower well-being rates across various domains one week after their observations. This particularly applies to student teacher engagement, which showed the strongest association with observation score. These findings support recent research highlighting that work engagement increases when employees perceive their supervisors as warm, competent, and moral (Orlowski et al., 2020). Notably, the expected connection is only present for student teachers' third and final observation and was not indicated for the first, second, and overall observations. It appears that only the last of three observations was relevant for student teacher well-being; thus, H2 is not supported. Three possible explanations for this outcome are discussed below.

First and most obviously, the last observation's prediction of student teacher well-being could result from recency bias, which is the human tendency to assign more weight to the most recent information or experiences. Recency bias has been found in observational learning (Warren and Loes, 2019); it affects university students when for example evaluating courses (Dickey and Pearson, 2005). Speaking against recency bias in the present case is the fact that student teachers documented their observations in writing using rating schemes and

were able to review their documents at any time. Previous studies had shown that the documentation of impressions helped avoiding the recency bias (Dickey and Pearson, 2005). In addition, recency bias would not explain why the principles of observational learning and emotional contagion were not present in observations one and two. Significant associations between all three observations and student teacher well-being, which may increase in correlational strength over time, would be a more plausible finding in the event of recency bias.

Another possible explanation is a training effect because the quality of observations is related to the observers and their training for the task (O'Leary, 2020). As the observation assignment was primarily implemented to trigger observational learning, the preparation of student teachers focused on explaining the objectives and correct use of the observation tool. However, it did not include intense training in scientific observation. This could explain why student teachers who are rather inexperienced at systematically observing the well-being of others needed three observation passes to effectively observe and realistically assess well-being among in-service teachers. Inaccurate observations could explain why there were no statistical associations between student teacher well-being and teacher well-being at observations one and two, when social cognitive theory would expect them. To explore the substance of this explanation, student teachers could be prepared using video training sessions to help them to better focus on the crucial aspects of the observation and to compare and evaluate their initial rating decisions.

A third explanation could be an adaptive process in calibrating expectable behavior. Research on role models indicates that witnessing the academic excellence of others stimulates emotional responses and motivates self-improvement, provided that excellence is perceived as attainable (Lockwood and Kunda, 1997, 1999). This insight suggests that student teachers may need to develop a sense of what makes a suitable role model and calibrate the behavioral aspects of teachers they perceive as expectable and attainable. It is possible that during observations one and two, student teachers gathered information about attainable models and used it to calibrate their observation skill, which led to a more refined and impactful impression in the third pass.

Because of the provisional nature of the present study, no definitive interpretation of the results with respect to the unsupported second hypothesis (H2) is yet possible. More research is needed in this regard. The findings in support of the first hypothesis (H1) are useful in pointing out possible directions for future research. In general, they underline the potential of observation assignments to enhance student teachers' observational learning. This could encourage the development of observation tools and assignments and testing their effectiveness in eliciting specific learning processes and outcomes. In particular, the findings of this study highlight that observational learning might be a promising route in supporting student teacher well-being. In addition to other support measures like dedicated university courses, mentoring, and self-help interventions (e.g., Goodday et al., 2019; Hobson, 2020; Dreer, 2021), methods of observational learning, like targeted classroom observations, should therefore be considered in teacher well-being education. This might be particularly valuable if student teachers are able to observe in-service teachers with high rates of occupational well-being, which emphasizes the importance of choosing a quality school for conducting field experiences. The present study's preliminary findings indicate that it is worth further investigating this proposition. Such future research could help overcome the limitations of the explorational work presented in this brief research report.

This study was based on data from two separate subsamples of student teachers from two successive university semesters. While group

comparisons for the two subsamples showed no significant differences in the well-being related variables, cautious interpretation of the results is warranted, as the two groups might have differed in other relevant aspects not measured in this study. Future research should use larger student teacher samples from different locations, countries, and cultural backgrounds. Furthermore, conclusions about causal relationships cannot be drawn based on this longitudinal research design. The relatively short time lag of one week between data collections might have led to inflated correlations between the data of the last observation and of student teachers' self-reported well-being. To avoid such shortcomings, future research should implement experiments and make use of research designs with more frequent, strategically spaced measurement intervals (e.g., pre, post, follow-up). The data presented are also not informative about the long-term impact of classroom observations. It could be that emotional contagion means that student teacher well-being benefits from targeted observations only briefly after the observation. On the other hand, student teachers might be durably inspired by their observations of model in-service teachers (admiration) and strive to develop in this regard (self-improvement, learning). To better understand the mechanisms of observational learning in well-being education, investigations into the four key stages of observational learning, i.e., attention, retention, reproduction and motivation (Bandura, 1977) are imperative. In addition to examining and differentiating such aspects, it would also be worth investigating the factors that might help prolong the potentially beneficial effects of such classroom observations.

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

BD is the sole author of this work, including conception, data collection, data analysis, and preparation of the manuscript.

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