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Auli Lehtinen

Crossing Boundaries — Becoming Critical, Dialogical, and Collaborative Teachers

UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF EDUCATION AND PSYCHOLOGY

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Editors
Pekka Mertala
Department of Teacher Education, University of Jyväskylä
Ville Korkiakangas
Open Science Centre, University of Jyväskylä

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ABSTRACT

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This thesis explores the learning of pre-service secondary teachers in relation to critical and transformative thinking, socioemotional competence, and dialogicality. Furthermore, the aim is to develop methodological and theoretical approaches to the study of collaborative and dialogical learning. The study took place in the context of multidisciplinary collaborative learning, online teaching, and the later stages of the COVID pandemic. Sociocultural and dialogical frameworks underpin the thesis. I use *becomings* as a lens for pre-service teacher learning: teachers become with and through others in an open-ended process. In addition, I use the concept of *boundary crossing* to explore identity work and multidisciplinary collaboration. The data consist of 14 interviews with pre-service teachers and video observations during an online course in a Finnish teacher education department in 2022. Analysis methods include content and interaction analysis, inductive qualitative analysis, narrative analysis, and reflexive thematic analysis. The findings highlight tensions as crucial in the process of becoming a teacher. Tensions included dissonance (conflicts between opposing thoughts), ambivalence (simultaneous and contradictory attitudes), and boundaries (sociocultural differences between various sites). Boundaries were identified between the situated context and the imagined future, between disciplines, and between online and face-to-face practices. This thesis provides several key insights. First, teacher educators play a crucial role in creating dissonance, which helps pre-service teachers challenge their initial ideas and engage in deeper learning and critical thinking. Second, a supportive socioemotional space with active listening, humor, open anxiety expression, and metacognitive statements can foster critical thinking. The role of teacher educators is essential in establishing these spaces. Third, adopting a transformative and active teacher role involves ambivalence. While ambivalence can restrict transformative action, it can also foster reflective thinking. However, excessive dissonance and ambivalence may lead to negative outcomes. Fourth, boundary crossing helps pre-service teachers to reflect on disciplinary practices, recognize the uniqueness of education, engage in reflective identity work, respond to the transformative teacher role, and develop their competences. Fifth, more attention needs to be given to addressing exclusion, non-belonging, and dogmatic views of others, and to critically reflecting on idealized beliefs.

Keywords: pre-service teachers; critical thinking; transformative capacities; socioemotional competence; dialogue; collaborative learning; boundary crossing

TIIVISTELMÄ

Lehtinen, Auli
Rajoja ylittämässä – opettajaopiskelijoiden kasvu kriittisiksi, dialogisiksi ja yhteisöllisiksi toimijoiksi
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Väitöstutkimukseni tarkastelee aineenopettajaopiskelijoiden oppimista kriittisen ja transformatiivisen ajattelun, vuorovaikutusosaamisen ja dialogisuuden näkökulmista. Tavoitteena on myös kehittää metodologisia ja teoreettisia lähestymistapoja yhteisöllisen ja dialogisen oppimisen tutkimiseen. Tutkimus toteutettiin monialaisen yhteisöllisen oppimisen, etäopetuksen ja COVID-pandemian myöhemmän vaiheen kontekstissa. Tutkielma nojaa sosiokulttuuriisiin ja dialogisiin viitekehyksiin. Tarkastelen opettajaksi kasvua (*becoming*) avoimena ja yhteisöllisenä prosessina sekä ylirajaisuuden käsitteen (*boundary crossing*) kautta. Aineisto koostui neljäntoista aineenopettajaopiskelijan haastattelusta ja etäopetuksen videohavainnoinnista suomalaisella opettajankoulutuslaitoksella vuonna 2022. Analyysimenetelminä käytin sisällön- ja vuorovaikutusanalyysia, induktiivista laadullista analyysia, narratiivista analyysia sekä refleksiivistä temaattista analyysia. Tulosten perusteella hahmottui jännitteitä, jotka ovat keskeisiä opettajaksi kasvussa: dissonanssi (ajatusten väliset ristiriidat), ambivalenssi (samanaikaiset ja ristiriitaiset asenteet) ja rajat (sosiokulttuuriset erot käytänteiden välillä). Tunnistin rajoja tilanteisen kontekstin ja kuvitellun tulevaisuuden välillä, tieteenalojen välillä sekä etä- ja kasvokkaiskäytänteiden välillä. Tulosten perusteella opettajankouluttajilla on merkittävä rooli dissonanssin luomisessa, mikä auttaa opettajaopiskelijoita haastamaan alustavia käsityksiään ja syventämään oppimistaan ja kriittistä ajatteluaan. Toiseksi sosioemotionaalinen tila, jossa on aktiivista kuuntelua, huumoria, avointa epämukavuuden ilmaisua ja metakognitiivista puhetta, voi edistää kriittistä ajattelua. Opettajankouluttajien rooli on keskeinen myös näiden tilojen luomisessa. Kolmanneksi ambivalenssi värittää transformatiivisen ja aktiivisen opettajan roolin omaksumista. Vaikka ambivalenssi voi olla rajoittavaa, se voi myös edistää reflektiivistä ajattelua. Liiallinen dissonanssi ja ambivalenssi voivat kuitenkin johtaa kielteisiin seurauksiin. Neljänneksi monialainen rajojen ylittäminen auttaa opettajaopiskelijoita reflektoimaan tieteenalojen käytänteitä ja identiteettejään, tunnistamaan kasvatustieteen ainutlaatuisuuden, ottamaan kantaa transformatiivisen opettajan rooliin ja kehittämään taitojaan. Lisäksi opettajankoulutuksessa on kiinnitettävä huomiota ulkopuolisuuden kokemuksiin ja dogmaattisiin näkemyksiin toisista ihmisistä sekä idealististen käsitysten reflektioon.

Avainsanat: opettajaopiskelijat, kriittinen ajattelu, transformatiivinen ajattelu, vuorovaikutusosaaminen, dialogisuus, yhteisöllinen oppiminen, ylirajaisuus

Author

Auli Lehtinen
Department of Teacher Education
University of Jyväskylä
Email: auli.m.lehtinen@jyu.fi
ORCID: 0000-0002-4027-8723

Supervisors

Associate Professor Piia Näykki
Department of Teacher Education
University of Jyväskylä

Senior Lecturer Emma Kostiainen
Department of Teacher Education
University of Jyväskylä

Reviewers

Professor Äli Leijen
Centre for Teacher Education and Higher Education
University of Tartu

Professor Auli Toom
Department of Education
University of Helsinki

Opponent

Professor Äli Leijen
Centre for Teacher Education and Higher Education
University of Tartu

LIST OF PUBLICATIONS

The present doctoral study is based on three empirical sub-studies, listed below, that have been published in peer-reviewed journals. Copies of the published articles can be found as appendices to this thesis, and they have been reprinted with the permission of the publishers.

Article 1 Lehtinen, A., Kostiainen, E., & Näykki, P. (2023). Co-construction of knowledge and socioemotional interaction in pre-service teachers' video-based online collaborative learning. *Teaching and Teacher Education*, *133*, 104299. https://doi.org/10.1016/j.tate.2023.104299

Article 2 Lehtinen, A., Kostiainen, E., Martin, A., & Näykki, P. (2024). Pre-service teachers co-constructing narratives about the future of education. *European Journal of Teacher Education*, 1–23. https://doi.org/10.1080/02619768.2024.2393329

Article 3 Lehtinen, A., Kostiainen, E., & Näykki, P. (2025). Crossing boundaries—pre-service teachers' situated and imagined views of socioemotional competence and dialogicality. *Learning, Culture and Social Interaction, 50*, 100880. https://doi.org/10.1016/j.lcsi.2024.100880

The author of this thesis is the first author of all three articles. The author was responsible for developing the research questions, designing and conducting data collection, conducting the analyses, reviewing the literature, and writing the manuscripts. The co-authors had advisory roles in the design of the studies, data collection and analysis (particularly through investigator triangulation), and interpretation of the findings, and they provided comments on the manuscripts

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Jyväskylä, 16th December 2024
Auli Lehtinen

FIGURES

TABLES

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"this boundary is between the self and the other, and is a site of engagement, struggle and becoming"

(Rule, 2011, p. 938)

1 INTRODUCTION

Teacher education plays an important role in addressing contemporary issues, such as tackling exclusion, inequality, and misinformation, and building a democratic and sustainable future (e.g., Aly et al., 2022). Among the concerns of the 21st century is the disruption caused by the COVID pandemic, which has affected many of the key aspects in education, including teacher well-being and students' socioemotional experiences and skills (Darling-Hammond & Hyler, 2020; Sánchez-Tarazaga et al., 2023). Many prospective teachers have studied during turbulent times of pandemic, climate change, and geopolitical crises. Education alone cannot deal with these troubles. However, schools and teachers are essential for building sustainable ways of being, for example through critical thinking and socioemotional competence. Critical thinking is necessary for solving complex problems as it is a prerequisite for knowledge creation and involves distinguishing the false from the true (Hager & Kaye, 1992; Lorencová et al., 2019). Teachers' socioemotional competence, in turn, is needed for dialogic and democratic education, building supportive and inclusive contexts, and addressing exclusion (e.g., Sánchez-Tarazaga et al., 2023).

The general aim of this thesis is to contribute to the research on pre-service teacher learning as a holistic process, particularly in relation to critical and transformative thinking and socioemotional competence. I study the process as situated in a specific time and space: in multidisciplinary collaboration, online teaching and collaborative learning, and the later stages of the COVID pandemic. Furthermore, I aim to develop both methodological and theoretical approaches to the study of collaborative and dialogical learning. The thesis is based on three empirical studies. Figure 1 shows how the central concepts relate to the sub-studies.

Critical thinking, socioemotional competence, and dialogicality are connected in many ways. For example, to become critical thinkers, students should develop skills and attitudes such as open-mindedness, empathy, respect for different views, and tolerance of ambiguity (Gunawardena & Wilson, 2021). Critical thinking, communication, and collaboration are recognized as a set of fundamental competences for the 21st century (e.g., Valtonen et al., 2021). These

generic skills are needed to meet the complex demands of life and careers (Tynjälä et al., 2016; Varas et al., 2023). However, a seemingly neutral and generic understanding of the skills is not sufficient, as critical thinking is context-specific (Gunawardena & Wilson, 2021) and not value-free. The same applies to socioemotional competence, which, without conscious effort and knowledge, for example about equity, can lead to a narrow focus on the technical aspects of skills (Miller Marsh & Castner, 2017). A narrow understanding can mean, for example, teaching some specific "best practice" techniques without considering social and cultural contexts or teachers' knowledge of the school environment and society at large (Miller Marsh & Castner, 2017). It is therefore important to consider the sociocultural and situated nature of these competences (see Cherrington, 2017; Korthagen, 2017), in line with the orientation of this thesis. At the end of the introduction, I explain the theoretical commitments in more detail.

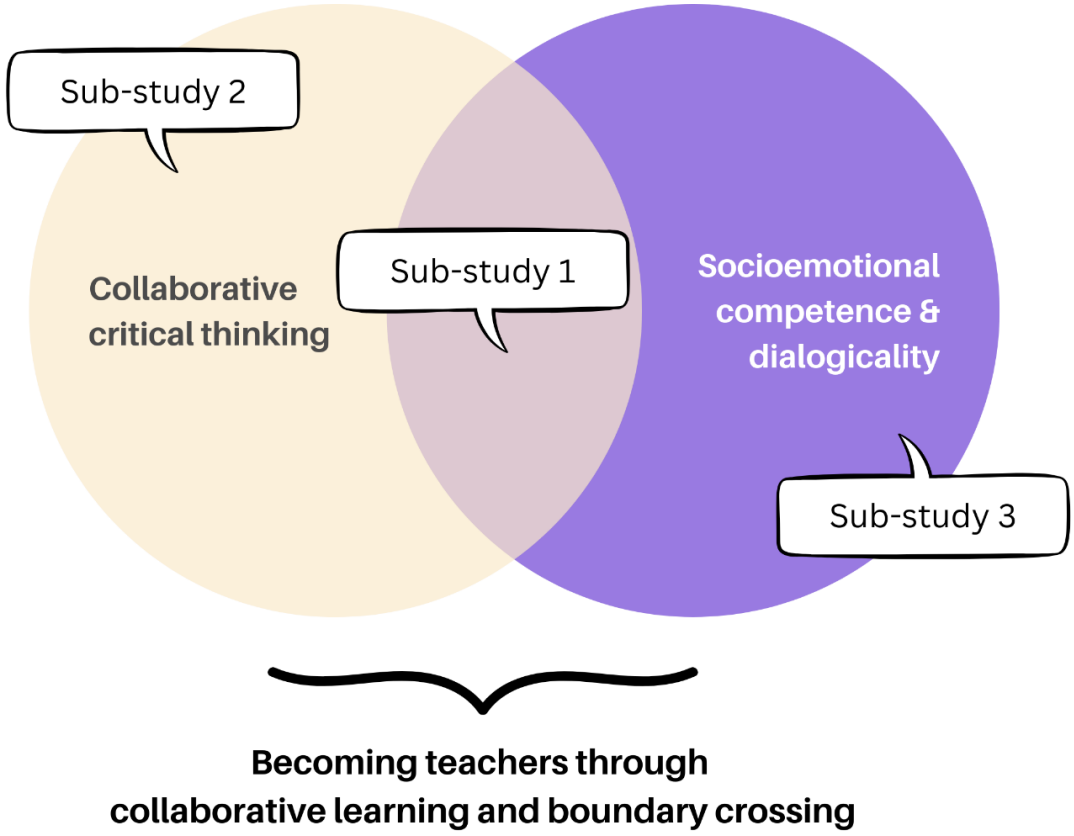

FIGURE 1. Central concepts of the thesis

This thesis specifically focuses on prospective secondary school teachers, also called subject teachers. In Finland, prospective secondary teachers study for a master's degree that involves studies in their discipline(s) and compulsory pedagogical studies (60 ECTS). They prepare to teach one to three subjects, typically at lower or upper secondary schools, or vocational schools. Focusing on secondary education is crucial for teacher educators, as adolescence represents a key developmental stage. During this time, young people gain greater

independence, form significant relationship patterns, build their identities, and frequently experience social and academic anxiety regarding their futures (Laletas & Reupert, 2016). However, the relatively small proportion of educational studies in secondary pre-service teacher education has been identified as a challenge to achieving sufficient pedagogical competence (Husu & Toom, 2016). Therefore, it is crucial to study how educational studies encompass the process of becoming a teacher.

This thesis addresses various research gaps. First, more research is needed on the critical, transformative thinking that pre-service teachers engage in collaborative learning situations (Lehtinen et al., 2024). Collaborative learning provides a meaningful context for studying critical thinking, as teachers are supposed to learn how to negotiate and co-construct their position on various educational phenomena in a collaborative setting. In their futures, they will be expected to work in professional learning communities (García-Martínez et al., 2021). Teacher collaboration is critical to school development because teacher teams implement change in schools and because collaboration can support reflection and well-being (Muckenthaler et al., 2020). Previous research has shown that Finnish teachers or pre-service teachers often do not take a strong transformative and societal role (Fornaciari & Männistö, 2017; Fornaciari & Rautiainen, 2020; Juutilainen, 2023), and thus more research is needed on teacher education practices in this regard (Juvonen, 2024). In addition, few previous studies have used narrative methodologies for exploring collaborative learning. Narrative analysis has the potential to tap into lived experiences, and using creative methods can build bridges between narrative, experience, and meaning (Bochner & Ellis, 2003).

Second, the development of socioemotional competence is under-researched in higher education (Lakkala et al., 2017; Sánchez-Tarazaga et al., 2023). The COVID pandemic emphasized the importance of enhancing social and emotional competences in both teacher education and among students (Sánchez-Tarazaga et al., 2023). Evolving technologies and platforms such as video-based meetings, social media, and generative AI are influencing the way interaction unfolds in both education and leisure time. Increased online interaction can lead to a weakening sense of community and engagement (e.g., Delahunty et al., 2014; Oittinen et al., 2022) and, for example, motivational fatigue and social anxiety (Bailenson, 2021; Castelli & Sarvary, 2021; Fauville et al., 2021). Therefore, the situated nature of building educational relationships and high-quality interactions—through socioemotional competence—requires further attention. I examine how pre-service teachers demonstrate their socioemotional competence through a fine-grained analysis of small-group situations, which is rare in face-to-face situations (Jones et al., 2021), let alone in online settings (Lehtinen et al., 2023; Mykota, 2018). Most studies of online collaborative learning after the pandemic have used self-report data, such as interviews or questionnaires, or relied mainly on text-based interactions (Almusharraf & Bailey, 2021; Altowairiki, 2021; Aslan, 2021; Chan & Ng, 2024; Gunawardena et al., 2023), instead of observing online video-based collaboration. In addition, I explore the under-

researched (Goegan et al., 2017) topic of pre-service teachers' conceptions of their own socioemotional competence, with a special focus on how secondary school pre-service teachers view socioemotional aspects (see Laletas & Reupert, 2016).

Third, more research is needed in the field of multidisciplinary and interdisciplinary teaching and learning, which have been among the most under-theorized and under-researched areas in education (Markauskaite et al., 2024). Multidisciplinary learning is essential for addressing complex issues, including societal challenges such as climate change (Lotz-Sisitka et al., 2015; Markauskaite et al., 2024). Pre-service teachers need to cross disciplinary boundaries in collaboration in their future work, and in Finland, this is explicated in the national core curriculum for basic education (Finnish National Agency for Education, 2016). The participants of the empirical studies worked in multidisciplinary groups while studying education, and they majored in different disciplines, such as history, languages, mathematics, and chemistry. This thesis provides insights into what such multidisciplinary collaboration affords for teacher education and how pre-service teachers perceived crossing boundaries (Akkerman & Bakker, 2011).

What all these perspectives—critical thinking, socioemotional competence, and collaborative and multidisciplinary learning (see Figure 1)—have in common is their dual role in teacher education. They are both first-order and second-order activities, meaning that to be able to develop such competences in others and guide others' learning, teachers must develop their own skills and competences (Tynjälä et al., 2016; see also Murray & Male, 2005). In teacher education, the understanding of the "discipline" of education and the pedagogical understanding of how to teach that discipline to prospective teachers are inseparable (Murray & Male, 2005).

From a theoretical perspective, sociocultural and dialogical approaches guide this thesis. Using a sociocultural lens, teacher development is viewed as a dynamic, holistic, and context-dependent process (Olsen, 2008). Sociocultural theory stresses the importance of social contexts (Cherrington, 2017; Putnam & Borko, 2000) and learning in a community of practice where participants progress from being "newcomers" to fully engaging in the sociocultural practice (Cherrington, 2017; Lave & Wenger, 1991). Participants, such as pre-service teachers, learn through social, affective, and cognitive means of participation (Cherrington, 2017). In initial teacher education, pre-service teachers must navigate their membership within social communities, such as teacher education departments or teacher training schools, which shapes their emerging teacher identities.

I also turn to dialogical perspectives in recognizing the uniqueness and subjectivity of each "newcomer," of each beginning teacher. The idea is not to socialize novice teachers into existing practices and simply copy the existing social and pedagogical practices (Cherrington, 2017; see also Adams, 2023). Rather, there is a difference between "participation in which only one party learns (by adapting to the other party), and participation that transforms the outlook of all who take part in it and that brings about a shared outlook" (Biesta,

2013, p. 33). Dialogical theories make valuable contributions in this sense, emphasizing engagement with others as subjects, the idea of constant becoming with and through others, and being together in ways that value diversity and otherness (Akkerman & Bakker, 2011; Arvaja & Hämäläinen, 2021; Rule, 2011). Here, I highlight two viewpoints: (1) becoming a teacher as an open, unfinalized process in which different voices are present (e.g., Arvaja et al., 2022) and (2) crossing boundaries in multidisciplinary teams and across unfamiliar domains and uncertainty (Akkerman & Bakker, 2011). I will briefly elaborate on these perspectives.

I take *becomings* as a construct of looking at pre-service teacher learning. In a dialogic sense, becoming a teacher is a process that has no finality. Human existence is open-ended, something that is always becoming and "yet-to-be" (Bakhtin, 1990; Freire, 1998; Rule, 2011). Humans become with and through their interactions with others. Similarly, Adams (2023) introduced the concept of *becoming-teacher* to emphasize that the process of becoming a teacher is limitless, non-linear, and never fully realized (see also Marble, 2012). This contrasts with traditional, linear models of teacher preparation, which are often criticized for merely replicating existing practices (Adams, 2023). *Becoming* can give room for the new and unthought. The openness of becoming teachers is also crucial from the point of view of continuing education and professional development, since professionals are expected to develop their expertise throughout their careers.

I employ the term *boundary crossing* (Akkerman & Bakker, 2011) as an overarching concept to explore how pre-service teachers from diverse disciplinary areas cross boundaries in multidisciplinary collaboration, work at the boundary between being a student and being a future teacher—between the situated and the imagined—and how they perceive boundaries between face-to-face and online practices. Boundary crossing theory is rooted in dialogicality, emphasizing learning as a process that embraces diverse perspectives, multiplicity, and heterogeneity (Akkerman & Bakker, 2011). Education, after all, is not about replicating what is already there but about introducing something new, something that comes from the outside of the learner (Biesta, 2013). The boundary "is a site of engagement, struggle and becoming" (Rule, 2011, p. 938), and boundaries thus make visible the need for dialogue, negotiation of meaning, and critical reflection.

In the empirical studies, the processes of becoming teachers were studied with multiple, primarily qualitative, methods. The research questions are: (1) How do pre-service teachers engage in critical, transformative thinking processes? (2) How do pre-service teachers demonstrate and perceive socioemotional competence and dialogicality? and (3) What kind of potential do collaborative learning and boundary crossing offer for becoming teachers?

2 BECOMINGS

2.1 Critical and transformative teachers

2.1.1 Varying definitions of critical thinking

In the process of becoming a teacher, critical thinking is important as both content and process. Future teachers have developed their thinking skills during their years of education; in teacher education, they need to engage in critical reflection on their past and present educational experiences and develop their critical thinking skills to cultivate such skills in others. This boundary between the student and teacher perspectives is constantly present in teacher education and requires critical reflection. In addition to reflection, important aspects of critical thinking for teachers include evidence-based reasoning and evaluation (Lorencová et al., 2019; Szabo & Schwartz, 2011). Ultimately, teachers' critical thinking is crucial because it is connected to learners' thinking skills and their effect at both the individual and societal levels. This includes the learners' capability to tackle global challenges as well as to fully express their humanity (Hager & Kaye, 1992). Critical thinking can be seen as the foundation of a rational and democratic society (Lorencová et al., 2019).

The definitions of critical thinking remain contested (Lorencová et al., 2019) and context specific (Lipman, 2003). One of the biggest issues in understanding and developing critical thinking is its varying definitions, interpretations, and the amount of broadly synonymous terms, such as *analytical thinking*, *holistic thinking*, *systems thinking*, *reflective thinking*, *rational thinking*, *creative thinking*, and so forth (Gunawardena & Wilson, 2021). Among the well-known definitions of critical thinking is that of Ennis (1987), viewing critical thinking as a generic skill, that is, "reasonable, reflective thinking focused on deciding what to believe or do" (p. 10). Ennis also suggested eleven attributes of a critical thinker, such as adequately judging the credibility of sources, asking relevant clarifying questions, and drawing up plausible hypotheses (Buraphadeja & Dawson, 2008). However, critical thinking is interpreted in specific ways in different contexts and

disciplines, depending on the culture and epistemology of the discipline (Gunawardena & Wilson, 2021; Moore, 2011). For example, historians seek to understand how past events are interconnected through cause and effect, and to analyze various interpretations of these sequences (Gunawardena & Wilson, 2021), while in physics, the aim is to formulate hypotheses, test predictions and physical principles, and solve problems in real-life situations. For teachers representing different disciplinary fields, this can create boundaries between different disciplinary practices and a need for dialogue as they collaborate and co-create in schools.

In education, Bloom's taxonomy (Bloom et al., 1956) and its revised version (Anderson & Krathwohl, 2001) have been widely used for assessing critical thinking and for designing curricula and courses. The taxonomy views understanding as a fundamental basis for learning, but highlights application, analysis, synthesis, evaluation, and creativity as higher-order skills. The main purpose of the taxonomy was to "facilitate the exchange of information about curriculum developments and evaluation devices" (Bloom et al., 1956, p. 1). Despite its extensive use, the taxonomy has been criticized for a variety of reasons, including its lack of a sound epistemology (e.g., Pring, 1971), its failure to address issues of value, and its omission of imaginative understanding (Ormell, 1974), which can be seen as crucial to education. Furthermore, the taxonomy does not consider how knowledge is constructed in a sociocultural context. Similarly, Ennis' definition focuses on individual cognitive processes without social interaction (Buraphadeja & Dawson, 2008). Both Bloom's and Ennis' definitions have also been criticized for being vague (Buraphadeja & Dawson, 2008).

In contrast, Lipman's (2003) definition of critical thinking considers the role of context; critical thinking is described as thinking that facilitates judgment by relying on criteria and by being self-correcting and sensitive to context. Criteria—such as principles and factual evidence—are often context specific and do not transfer from one domain to another (Buraphadeja & Dawson, 2008). In line with critiques of Bloom's taxonomy and ideas about the centrality of context, I wanted to study critical thinking through a sociocultural lens. Indeed, critical thinking may be most meaningfully experienced as a collaborative learning process, rooted in specific events and experiences (Brookfield, 2012). Furthermore, in this thesis, I emphasize the role of the teacher (educator) in modeling such a process and the significance of disorienting dilemmas as triggers for critical thinking (Brookfield, 2012; see Section 2.1.4).

2.1.2 Knowledge co-construction

In this thesis, two viewpoints of critical thinking are central. On the one hand, critical thinking is analyzed through the social constructivist model of *knowledge co-construction* (Gunawardena et al., 1997), where collaborative thinking is seen as progressing from sharing ideas and experiences to a process of expressing dissonance, negotiating meaning, synthesizing, and applying new knowledge. On the other hand, critical thinking is addressed by exploring prospective teachers' transformative capacities (Brevik et al., 2019; Matikainen et al., 2018)

and their positions toward the societal teacher role (see Section 2.1.3). The sociocultural context is essential for both perspectives. Further, the significance of dissonance and the unique role of the teacher, the "gifts of teaching" (Biesta, 2013), are considered (Section 2.1.4). Next, I elaborate on these viewpoints.

The model of knowledge co-construction, termed the interaction analysis model (IAM) (Gunawardena et al., 1997), consists of five phases: (I) sharing and comparing of information, (II) discovering and exploring dissonance or inconsistency, (III) negotiating meaning or co-constructing knowledge, (IV) testing of proposed synthesis or co-construction, and (V) stating a summary of agreement, the application of new knowledge, or metacognitive statements. By definition, critical thinking comprises metacognition, such as thinking about one's own processes of thinking (Szabo & Schwartz, 2011). In the IAM, critical, higher-level thinking refers to content, such as talk, that demonstrates the use of cognitive and metacognitive skills through the collaborative process of negotiating meaning. The term "higher-level" refers to Vygotsky's concept of higher mental functions, which includes the use of mediating tools to gain more conscious control over cognitive processes (Gunawardena et al., 1997). In collaborative groups, the zone of proximal development can facilitate higher-level learning and thinking. When working collaboratively, individuals have access to different understandings, knowledge gaps, and new ideas that become visible through the processes of thinking aloud and negotiating meaning, and collaborative learning can thus support higher levels of thinking and learning (e.g., Dillenbourg, 1999; Mercer & Howe, 2012).

The IAM differentiates between learning where participants merely provide additional examples of already understood ideas, so-called "pooling of knowledge" (lower level), and the process of negotiation that takes place when significant inconsistencies or disagreements need to be resolved (higher level). Ultimately, the model examines whether knowledge is constructed through negotiation and whether participants develop new understanding through their interactions, thus exploring the quality of learning. The phases resemble other frameworks of higher-level thinking, including critical thinking (Newman et al., 1995), *cognitive presence* (Garrison et al., 1999), *deep learning* (Ke & Xie, 2009), and Mercer's (2000) concepts of *cumulative* and *exploratory talk*.

I chose to use the IAM in sub-study 1 (Lehtinen et al., 2023) because it is suitable for student-centered collaborative environments (Buraphadeja & Dawson, 2008) and because I wanted to better understand the evaluation of critical thinking from a sociocultural perspective. In teacher education, critical thinking is habitually assessed in terms of products rather than processes, and often with a focus on individual learning. However, many collaborative learning designs are used. This gap is partly what inspired me to focus on collaborative thinking processes in my study. The IAM has been theoretically and empirically validated in asynchronous, text-based online discussions and within instructional sciences (De Wever et al., 2006, 2010; Lucas et al., 2014). However, to my knowledge, the model had not been implemented in synchronous video-based online learning, which is the context of sub-study 1.

Several researchers have pointed out the strengths of the IAM. Marra et al. (2004) compared the IAM with the model of critical thinking by Newman et al. (1995), both aiming at a qualitative description of meaningful interaction that fosters deep learning in online discussions. According to them, the IAM provides a more holistic understanding of discussion flow and knowledge construction. Marra et al. (2004) noted that the IAM better accounts for context and sociocultural aspects, as researchers must consider how the episodes relate to the overall discussion. Unlike Newman et al.'s model, which focuses on the isolated meanings of individual sentences, the IAM provides more descriptive and synthesized results due to the rich descriptions of each phase.

According to Lally (2001), the IAM is well-suited for studying teaching and learning in networked collaborative environments as it (a) emphasizes interaction for co-constructing knowledge, (b) examines overall patterns of knowledge construction, (c) aligns with social constructivist and collaborative contexts, (d) is straightforward to use, and (e) adapts to diverse contexts. Despite some critiques stating that the boundaries of the phases could be better defined or fewer, the model continues to be applicable to various teaching and learning contexts (Lucas et al., 2014). Another question is whether dissonance or disagreement is a necessary condition for higher forms of knowledge construction or argumentation, or whether this is solely a Western perspective (Lucas et al., 2014) (see also Section 2.1.4).

The IAM has mainly been used in asynchronous online contexts. Many of the studies have been conducted within instructional sciences, in both pre-service and in-service education (Lucas et al., 2014). With only a few exceptions, the results are very similar to those from the original study (Gunawardena et al., 1997): the proportion of higher-level, complex thinking is minimal, with most discourse at level I of sharing and comparing information (Lucas et al., 2014). There is some evidence of levels II and III, but levels IV and V are almost non-existent (0–7% of the discourse), with only a few exceptions. Lucas et al. (2014) discussed the possible reasons for this, including teachers' lack of competence in promoting higher-level thinking, the need to get to know each other and understand each other's positions, the nature of the task (reporting daily activities vs. problem solving), and the issues related to motivation in online asynchronous discussions, which are usually text-based.

Although sub-study 1 seems to be the first to apply the model in synchronous video-based online collaboration, similar models have been used with video data. Mroz (2015) used a coding framework that is based on the IAM, but modified by Hull and Saxon (2009), to study second-language learners' critical thinking using chat logs as the main data and screen-recorded videos of a virtual environment as secondary data. The results reaffirmed a theory stating that complex tasks promote the use of higher levels of critical thinking in a second language.

2.1.3 Transformative capacities and world-centered education

The second way I explore critical thinking is through pre-service teachers' *transformative capacities* (Brevik et al., 2019; Matikainen et al., 2018) and their positions toward the societal teacher role. Teachers' transformative capacities can be defined as breaking free from established frames of action and driving change, and it can be due to conflict or dilemma (Brevik et al., 2019; Virkkunen, 2006). Here, the boundary is between the given framework and change, between a passive orientation and a more active position toward educational phenomena. An example of this is whether teachers take the role of technology for granted or actively work in a direction that they feel is sustainable and pedagogically sound. The development of collaborative transformative capacities is closely related to pre-service teachers' identity work (Akkerman & Meijer, 2011; Galman, 2009), as they must negotiate how to integrate an active, transformative aspect into their identities as educators.

An active role is needed, since schools and teachers play a key role in securing a democratic and sustainable future (Aly et al., 2022; Kranz et al., 2022). Contemporary societies face numerous challenges, including climate change, the effects of pandemics, and increasing inequality (Aly et al., 2022). Moreover, teachers need to exercise agency and make decisions in everyday situations as they navigate the increasing complexity in their classrooms (e.g., Brevik et al., 2019), whether it is in relation to digitalization in schools or collective efforts to prevent student exclusion. Traditionally, specialists are seen as responsible for transformative action, while grassroots practitioners, such as teachers, are seen as those who should focus on their tasks in the given frame of action (Galman, 2009; Virkkunen, 2006; see also Sannino, 2010). However, it has been argued that top-down change programs often fail and that a strict vertical division of labor is problematic, leading to the idea that practitioners must actively participate in transforming the system (Virkkunen, 2006). This is important for democratic education, where teachers should have a participatory decision-making role in various school activities (Aly et al., 2022).

The transformative perspective in teacher education calls attention to teachers' ethical responsibilities toward both society and students (Matikainen, et al., 2018). This can mean promoting meaningful purposes, such as equitable education (McGraw et al., 2023), education for democracy (Aly et al., 2022; Raiker & Rautiainen, 2017), or education for sustainability (Kranz et al., 2022; Lotz-Sisitka et al., 2015). Therefore, it is by no means value-free—something that Bloom's taxonomy, for example, was criticized for (see Ormell, 1974). Similarly, the model of knowledge co-construction can be criticized for allowing any kind of mutually negotiated synthesis to be evidence of higher-level thinking, which is ultimately not the case. After all, a group of people can negotiate a common understanding that, for example, other kinds of people do not have the same human rights. Transformative capacities thus enrich the overall outlook into pre-service teachers' collaborative thinking.

Previous research has shown that Finnish teachers often do not consider an active and transformative perspective or education for democracy as core aspects

of their work (Fornaciari & Männistö, 2017; Fornaciari & Rautiainen, 2020) or that it is not central to the school culture (see Männistö & Moate, 2023). Finnish teacher education has traditionally focused strongly on didactics and psychology, placing less emphasis on societal aspects or education for democracy (Furuhagen et al., 2019; Rautiainen & Räihä, 2012). Interviews with Finnish primary teachers revealed that they associated active citizenship with general critical thinking and media literacy (Fornaciari & Rautiainen, 2020). However, more concrete aspects of active citizenship can be viewed as problematic due to their perceived political nature. Juutilainen (2023) studied Finnish pre-service primary teachers' identity negotiations and agency and found that pre-service teachers' agency was rarely expressed as a desire to influence society or to change the status quo. Instead, students held a norm of a "typical future teacher" who was seen primarily as a practical actor and a mediator of learning content. The few who emphasized a more transformative role felt different and even questioned their suitability for the profession (Juutilainen, 2023).

The question of transformative capacities has similarities with the questions that Biesta (2022) framed as key educational questions. That is, what the "educated"—in this thesis, pre-service teachers—will do when it matters, when the world calls. These are not questions of learning or development but of existing in the world as a subject. Biesta used the metaphor of knocking on the person's door and asking whether anyone is "there." The goal is for people, in this case pre-service teachers, to have a direction, to be able to act in the world, and to be active, responsible subjects in a democratic society (Biesta, 2022). I will let Biesta (2022, p. vii) explain:

> […] what is at stake in this [educational] relationship is not what the one "receiving" may learn from the educator or how the one "receiving" the education may develop in response to the affordances provided by the educator. Rather the key issue at stake is what the one "receiving" will do with what he or she has learned and with how he or she has developed and with who he or she has become and, more specifically, what they will do when it matters, that is, when they encounter something in their lives that addresses them and calls for them. What – or who – this "something" is and when and from where it may arrive, is something we can never know in advance, which also means that it is fundamentally beyond our control. It is given, not taken.

Biesta (2022) suggested rejecting the dichotomy between student-centered and curriculum-centered approaches, which often involves a pendulum-like movement from one end to the other. Instead, he argued for world-centered education to emphasize that educational questions are fundamentally existential questions: questions related to being "in" and "with" the world. The world, being both natural and social, imposes limitations on our desires and actions, making this both an ecological and democratic issue. Education, then, is about "(re)directing the attention of the ones being educated *to* the world" (Biesta, 2022, p. 91).

2.1.4 Dissonance, dilemmas, and the transcendent teacher

According to Biesta (2006, 2013), the "learnification" of education has sidelined teachers, reducing them to facilitators rather than recognizing their role in introducing the new and disruptive. He argued that education should involve *transcendence*, that is, something that comes radically from the outside of the learner. The point of education is "precisely *not* to repeat what is already there but to bring something new to the scene" (Biesta, 2013, p. 47). According to him, the constructivist model diminishes the transformative role of the Other; the Other being "what I myself am not" (Todd, 2003, p. 29). Here, a boundary exists in between what I am and what I am not —what is part of me and what is not.

In this context, Biesta introduced the concept of *gifts of teaching*. At best, teaching can be described as giving a gift, something from the outside, and it is always possible that the recipient is not open to receiving the gift. Teaching is thus understood in a weak sense, as a possibility. Whether someone will actually be taught is beyond the teacher's control.

This is connected to critical thinking, because the teacher can be the one who gives the students what they did not ask for, but what is essential: even uncomfortable truths or difficult knowledge (Biesta, 2013). Brookfield (2012) suggested that dealing with a disorienting dilemma (Mezirov, 1991) is one of the most important triggers for critical thinking. Dissonance, tensions, and dilemmas have been described as key catalysts for critical reflective capabilities in teacher education (Arvaja et al., 2022; Galman, 2009; Kagan, 1992; Moate, 2023). Prospective teachers may need to question their initial ideas and beliefs about teaching (e.g., Kagan, 1992).

Dissonance can be defined as conflict between one or more opposing thoughts (Festinger, 1957; Galman, 2009). Galman (2009) investigated beginning pre-service teachers' identity development and the stories they learned and told during teacher education. Pre-service teachers encountered conflicting stories: one from progressive teacher education that encouraged agentic work for change, and another from bureaucratic practice in which teachers are expected not to "rock the boat" within the institution. Specifically, the results showed that dissonance can act as a significant catalyst in teacher education. Tensions can be challenging but also crucial for identity work and learning (Akkerman & Meijer, 2011; Galman, 2009), transformative learning (Mezirow, 2000), and metacognitive awareness (Alsup, 2006).

Uncomfortable truths or dilemmas coming from outside the student are also relevant to dialogical theories that value difference as a foundational motivator for communication and dialogue (Arvaja & Hämäläinen, 2021; Sullivan, 2010; see also next section). In contrast, Vygotsky's ideas about the zone of proximal development and the relation between novice and expert tend to reduce the difference between the other and the self (Sullivan, 2010).[1] Similarly, the IAM (see Section 2.1.2), building on the work of Vygotsky, emphasizes

[1] However, as Sullivan (2010) points out, these two dimensions—sociocultural and dialogical lenses—can be brought together in interesting ways.

reaching consensus rather than alterity. Alterity celebrates difference, open-endedness, or inconclusiveness (Arvaja & Hämäläinen, 2021). Engaging in dialogue at the boundary between self and other is valuable in itself.

When it comes to Bakhtin's dialogical approach, there is a continuum between authoritative knowing with the other and a carnivalistic knowing (Sullivan, 2010). Carnivalistic knowing breaks down hierarchies, inequalities, and assumptions that are taken for granted, for example, by the means of humor. Authoritative knowing, in turn, is knowing that depends on the authority of an individual or institution for validating truth claims; it can be both positive or negative, healthy and expansive or dogmatic (Sullivan, 2010). Teachers are one example of such authorities. Sullivan (2010), elaborating on Bakhtin, pointed out that we have "sore spots" that "the outer, authoritative words of the other can sometimes amplify, disturb, or even help resolve" (p. 373). This resonates with the dissonance or inconvenient truth that teachers and teacher educators can reveal. Next, I further elaborate on dialogicality and socioemotional competence.

2.2 Dialogical, socioemotional, and collaborative teachers

2.2.1 Constant becoming with and through others in dialogue

Critical thinking and dialogue are connected in many ways. For example, in his book *Pedagogy of the Oppressed* (1970/2018), Freire envisioned critical thinking and dialogue as inherently linked to liberatory education. He taught literacy to peasants in Brazil, using a revolutionary method that moved away from a "culture of silence" to actively naming and transforming the world. Another point of view is that for critical thinking to become a habit, students ought to develop skills and dispositions such as empathy, open-mindedness, respect for different perspectives, and tolerance of ambiguity (Gunawardena & Wilson, 2021; see also Lorencová et al., 2019)—all relevant for dialogicality as well as socioemotional competence. Dialogue and communication have also been linked to striving for democratic education, as described by Michaels et al. (2008) (see also Alexander, 2018):

> Dialogue and discussion have long been linked to theories of democratic education. From Socrates to Dewey and Habermas, educative dialogue has represented a forum for learners to develop understanding by listening, reflecting, proposing and incorporating alternative views. For many philosophers, learning through discussion has also represented the promise of education as a foundation for democracy. (p. 284)

For my studies, competences such as socioemotional competence and competences in building collegiality and collaboration are relevant; at the same time, I wish to highlight the broader idea of dialogue as an authentic way of being in educational relationships and as a foundation for establishing them. In line with Bakhtin's (1984) and Freire's (1970/2018) ideas, I see dialogue as a way of being, rather than just as a technique or a type of communication. Humans

become with and through others. We need others to give us a sense of importance and value in the world (Bakhtin, 1990; Sullivan, 2010). In this thesis, *dialogue* is defined as a "value-laden process of acknowledging and engaging with the other as a subject" (Rule, 2011, p. 930), as constant becoming with and through others, and as a process that values diversity and otherness (Akkerman & Bakker, 2011; Arvaja & Hämäläinen, 2021). Therefore, dialogue aligns with world-centered education (Section 2.1.3) in that existing as a subject is of utmost importance.

The notions of dialogue and dialogicality are particularly central to sub-studies 1 and 3, to boundary crossing theory (see Section 2.3), and to the overall idea of becoming a teacher as an open, unfinalized process in which multiple voices are present (e.g., Arvaja et al., 2022). When it comes to social and socioemotional encounters, a boundary exists between the self and the other. We are different, but through dialogue and, for example, active listening, we can seek to truly meet, reach, and know one another. There is also a boundary within each learner: what they are and what they are not; and what they are not may be an idealized version of themselves (see also next section). Dialogue is part of what it means to be authentically human; something that unfolds both internally and externally, in one's consciousness and with the other (Rule, 2011). It includes an ontological and ethical facet: human existence as open-ended and unfinished, rooted in values of hope, mutual respect, and curiosity (Rule, 2011).

The opposite of a genuine, dialogic, and open-ended mode of being is monologue (Bakhtin) or anti-dialogue (Freire). Monologue and anti-dialogue diminish others to the status of objects (Bakhtin, 1984) or suppress them (Freire, 1970/2018; Rule, 2011). A dialogic relationship is not self-evident; it is a site of struggle and something that demands continuous effort and rebuilding (Rule, 2011).

On a practical level, there are issues related to a monological orientation in education. In recent years in Finland, media discussions around school have called for more teacher control and discipline. A monological, controlling orientation can result in aggressive responses or extensively relying on punishments when dealing with pupils' behavioral issues, which is not only ineffective (see Greene, 2018; Jennings & Greenberg, 2009) but often also unethical. A healthy classroom climate, including fewer conflicts and disruptive behavior, is connected to teachers' social and emotional competences (Greenberg et al., 2017; Jennings & Greenberg, 2009; Schonert-Reichl, 2019), not to an authoritative position or control as such. Positive behavior interventions that involve the entire school community have also been shown to improve the school climate and reduce problem behaviors (Bradshaw et al., 2010; Karjalainen et al., 2023). In addition, enhancing classroom talk through dialogic principles such as questioning and allowing sufficient thinking time can promote student engagement and teachers' professional competences (Alexander, 2018). Next, I will go deeper into becoming teachers' socioemotional competence.

2.2.2 Socioemotional competence for inclusive and democratic education

In this thesis, socioemotional competence is studied by (1) observing pre-service teachers' collaborative learning situations and analyzing how they engage in socioemotional interactions, (2) investigating their situated understanding of the socioemotional dimensions of becoming a teacher during a pandemic and in multidisciplinary collaboration, and (3) their imagined views of teachers' socioemotional competence in their future work. The first is related to sub-study 1 and the second and third to sub-study 3. Similar to critical thinking, the development of socioemotional competences has a dual role in teacher education, as teachers must not only develop their own competences, but also be able to foster them in their students (Tynjälä et al., 2016). First, I review research on pre-service teachers' socioemotional competence. In Section 2.2.3, I elaborate on socioemotional interaction within collaborative learning.

Even though researchers have widely recognized the significance of teachers' socioemotional competence, there is limited research on teachers' perceptions of their own socioemotional competence (Goegan et al., 2017; Tynjälä et al., 2016). Most related research has concentrated on teachers' beliefs about socioemotional learning (SEL). Furthermore, the emphasis has been more on the beliefs of in-service teachers than on those of pre-service teachers (Goegan et al., 2017). However, researchers have examined pre-service teachers' views on similar competences: *social competences* (Sánchez-Tarazaga et al., 2013; Tynjälä et al., 2016), *relational competences* (Aspelin & Jonsson, 2019), and *emotional intelligence* (Gallardo et al., 2019). Other relevant concepts include teachers' *interpersonal competences* (Wubbels et al., 2006), *care* in teaching (Laletas & Reupert, 2016), and teachers' competences to foster *dialogic teaching* (Alexander, 2018). All these terms share the goal of fostering educational relationships and contexts that are safe, supportive, respectful, reciprocal, collective, and empathic. Underlying broader purposes include cultivating social justice and equity (McGraw et al., 2023), inclusion, engagement (Vasalampi et al., 2021), and democracy (Sánchez-Tarazaga et al., 2023). However, if there is a lack of conscious effort and further knowledge (e.g., on equity), such broader perspectives may be disregarded. This may lead to viewing teacher competences as value-neutral and focusing solely on the technical aspects of teaching (Miller Marsh & Castner, 2017).

In this thesis, I view *socioemotional competence* through the broader goals of building safe and dialogic relationships and contexts that strive for democratic and inclusive education. This includes important sub-competences such as active listening, encouraging participation, and constructive ways of expressing feelings (Isohätälä et al., 2018; McNaughton et al., 2008). Furthermore, I examine socioemotional competence as a sociocultural phenomenon and as intertwined with a certain context and its resources (see Ikävalko et al., 2020). The broad definition is justified, I believe, because I approach socioemotional competence primarily through inductive analysis (see Sections 4.1 and 4.4), which means that

in the analyses, I did not use any specific framework. [2] Socioemotional competence has usually been approached through either a psychological or sociological framework, often from the perspective of an individual (Ikävalko et al., 2020). In the sociocultural approach, emotions and competences are not only internal to the individual but more broadly part of the social, cultural, and situational context (Ikävalko et al., 2020).

Teachers' socioemotional competence is vital because it influences teacher–student relationships, classroom management, and a healthy classroom climate, all of which impact students' social, emotional, and academic outcomes (Jennings & Greenberg, 2009; see also Merritt et al., 2012). Socioemotional interaction affects learners' perceptions about social cohesion and psychological safety (Isohätälä et al., 2018). After synthesizing 800 meta-analyses, Hattie (2009) found that strong classroom cohesion is positively related to student achievement (see also Hattie, 2023). A large meta-analysis (Durlak et al., 2011) found that school-based socioemotional learning interventions positively affected both socioemotional and academic outcomes. Moreover, a positive affective learning climate supports students' well-being, intrinsic motivation, and creativity (Boelens et al., 2017; Haerens et al., 2016). In higher education, cohesion and belonging support student identity, potentially fostering engagement and learning (Murray & Kennedy-Lightsey, 2013; Thornton et al., 2020).

Earlier studies have shown that pre-service teachers need a more multifaceted understanding of relationships and socioemotional competence (Aspelin & Jonsson, 2019; Laletas & Reupert, 2016). Pre-service teachers tend to hold idealistic and unrealistic views of caring (Goldstein & Lake, 2000; Laletas & Reupert, 2016). For example, Goldstein and Lake (2000) studied pre-service primary school teachers' understanding of the links between caring and teaching during their first practicum experience. Their reflections showed idealized views of teaching, such as "endless, deep love for children," rather than their actual experiences with children. Despite teacher educators' efforts to challenge these views through various activities and one-on-one dialogues related to pre-service teachers' reflections, their influence seemed minimal (see also Kagan, 1992). Nonetheless, the authors saw value in these beliefs as a starting point for dialogue to challenge oversimplified ideas and to support novice teachers against burnout.

In another study, Aspelin and Jonsson (2019) investigated pre-service teachers' analyses of teacher–student relationships using videos that showcased challenges to teachers' relational competence. Pre-service teachers' responses involved abstract descriptions, indicating that they perceived competencies through a relatively static and general framework, rather than referring to what had actually happened in the videos. It seems that pre-service teachers struggle with analyzing competence as a situated practice.

[2] One widely used model is the CASEL model (2024), which combines perspectives from different theories (Zhou & Ee, 2012) and links teachers' competences to the skills they teach for their learners (Jennings & Greenberg, 2009). The competences include self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2024; Jennings & Greenberg, 2009).

2.2.3 Multifaceted nature of collaborative learning in teacher education

Teacher collaboration is important for school development processes, school quality, and teacher professional development for several reasons: change requires the involvement of teacher teams who are the primary implementers of reform; collaboration can support teachers' reflection on their practice, help them change their behavior, and protect against burnout; and it can benefit students, for example, by making teachers more responsive to individual student needs (Muckenthaler et al., 2020). Moreover, collaborative learning is often used as a method in teacher education, and pre-service teachers are expected to observe and reflect on such processes—the same processes they are expected to be able to guide in their profession. This multifaceted nature of collaborative learning in teacher education may pose challenges for its high-quality realization. Research has shown that collaborative mindsets and dispositions are quite stable and difficult to transform in teacher education (Valtonen et al., 2021). In this section, I elaborate on critical thinking, dialogicality, and socioemotional interactions in the context of collaborative learning.

Collaborative learning has the potential to foster deeper level learning and critical thinking as participants need to explain and reason their emerging understanding (Dillenbourg, 1999; Kreijns et al., 2003; Mercer & Howe, 2012; Van den Bossche et al., 2006). Collaborative learning triggers important learning mechanisms such as questioning, reasoning, perspective taking, and developing working strategies (Rochelle & Teasley, 1995). At its best, it can initiate mechanisms of understanding, helping the individual to process and understand the topic at hand in greater depth. At the same time, it allows for developing social skills and positive attitudes toward others as well as creating meaningful relationships and group cohesion (Kreijns et al., 2003). To build a favorable atmosphere for learning together, participants need to engage in joint and socioemotionally positive interaction (Baker et al., 2013; Isohätälä et al., 2018), such as active listening (Gordon, 2003; McNaughton et al., 2008).

However, the picture is not always rosy. Even at the university level, students may rarely reach higher levels of knowledge co-construction, critical thinking, or argumentation (Isohätälä et al., 2018; Lucas et al., 2014). Socioemotional challenges, such as overruling others' ideas, may hinder collaboration (Näykki et al., 2014). Moreover, studies of collaborative learning in schools show that genuine collaborative activity seldom happens (Mercer & Howe, 2012). The TALIS survey from 2018, which had a sample of 260,000 teachers in almost 50 education systems, showed that less than half of teachers have their students work in small groups to find solutions or tackle complex tasks (Darling-Hammond & Hyler, 2020; OECD, 2024). Additionally, only one third of teachers assign tasks that do not have an obvious solution.

Recent studies have increasingly concentrated on the dynamic interplay between the sociocognitive and socioemotional facets of collaborative learning (Hod & Katz, 2020; Isohätälä et al., 2020; Li et al., 2024; Zhu et al., 2024). This is not a new perspective, as group research has a long history of simultaneously examining the "task function" and the "socioemotional function" (Brabender,

2010; Hod & Katz, 2020). However, Baker et al. (2013) noted that collaborative learning research has predominantly focused on cognitive aspects, often neglecting the affective dimension. Furthermore, socioemotional processes are seldom analyzed as detailed sequential interactions in face-to-face group work (Jones et al., 2021) or in online synchronous interactions (Mykota, 2018)—which is what I set out to do in sub-study 1.

Another research gap was identified in the use of narrative research orientation to study collaborative learning discussions (sub-study 2). Collaborative learning studies have been criticized for focusing on coding and counting, which can be reductive and may not properly reflect the dynamic processes of learning in groups (e.g., Näykki, 2014). Narrative analysis has the potential to tap into lived experience, and creative methods can build bridges between narrative, experience, and meaning (Bochner & Ellis, 2003) and bring practice closer by being accessible (Moen, 2006).

There are some prior narrative studies on collaborative learning, such as the study by Yukawa (2006) in which narrative analysis was employed to examine collaborative critical thinking in an online course. However, the focus was not on small group collaboration but on dyadic text-based collaboration between students and the teacher. Yukawa used narrative analysis to discover critical transformations in students' understanding, with reference to Mezirow's (2000) transformative learning theory. The results showed that critical transformations were found, following a plot structure for the reflection narratives that included dealing with both cognitive and affective challenges. Overall, collaborative learning studies rarely seem to adopt a narrative orientation.

Dialogical perspectives come close to narrative orientation, since Bakhtian ideas about dialogue are key to the narrative research approach (Moen, 2006). However, Arvaja and Hämäläinen (2021) argued that collaborative learning studies are often based on a dialectical, rather than dialogic, orientation since the underlying idea is either reaching a consensus or learning some predefined knowledge. Furthermore, it is common that the categorizations of messages or talk are often predefined (see De Wever et al., 2006) and thus examined from the researcher's perspective (Arvaja & Hämäläinen, 2021). This may exclude participants' interpretations and diverse meanings. Therefore, Arvaja and Hämäläinen (2021) stressed dialogicality in collaborative learning, valuing open-endedness and the idea of really hearing others without requiring consensus. In line with this, I used narrative methods to capture pre-service teachers' co-constructed narratives about the future of education in sub-study 2.

To be able to collaborate across unfamiliar domains and within multidisciplinary professional teams, boundary crossing (Akkerman & Bakker, 2011) competences are relevant. Boundary crossing theory is grounded within dialogicality, stressing learning as a process that embraces different perspectives, multiple parties, and heterogeneity (Akkerman & Bakker, 2011). This is further explained in the next section.

2.3 Becoming teachers through boundary crossing

2.3.1 Defining boundary crossing

In this section, I further define boundary crossing and the dimensions of it that are relevant to my studies. I employ the term boundary crossing (Akkerman & Bakker, 2011) to draw attention to how pre-service teachers, representing various subject disciplines, cross disciplinary boundaries in multidisciplinary collaboration and work at the boundary between being a student and being a future teacher. The former, multidisciplinary collaboration is not only key to the teaching profession and school development (see previous section), but also critical to addressing challenging issues, such as inequality, through education. The latter, the boundary between being a student and a teacher, is one of the main boundaries in teacher education and a site of struggle. Furthermore, given that the context of the studies in this dissertation is online teaching, another boundary can be perceived between face-to-face and online practices (Lehtinen et al., 2025).

Boundary crossing focuses on how to sustain participation and collaboration across different sites despite their differences (Akkerman & Bakker, 2011). More specifically, the literature views:

> [...] learning as a horizontal movement, as a process of crossing boundaries between systems, where crossing refers to establishing continuity in action or interaction across socioculturally different sites. (Akkerman & Van Eijck, 2011, p. 62)

Boundary crossing as a competence refers to the ability to collaborate across unfamiliar domains and integrate knowledge from various fields, enabling co-creation within multidisciplinary and multicultural teams (Fortuin et al., 2024). It should be noted that the term does not mean crossing one's personal boundaries in interaction or in therapeutic settings, where boundary crossing is linked to ethical issues (Akkerman & Bakker, 2011).

According to Akkerman and Bakker (2011), all learning involves boundaries. For example, the community of practice theory (Lave & Wenger, 1991; Wenger, 1998) explicates a boundary between peripheral and full participation in a community. The theory views becoming a member of a professional community as a process of engaging with its culture, encouraging discussion, transparency, and collective reflection on practices (Cherrington, 2017), such as assessment when it comes to teachers. In initial teacher education, prospective teachers negotiate their membership within social communities, such as teacher education departments or training schools, a process that shapes their evolving teacher selves.

Boundary crossing theory embraces sociocultural differences. Differences call for reorganizing action or interaction, which is seen as a resource for learning (Akkerman & Bakker, 2011). This is also relevant to sociocultural theory, as becoming a full participant in sociocultural practice assumes that domains or

communities have boundaries—and learning at the boundaries is considered necessary to maintain dynamism (Akkerman & Bakker, 2011; Wenger, 1998).

There are various examples of boundaries. When considering identity, a relevant boundary is between "what is part of me versus what is not (yet) part of me" (Akkerman & Bakker, 2011, p. 132). In schools, disciplinary boundaries are evident (see also Section 2.3.3). Other examples include boundaries between formal education, work practice, and everyday life. Akkerman and Bakker (2011) referred to the study by Williams et al. (2007) in which teachers who worked as school numeracy coordinators operated at the boundary between their fellow teachers and the research and development group at the university. In the study, teachers experienced conflict and tension, but crossing boundaries afforded reflective identity work. The research and development activity, being at a boundary between schooling and research, afforded teachers with essential features of an inquiring community: "dialogue, reflexivity, time, distance, mediation, colleagueship" (Williams et al. 2007, p. 66).

In their review of boundary crossing, Akkerman and Bakker (2011) explained boundaries as a dialogical phenomenon, the notion of boundary being central to Bakhtin's ideas about dialogue (see also Rule, 2011). They identified four possible learning mechanisms that can occur at boundaries: identification, coordination, reflection, and transformation. Identification involves questioning core features of practices, leading to new insights about them and their relations. An example of this is defining one practice in light of another, that is, *othering* (Akkerman & Bakker, 2011), such as defining history teaching in contrast to chemistry teaching. Coordination, in turn, means overcoming the boundary to achieve effortless movement between practices with minimal dialogue. Reflection involves grasping and explaining differences between practices and learning about one's own and others' practices. Akkerman and Bakker illustrated this with a study (Williams & Wake, 2007) of college teachers who visited workplaces with their students and became aware of the different mathematical genres in college and work cultures. The fourth learning mechanism, transformation, is about collaboration and co-development of (potentially new) practices. While coordination involves little dialogue, transformation prioritizes dialogue and brings about profound changes in practices.

2.3.2 Identities-in-the-making

When it comes to identity work, a boundary can be seen in the question of what is part of me and what is not (yet). I view *identities* as narratively, socially, and dialogically constructed perceptions of who one is (Arvaja et al., 2022). In the dialogical views of identity, "self" refers to the self-as-knower and "identity" as the self-as-known (Akkerman & Van Eijck, 2013). Both external (contexts and relationships) and internal (e.g., stories and emotions) characteristics set up the building blocks for identities (Lee & Schallert, 2016). A dialogical perspective to identities is consistent with sociocultural theories (Akkerman & Meijer, 2011). Identities are seen as evolving and relational; they are constantly negotiated and renegotiated in interactions with other people, institutions, and groups

(Akkerman & Meijer, 2011; Arvaja et al., 2022; Gee, 2000). According to Gee (2000), a person might need to engage in complex moment-by-moment negotiations between themself and others to be recognized as a "certain kind of person," such as a "charismatic" person in a particular time and space, or a teacher of a certain kind. Given that time and context are central to the concept, identity can be seen as an answer to the question "Who am I at this moment?" (Beijaard et al., 2004).

For pre-service teachers, an important question is "What kind of teacher do I wish to be?" (Furlong, 2013). They need to project "future possible selves" (Lee & Schallert, 2016, p. 77) in the process of becoming a teacher. During teacher education, pre-service teachers reshape their conceptions of teaching, reflecting on past and current experiences and imagining themselves as future teachers. This process creates tensions between the past, present, and future (Lee & Schallert, 2016; Furlong, 2013) and between the sometimes conflicting expectations and roles that pre-service teachers are expected to carry out (Akkerman & Meijer, 2011; Beijaard, et al., 2004).

Identity negotiations can be tacit, occurring in situations that teacher educators cannot fully observe, such as during collaborative learning discussions. These settings may reveal more authentic conceptions than coursework or interviews, where socially desirable responses (see DeMaio, 1985) are more likely. Conversational stories differ significantly from stories that are told during interviews (Bamberg & Georgakopoulou, 2008), and less formal conversations among peers provide meaningful insights into beliefs and behavior. There is hardly any previous research on the narratives that pre-service teachers share in collaborative learning situations while addressing societal dilemmas, a research gap I grasped in sub-study 2.

Building on the work of Bamberg and Georgakopoulou (2008), I apply the notion of *identities-in-the-making* to illustrate how pre-service teachers collaboratively narrate their future scenarios as teachers. Another possible wording is identities "coming-into-being" (Bamberg & Georgakopoulou, 2008). By using a dialogical and narrative orientation, I adopt the "small stories" approach, analyzing everyday stories with a focus on under-represented narrative activities, such as talk about future or hypothetical events (Georgakopoulou, 2006). In my studies, collaborative learning discussions form the sites of engagement where identities are practiced and experimented (Bamberg & Georgakopoulou, 2008).

2.3.3 Disciplinary boundaries and multidisciplinary collaboration

In the context of the empirical studies, pre-service secondary teachers work in multidisciplinary groups while studying education, and they major in various disciplines, such as mathematics, English language, or history. In their future profession, they are expected to cross disciplinary boundaries in collaboration. The Finnish national core curriculum for basic education (Finnish National Agency for Education, 2016) promotes the idea of transversal competences and multidisciplinary learning. Transversal competences, such as multiliteracies and "thinking and learning to learn," are framed as a necessary response to societal

changes. It is argued that personal growth and citizenship require competences that transcend disciplines. Schools are expected to organize at least one multidisciplinary activity each year. The duration of the activity may vary. In the core curriculum, multidisciplinary learning is explained as an integrative approach in which real-world issues are explored as a whole, especially across subject boundaries.

I use the term *multidisciplinary collaboration* to refer to such collaboration across disciplines. Another formulation might be interdisciplinary (see Markauskaite et al., 2024), and here I understand it as broadly synonymous with multidisciplinary. Markauskaite et al. (2024) provided an interesting introduction to interdisciplinary learning. According to them, interdisciplinary teaching and learning is one of the most under-theorized and under-researched areas in primary, secondary, and higher education. Following their words, I see multidisciplinary collaboration as requiring "resourcefulness to interact productively and co-create knowledge together with people who have different expertise and who do not share the same disciplinary vocabularies, epistemic practices, and cultures" (p. 216). Markauskaite et al. (2024) argued that interdisciplinary learning is key to solving complex problems, such as climate change, and that we have a "moral obligation" to promote it. Similarly, Lotz-Sisitka et al. (2015) emphasized that we must cross disciplinary boundaries and broaden epistemological perspectives to build a sustainable and socially just future. As with transformative and dialogical perspectives, an ethical approach is necessary, with attention to issues such as equity and diversity.

Explicit interest in the topic emerged in the 19th and 20th centuries as universities and education became more specialized and compartmentalized (Markauskaite et al., 2024). The shift to interdisciplinarity aimed to bridge disciplinary divides and bring back the "whole person" vision of university education (Fuller, 2010; Markauskaite et al., 2024). Although the field is under-theorized, there are theoretical and methodological foundations to build upon, including theories of knowledge building (Scardamalia & Bereiter, 2003) and dialogic pedagogies for transformative education (Markauskaite et al., 2024; Slakmon & Schwarz, 2019), in line with the perspectives of my thesis. Research on interdisciplinary learning is also related to my studies in that more research is needed especially on students' teamwork and learning processes, as existing research mainly looks at reflections and self-assessments or finished project products. Detailed, process-oriented, and integrative methodologies are needed to study the relational and dynamically evolving aspects of interdisciplinary learning (Markauskaite et al., 2024).

2.3.4 Boundary between online and face-to-face practices

Since the context of the empirical studies is online teaching, one boundary can be perceived between face-to-face and online practices (Lehtinen et al., 2025). Online education is the "new normal," especially for continuing education, in which professionals develop expertise throughout their careers. There is a growing body of research on how learning together in online settings creates new kinds

of challenges and opportunities (e.g., Castelli & Sarvary, 2021; Grammens et al., 2022; Timonen & Ruokamo, 2021). In the field of education, the COVID pandemic led to a transformative change and challenged teacher learning (Darling-Hammond & Hyler, 2020). This kind of disruption can allow for a rethinking of (teacher) education and simultaneously illuminate some overshadowed aspects of being a teacher. One example is being a professional "teacher body" because the online environments—substantially used during and after the pandemic—remove many physical cues and limit body language and eye contact (Godhe & Wennås Brante, 2022).

New teachers, whose training was impacted by the pandemic, may require extra support as they start their careers. However, they may also bring new perspectives shaped by their experiences, including equity issues highlighted by the pandemic (Darling-Hammond & Hyler, 2020; Glenn et al., 2020). This is due to the shared struggles that both teachers and students faced during the lockdown, as explained by some pre-service teachers (Glenn et al., 2020). Even they, as younger people who were well prepared for online environments, struggled. The issues of access and equity became "incredibly obvious" (Glenn et al., 2020, p. 6), highlighting the problems students faced in schools even before COVID. These experiences can help pre-service teachers see how various crises can affect teaching and learning, even in the future. Moreover, the COVID pandemic foregrounded the need to strengthen social and emotional competences, both in teacher education and among pupils (Sánchez-Tarazaga et al., 2023).

In teaching and collaborative learning, the online environment poses similar cognitive, motivational, and emotional challenges as face-to-face learning situations, including regulating and sustaining collaborative learning processes (Näykki et al., 2021), while also introducing new issues. These include reduced social and visual signals during interactions (Sherblom, 2010), physical and social distance, a lack of sense of community (Kreijns et al., 2003; Oittinen et al., 2022), challenges related to technology and the skills needed to use it (Grammens et al., 2022), and fatigue linked to video-based interactions (Bailenson, 2021; Fauville et al., 2021). Online interactions are more likely to be minimally dialogic, which can discourage community building (Delahunty et al., 2014). Even though technologies should support social and emotional interactions (Hod & Katz, 2020), it may be difficult to foster intersubjectivity (Vygotsky, 1978) and build relations between participants. Communication researchers have argued that reduced social signals, overemphasis of textual interaction, and visual anonymity can lead to deindividuation in online settings (Sherblom, 2010). This might foster stereotypes, stronger group distinctions, and less self-reflective communication (Sherblom, 2010).

However, synchronous tools such as Zoom enable real-time communication through video, audio, chat, and breakout rooms, fostering collaboration, critical discussion, and a sense of presence (Martin et al., 2017; Tyrväinen et al., 2021). Webcams can enhance social interaction and reduce misunderstandings but may also increase self-focus and social anxiety (Castelli

& Sarvary, 2021). Additionally, "Zoom fatigue" can cause emotional, visual, and motivational exhaustion (Bailenson, 2021; Fauville et al., 2021).

Some researchers have proposed design principles regarding high-quality online teaching. Garrison (2017) outlined seven principles, including planning for open communication and trust, critical reflection, community building, and inquiry. Reinholz et al. (2020) suggested combining asynchronous and synchronous methods to offer learners multiple access points to learning (see also Rose, 2000). However, a more comprehensive view of online pedagogy may be needed. Carillo and Flores (2020) reviewed online teaching practices in teacher education. They emphasized the need for a comprehensive pedagogy, promoting collaborative learning and support for equity and inclusion, socio-affective competences for educators, and attention to ethical and political issues. They called for more research on sociocultural and contextual aspects in online teacher education, a perspective relevant to my thesis.

To sum up, Figure 2 illustrates in more detail the concepts that guide the empirical studies.

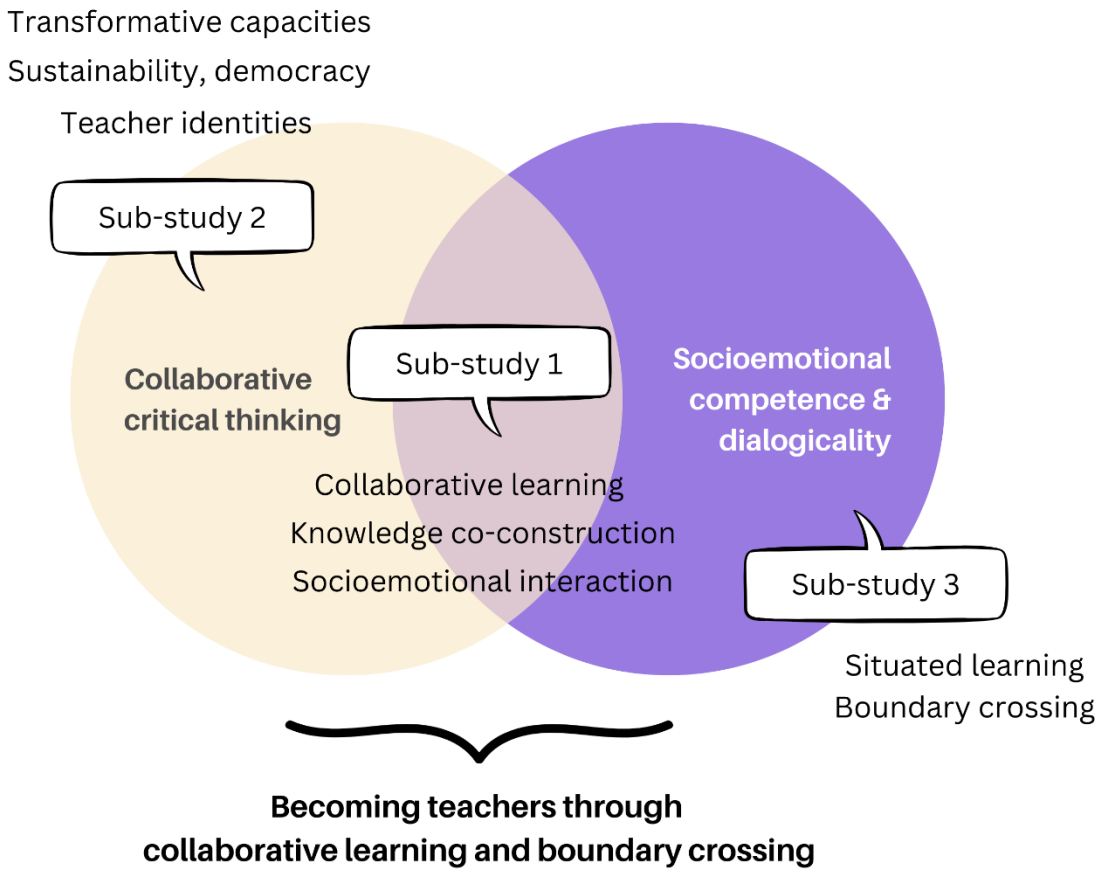

FIGURE 2. A closer look at central concepts

3 THE AIM OF THIS THESIS

The general aim of this thesis is to contribute to the research on pre-service teacher learning, particularly in relation to critical and transformative thinking and socioemotional competence, as situated within a specific time and space: in multidisciplinary collaborative learning, online teaching, and the later stages of the COVID pandemic. Furthermore, this thesis aims to develop both methodological and theoretical approaches to the study of collaborative and dialogical learning. The following research questions guide the studies:

1. How do pre-service teachers engage in critical, transformative thinking processes? (Sub-studies 1 and 2)
2. How do pre-service teachers demonstrate and perceive socioemotional competence and dialogicality? (Sub-studies 1 and 3)
3. What kind of potential do collaborative learning and boundary crossing offer for becoming teachers? (Sub-studies 1, 2, and 3)

4 METHODS

4.1 Philosophical foundations: epistemological, ontological, and methodological questions

In this section, I consider the philosophical underpinnings of my thesis—that is, epistemological, ontological, and methodological questions, such as mixed-methods perspectives and questions about induction and abduction. My thesis builds on various philosophical foundations. At the epistemological level, I apply both a *social constructionist* and a *pragmatist* perspective to studying pre-service teacher learning. Social constructionists highlight that social and psychological realms are constructed through social processes and interaction (Young & Collin, 2004), and pragmatists emphasize that knowledge is, in fact, action—a human activity of coping with the world (Brinkmann, 2018). Furthermore, sociocultural and dialogical theories (Akkerman & Meijer, 2011; Cherrington, 2017; Gee, 2000; Lave & Wenger, 1991; Vygotsky, 1978) guide the sub-studies: sub-study 1 focuses on how individuals co-construct meaning and express socioemotional interaction in a collaborative setting, sub-study 2 focuses on social and cultural narratives and identity negotiations, and sub-study 3 on the situated understandings of becoming and being a teacher.

Social constructionist and sociocultural theories share the epistemology that knowledge is co-constructed in authentic, social contexts by engaging in interactive dialogue with others and society (Burr, 2015; Scardamalia & Bereiter, 2003). Individual learning is perceived as socially mediated and collaborative by nature (Schrire, 2004). In addition, identities are created in interactions through patterned behavior and cultural mediation (Akkerman & Meijer, 2011) and influenced by cultural, historical, and linguistical contexts (Cunliffe, 2008). This is consistent with a dialogical perspective on teacher identities (Akkerman & Meijer, 2011).

Similarly to social constructionists, pragmatists hold that humans are meaning-seeking subjects who continuously engage in reflective interaction with others (Brinkmann, 2018). Pragmatists emphasize that: (1) knowing stems

from participating in social practices, it is the relationship between what we do and what happens thereafter; (2) knowing is what we do, not only in research but also in everyday life (3) theories are tools for problem-solving, judged by their validity in practice; and (4) inquiry enriches human experience, with qualitative research as a reflective form of it (Brinkmann, 2018). Hence, the validity of, say, a dialogical perspective on teacher identity can be evaluated in terms of how it can help us reflect on and support teachers' identity growth. Educational researchers widely call for knowledge that is relevant to educational practice. It is thus not enough to know how things are "out there" but to know how they are in order to inform activities and policies (Biesta & Burbules, 2003). In this thesis, I argue that a social constructionist perspective is not sufficient; the idea of transcendence in education and dialogical perspectives that embrace otherness (see Sections 2.1.4 and 2.2) require a pragmatist perspective. The different theoretical perspectives bring to light tensions about how something transformative or entirely new can emerge when the social context influences our lives so profoundly. However, these tensions can be worked through creatively (see Sullivan, 2010).

At the ontological level, I apply *social ontology*—that is, seeing the world primarily through meaning and interpretation. This does not mean that it is impossible to find regularities or causes but rather that connections in the social world are manifested through interpretative acts (Biesta, 2010). For example, the connections between teaching and learning are not accomplished in a mechanistic or deterministic way but in a process in which those who learn have interpreted the teaching in some way (Biesta, 2010).

According to Biesta (2010), it is not useful to talk about fixed paradigms—qualitative and quantitative—as such, but rather more specifically to open the discussion about ontological, epistemological, or methodological assumptions. According to him, the idea of the qualitative paradigm is not precise enough to encourage meaningful conversations. Furthermore, paradigm thinking may lead to having to reject or embrace one or the other in a "wholesale manner" (p. 98). Biesta's ideas opened my eyes to seeing the mixed-methodness of my research from a new perspective. In sub-study 1, I used numbers, percentages, and temporal analysis to explore online collaborative learning, without employing statistical methods or suggesting causality. The findings contributed to the understanding of this largely unexplored area, and a systematic analysis made it possible to compare the findings with previous studies from other contexts. However, it left me thinking about what kind of qualitative study it was and led me to consider mixed methods.

Biesta (2010) proposed seven levels of discussion on mixed-methods research, covering data, methods, epistemology, ontology, and purposes of research. As explained above, I apply both social constructionist and pragmatist epistemology and social ontology. When it comes to my considerations of numbers in a primarily interpretive study, Biesta argued that at the level of data analysis, mixing numbers and text means combining measurement and interpretation, which does not bring about any philosophical or practical issues.

Measuring can even be seen as a form of interpretation, in line with my interpretative orientation. It could therefore be said that this thesis has some characteristics of a mixed-methods study.

The extent of inductiveness varied in the sub-studies. *Inductive* refers to an analysis that centers detailed readings of raw data to generate concepts and themes (Thomas, 2006). I wish to highlight, building on Braun and Clarke (2021), that inductive analysis means an analysis that is grounded in data, not "pure" induction, since one cannot be in a theoretical vacuum while doing research. In sub-study 1, I used theory-driven coding categories as part of my content and interaction analysis (Derry et al., 2010; De Wever et al., 2006). I selected and partly modified the codes in an iterative analysis process, after several rounds of analyzing the video data and reviewing the literature. Thus, codes were not predefined before starting the analysis (deductive) but inductively chosen in dialogue with the data and literature. In sub-studies 2 and 3, I used an inductive approach by employing data-driven qualitative analysis (Miles et al., 2020), narrative analysis (Smith, 2016), and reflexive thematic analysis (Braun & Clarke, 2021). In sub-study 3, thematic analysis was also informed by theory during the final phases of analysis (see Braun & Clarke, 2021). Supplementing the inductive and deductive approaches (Brinkmann, 2018), *abduction* could also be seen as guiding this thesis. Methodologically, pragmatists rely on abduction, as it means "developing potentially helpful understandings and explanations in uncertain situations that are tested to determine if the situation becomes more clear and workable" (Brinkmann, 2018, p. 113).

This thesis can be defined as a naturalistic case study (Stake, 1995). The aim was to gain an in-depth understanding of pre-service teacher learning. A natural design in a real-life setting can be regarded as ecologically valid (Lipponen et al., 2003). For example, the small groups were organized according to the teacher educator's pedagogical vision, and the students did not work in small groups of the same size. This is very common when doing research in realistic settings, such as ordinary school or education environments, and not in laboratory settings (Lipponen et al., 2003). Furthermore, my study has features of an ethnographic orientation. The term has been under substantial controversy, but the following attributes can be stated: (1) investigating the nature of social phenomena, rather than testing hypotheses; (2) using primarily unstructured data; (3) examining cases or one case in detail; and (4) analyzing meanings and functions of human actions (Atkinson & Hammersley, 1998). All of these are relevant to my studies, and they align well with the social ontology mentioned earlier. However, I did not infuse myself in the studied community in a traditional, long-term kind of way (see Atkinson & Hammersley, 1998). Rather, this thesis relies considerably on observations, as do ethnographic methods.

4.2 Context

The context of this thesis is Finnish teacher education for prospective secondary school teachers. In Finland, secondary school teachers pursue a master's degree that includes studies in their specific discipline(s) as well as mandatory pedagogical studies (60 ECTS). They qualify to teach one to three school subjects, typically at lower or upper secondary schools or vocational institutions. In the studied teacher education program, prospective secondary school teachers study education in multidisciplinary groups that include, for example, chemistry, history, and English majors. The underlying aim is to prepare for multidisciplinary collaboration in their future professions and to cross disciplinary boundaries.

The pre-service teachers who participated in the empirical studies were in their first academic year. During their first year of studies, they studied three teacher education courses (à 5 ECTS) in the same group and with the same teacher educator. The courses focused on 1) interaction and collaboration, 2) societal issues of education, and 3) scientific knowledge and thinking. The data collection started simultaneously with the second course and lasted until the end of the third course. All courses included lectures, classes, and small group collaboration.

During the fall of 2021, the students studied the first teacher education course in a face-to-face setting. With the COVID pandemic situation worsening at the beginning of 2022, the second course was moved to online teaching and held on Zoom. The worsened situation caused almost all university education in Finland to move to distance mode. The sudden changes in COVID restrictions furthered my interest in examining online teacher education amid turbulent times. At that time, the pandemic had affected teaching practices for almost two years. The students returned to face-to-face teaching in April 2022, when the second course was already finished and the third had started.

The main context was the second course, which focused on the societal issues of education. During the course, students worked on "the megatrend task," which dealt with teachers as transformative agents in society. Students formed small groups according to their interest in a specific megatrend. In particular, the small groups that worked with the digitalization and ecological sustainability megatrends were studied. Students were instructed to collaborate in Zoom breakout rooms to discuss questions about the connections between the megatrend and education, such as how the megatrend appears across various disciplines and the changes they wish to promote. They also prepared presentations for their peers. The related readings included research articles critically examining digitalization in education and sociologically focused articles on sustainability and education.

4.3 Participants and data collection

The teacher educator was recruited in the study using purposive sampling. Purposive sampling is usually used in qualitative research to select information-rich cases and to adequately use the available resources (Etikan et al., 2016). I knew the teacher educator to be well-informed with the phenomena of interest (see Etikan et al., 2016). Since geographic proximity and availability at a given time were also part of the practical selection criteria, some features of convenience sampling were also present (Etikan et al., 2016). According to the teacher educator, the targeted group (n = 14) was a well-functioning group that usually had a positive attitude toward experimentation. Therefore, together we considered them suitable potential participants for this study.

Before data collection, I presented the purpose of the study and the ethical considerations to the potential participants. Participation was voluntary, and participants filled in a written consent form online to confirm having received sufficient information about the research. Participants acknowledged that they were free to withdraw their participation at any time and without consequence. One pre-service teacher from the targeted group dropped out of the course during the process.

I collected a dataset that included videos of teacher education classes, a questionnaire conducted with pre-service teachers (N = 57), and interviews with pre-service teachers (n = 14) and one teacher educator. Data were collected in a Finnish teacher education department from January to April 2022. During the research process, a smaller subset (n = 14 and one teacher educator) was considered diverse and suitable for the three sub-studies due to the richness of the data. Thus, the total dataset consisted of 14 interviews as well as videos (12 h 15 min) and observation notes from an online teacher education course, from which case groups and situations were selected for in-depth analyses.

The pre-service teachers were aged between 19 and 22 years (the ages of four participants are not available). They were majoring in various disciplines: chemistry, educational technology, English, Finnish language and literature, history, languages, mathematics, and physics. Participants were given pseudonyms to ensure their anonymity.

Data for sub-studies 1 and 2 came from video observations of collaborative learning discussions. Video observation data were collected using Zoom's screen-recording feature and by writing observation notes. The processes of two small groups (n = 4 and n = 5 pre-service teachers and one teacher educator) were selected for in-depth analyses after first examining all the videos from the course that focused on societal issues in education (12 h 15 min). The situations were chosen because the task was complex and collaborative, viewing teachers as transformative agents. Furthermore, data for the entire process was available for these two groups.

I wished to carefully observe and follow the pre-service teachers' process, somewhat similarly to ethnographic orientation (e.g., Atkinson & Hammersley,

1998). In line with this, I held interviews with the teacher educator twice during the process and discussed with them also before and after the observed classes, as well as during the moments when pre-service teachers collaborated in online breakout rooms. The aim was to further understand the context, pedagogical aspects, and students' situation. This provided me with background information but was not used as data. The background information covered topics such as pedagogical choices, experiences with online teaching and COVID policies at the university, well-being, and views on interaction processes, student participation, and technologies.

I intended to make my role as an observer as transparent as possible, for example, by keeping my webcam on while observing. I presented myself and my background and participated in the first course activity, where everyone shared something about themselves through an object they found in their surroundings. Usually, I would not take part in other conversations during the observations (except for discussing with the teacher educator before and after the classes). Furthermore, I observed the Zoom main sessions but did not enter the breakout rooms. The participants were instead asked to record the breakout room situations and send the videos to me after class. They therefore always had the option of not recording or sending the videos, or the possibility of forgetting to click the recording on. As a result, there were some missing data. One small group and their activities on the main task could not be studied because of a lacking video.

As Angrosino and Rosenberg (2011) stated, classic (ethnographic) fieldworkers aimed at objectivity and adopted limited participatory roles, while modern-day researchers seek situational identities in the communities they study. Observational researchers today need to consider their own attributes and activities—at the same time, observations cannot become completely subjective but must be carefully conducted and clearly recorded (Angrosino & Rosenberg, 2011). I sought to find this equilibrium.

The data for sub-study 3 came from semi-structured thematic interviews (e.g., Kallio et al., 2016) (n = 14) conducted in April 2022. Since the COVID restrictions had been removed, most interviews were held in person, except for two that were held online at the students' requests. The interview topics focused on pre-service teachers' experiences during online and face-to-face teacher education, interaction processes and well-being during the courses, their participation in the courses and in collaborative learning, experiences from working in collaborative teams, and their views of socioemotional competence, both as situated in online teaching and as future teachers. The interview protocol can be found in Appendix 1. I designed the questions to be open-ended (Brinkmann & Kvale, 2009) to capture the participants' own viewpoints and the complexity of their experiences and to allow for potentially unexpected perspectives to emerge. I also encouraged the students to share their thoughts and experiences as freely as possible. The interviews ranged from 21 to 58 minutes in length (mean 39 min).

4.4 Data analysis

In **sub-study 1**, I applied content and interaction analysis (Derry et al., 2010; De Wever et al., 2006) to study the knowledge co-construction and socioemotional processes in online collaborative learning. I used content and interaction analysis because the former allows the exploration of evidence of students' learning and collaborative knowledge construction (Xie & Ke, 2011), and the latter allows for examination not only of the content but also at ways of interacting, such as nonverbal communication. The study was among the first to use video data to examine small groups' collaboration in synchronous online breakout sessions. Methodologically, the aim was to shed light on how the analytical tools used in analyzing face-to-face and asynchronous online collaborative learning can be applied to synchronous online settings.

In addition to analyzing the nature of knowledge co-construction and socioemotional interaction, the temporal processes within the collaborative situations were studied. This approach was chosen because collaborative learning unfolds as a temporal process in which each discussion and event builds on the previous ones, creating new opportunities for learning and participation (Damşa, 2014; Mercer, 2008; Näykki et al., 2017). A similar cumulative quality exists within all educational processes (Mercer, 2008; Reiman, 2009). The fluctuation of socioemotional interaction in different situations can either invite others to participate or create barriers to participation and learning.

Small group level was the primary unit of analysis (Barron, 2003), along with individual contributions. Coding was done directly on the timeline of the video. Thirty-second segments of video data were used as units of analysis (see Isohätälä et al., 2018). The segmented timeline has been regarded as a practical and manageable framework for detailed video data analysis (Sullivan & Wilson, 2015; see also Sinha et al., 2015). The 30-second segments afforded analyzing the flow of interaction and meaning-making processes; phases of interaction are rarely clear-cut, and transcripts might not fully capture their complexity. It also allowed for studying nonverbal communication as thoroughly embedded in talk (Jones et al., 2021). The same segment could be coded to various categories. Such decisions align with the Vygotskian principle that analysis should consider the whole activity rather than focusing on isolated elements (Hull & Saxon, 2009; Moll, 1990). Therefore, for example, the analysis of knowledge co-construction meant a thorough examination of the entire context. In this way, it was possible to illustrate gradual changes in collaborative thinking. Microsoft Word was used to automatically create transcripts of the discussions, which were used only briefly alongside the video data to help return to specific moments.

The analysis was conducted via an iterative process. The main- and sub-categories were constructed after several cycles of reviewing the video data and literature. I applied theory-driven categories but chose and partly modified them inductively. The co-construction of knowledge was analyzed using the IAM categories (Gunawardena et al., 1997). Descriptions for the categories can be

found in Table 1. I selected the IAM as it is well-suited for student-centered collaborative environments (Buraphadeja & Dawson, 2008) and because I aimed to gain a better understanding of evaluating critical thinking from a sociocultural perspective.

TABLE 1. Categories for the co-construction of knowledge

Co-construction of knowledge	**Shortened description**
I. Sharing/comparing of information	States observations or opinions, provides additional examples, or asks for clarification
II. Dissonance	Identifies cognitive dissonance, inconsistency, or disagreement, or restates one's position and introduces arguments (based on, e.g., formal data, literature, or experience)
III. Negotiation/co-construction	Proposes new co-constructions that embody compromise, or negotiates the meaning of concepts or the value of different arguments
IV. Testing tentative constructions	Tests the newly constructed knowledge against personal understanding or other resources (e.g., literature)
V. Agreement statement/application	Summarizes agreement, applies the newly constructed knowledge, or expresses metacognitive statements

Socioemotional interaction was explored with the following categories: active listening (Isohätälä et al., 2018), laughter or humor (Isohätälä et al., 2018; Kauffeld & Lehmann-Willenbrock, 2012), self-disclosure of personal life outside the shared context (Hod et al., 2020), expressing feelings (Hod et al., 2020; Kauffeld & Lehmann-Willenbrock, 2012), and encouraging participation (Kauffeld & Lehmann-Willenbrock, 2012). I selected and modified the codes and their definitions, vis-à-vis the analysis cycles. These codes were chosen because they seemed meaningful in the context of pre-service teachers' collaboration and could be observed through either verbal or nonverbal interaction. Online discussions tend to focus predominantly on task execution and include issues such as a lack of sense of community (Kreijns et al., 2003; Oittinen et al., 2022). I wanted to study the extent to which socioemotional dimensions were present despite such challenges.

As part of the analysis, I conducted an interrater reliability check with a research assistant (see De Wever et al., 2006). After coding one video, we resolved all disagreements through discussion. The analysis scheme was refined, and more grounded examples were included. Next, we coded further data independently. After the independent coding, we identified one section where a particularly long speech turn was interpreted differently. We then resolved the disagreement by discussion. Following the reliability check, I compared the codings and made revisions where justified before coding the remaining data.

The negotiations were particularly helpful in gaining a deeper understanding of the model of knowledge co-construction.

The results were presented at both individual and small group levels. Temporal processes were illustrated via temporal figures, and an illustrative case example was presented in more detail. The results were linked to existing literature on collaborative learning in both online and face-to-face settings.

In **sub-study 2**, I employed a data-driven qualitative analysis (Miles et al., 2020) and a thematic narrative analysis combined with a storyteller researcher position (Smith, 2016), using nonfiction comic strips (see Tatalovic, 2009) as part of the findings section. In sub-study 1, a need for further analysis was identified, focusing more closely on collaborative learning discussions' content and teacher identity. Moreover, a research gap was identified regarding pre-service teachers' narratives about difficult societal issues and the use of narrative methods to explore collaborative learning discussions. The purpose of sub-study 2, therefore, was to examine the types of narratives that the pre-service teachers shared about the future of education in relation to digitalization and ecological sustainability megatrends. Moreover, the aim was to analyze how they positioned themselves in the future of education. While segmented videos were used as data in the previous study, in sub-study 2, I set out to examine the transcribed conversations from the same situations.

The analysis started with transcribing the data, resulting in 70 pages of text (font size 12, line spacing 1.5). The analysis consisted of first- and second-cycle coding (Miles et al., 2020). The first cycle involved inductive coding to identify various aspects of the participants' values and beliefs, while the second cycle focused on identifying narrative themes. Furthermore, counter-narrative was used as an analytical tool (Heikkilä et al. 2022). Concerning the analysis of positioning and identity work, evaluative talk (e.g., positive and negative evaluations) was particularly considered, since positioning can be reinforced by evaluation (Arvaja et al., 2022; Wortham 2001). An example of such evaluation is distancing oneself from the qualities of others, such as the kind of teacher one does not want to become.

Through an iterative process, I developed themes that condensed the essence of the pre-service teachers' narratives. The themes were intended to be like main characters in the story told about the data, rather than merely being summaries of data domains (Braun & Clarke, 2021; Clarke & Braun, 2018). Investigator triangulation (Denzin, 2009) was used in several parts of the process to evaluate the codes and grounded examples of them through discussion, and to critically analyze the preliminary themes and the narratives.

Four final themes were formed. The narratives of Group1 (the digitalization group) were summarized by the themes of "Welcome all changes with open arms, but still question them" and "The most important thing is media literacy." The narratives of Group2 (the consumer behavior group) were condensed into the themes of "To take root deeper than on a superficial level" and "Not everyone needs to get excited," the latter being a counter-narrative to the former. As a result of the first- and second-cycle coding and narrative analytical process,

dialogic and narrative pieces were composed to illustrate the themes. Finally, three nonfiction comic strips were created to capture the key aspects within the dialogic pieces. The findings were discussed in light of teacher identity and education for democracy and sustainability.

In **sub-study 3**, I used reflexive thematic analysis (Braun & Clarke, 2021) to explore pre-service teachers' situated and imagined views of the socioemotional and dialogical dimensions of becoming and being a teacher. Potential tensions between these situated and imagined perspectives were also considered. The analysis consisted of six phases: 1) data familiarization, 2) systematic data coding, 3) generating initial themes from the coded data, 4) developing and reviewing the themes, 5) refining, defining, and naming the themes, and 6) writing the report (Braun & Clarke, 2021). The orientation was primarily inductive but, after completing the initial rounds of analysis, more theory of dialogicality and boundary crossing was read alongside the analysis. The concept of boundary crossing (Akkerman & Bakker, 2011) was applied since the pre-service teachers seemed to explicate boundaries between various disciplinary practices and in their learning.

In the first phase, the audio data from the interviews was transcribed, yielding a total of 231 pages of text (font size 12, line spacing 1.5). After reading through the transcripts several times and writing preliminary codes, I created initial thematic maps and coded the data systematically. Initial themes belonged to three different perspectives: situated views during a pandemic, situated views within multidisciplinary teams, and imagined views (as future teachers). Investigator triangulation was used in several phases of the analysis process. Themes were reviewed and refined various times before the final thematic map and themes (Fig. 3) were ready. The results were presented together with the related discussion, considering what kind of learning might be happening at the boundaries—that is, boundaries (1) between disciplines, (2) between being a student teacher and being a future teacher, and (3) between online and face-to-face practices. Ultimately, one aim was to further theorize the boundary between the situated and the imagined.

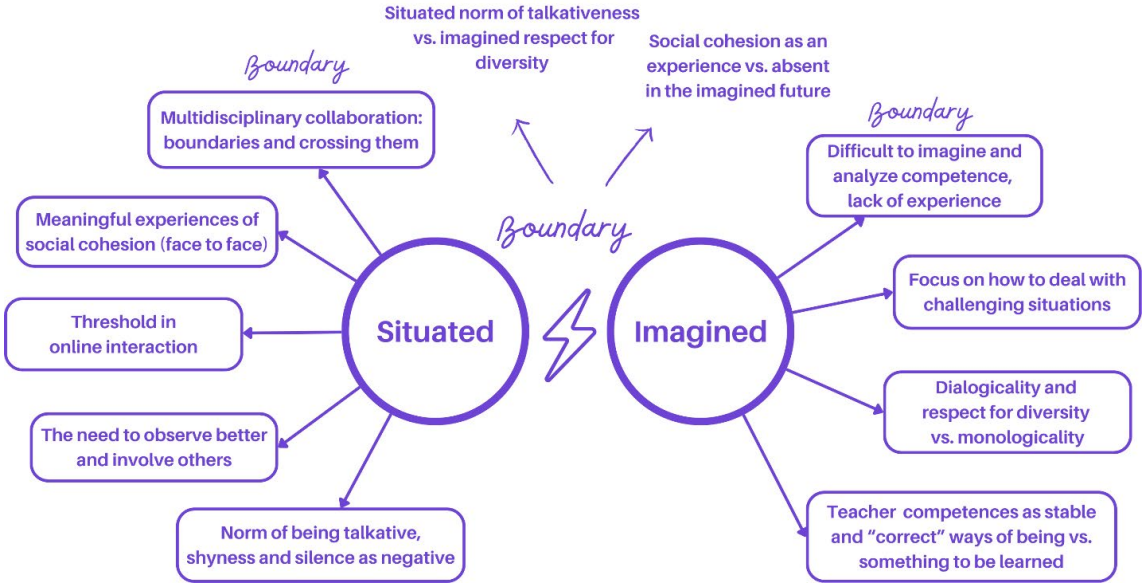

FIGURE 3. Situated and imagined views of socioemotional and dialogical dimensions of becoming and being a teacher (Lehtinen et al., 2025)

TABLE 2. Overview of the sub-studies

	Sub-study 1	**Sub-study 2**	**Sub-study 3**
Title	Co-construction of knowledge and socioemotional interaction in pre-service teachers' video-based online collaborative learning	Pre-service teachers co-constructing narratives about the future of education	Crossing boundaries—pre-service teachers' situated and imagined views of socioemotional competence and dialogicality
Aim	To explore how pre-service teachers engage in critical thinking, knowledge co-construction, and socioemotional interaction in collaborative learning. To develop methodologies for studying collaborative learning in synchronous online settings.	To investigate how pre-service teachers engage in critical, transformative thinking related to societal dilemma and global megatrends. To develop narrative methodologies for studying collaborative learning.	To understand pre-service teachers' situated and imagined views of the socioemotional dimensions of becoming and being a teacher, and to consider the potential tensions between these. To further theorize the boundary between the situated and the imagined.
Research questions	1) What is the quality of co-construction of knowledge in pre-service teachers' breakout room discussions during a collaborative task? 2) What kind of socioemotional interaction do pre-service teachers express in breakout room discussions? 3) What characterizes the temporal processes of knowledge co-construction and socioemotional interaction, and how does the teacher educator's visit to the breakout room influence these processes?	1) What kind of narratives can be composed from pre-service teacher groups' collaborative discussions about the future of education in relation to the digitalization and ecological sustainability megatrends? 2) How do pre-service teachers co-construct their position in the future of education?	1) What kind of situated understanding do pre-service teachers have of the socioemotional and dialogical dimensions of becoming a teacher during a pandemic and in multidisciplinary collaboration? 2) How do pre-service teachers imagine teachers' socioemotional competence and dialogicality in their future work?
Participants and data	Video observations (12 h 15 min) and observation notes from an online teacher education course, case groups and situations for in-depth analysis (2 h 47 min); nine pre-service teachers.	Transcripts of online collaborative learning situations (70 pages); nine pre-service teachers.	Semi-structured interviews (231 pages); 14 pre-service teachers.
Analysis	Content and interaction analysis.	Inductive qualitative analysis and narrative analysis.	Reflexive thematic analysis.

5 OVERVIEW OF THE ORIGINAL STUDIES

5.1 Sub-study 1: Co-construction of knowledge and socioemotional interaction in pre-service teachers' video-based online collaborative learning

Sub-study 1 aimed to investigate how small groups of pre-service teachers (n = 5 and n = 4) co-constructed knowledge and expressed socioemotional interaction in online breakout rooms during a collaborative task regarding global megatrends and education. Moreover, the teacher educator's role was considered. Knowledge co-construction was studied from a social constructivist perspective, considering, for example, the negotiation of meaning as well as the role of dissonance and metacognitive statements (Gunawardena et al., 1997). Socioemotional interaction was analyzed via active listening, laughter or humor, expressing feelings, expressing experiences related to life outside, and encouraging participation (Hod et al., 2020; Isohätälä et al., 2018; Kauffeld & Lehmann-Willenbrock, 2012).

Overall, the results showed that first-year pre-service teachers engaged in complex processes of knowledge co-construction. The open-ended collaborative task on megatrends and education proved to be fruitful in terms of higher-level thinking. Participants reached higher levels of knowledge co-construction than in most studies from asynchronous (text-based) online learning. Simultaneously, they fostered a positive environment where active listening, humor and other socioemotional elements were thoroughly present. However, there were large individual differences in participation, and some pre-service teachers showed a low level of participation or a lack of participation. Pre-service teachers rarely explicitly encouraged each other's participation. The teacher educator visited the breakout rooms and expressed dissonance, which led to metacognitive statements. Furthermore, the pre-service teachers' participation and expressions of active listening decreased while the teacher educator expressed dissonance, and the dissonance seemed partly overwhelming for them.

The findings suggested characteristics that help pre-service teachers achieve higher levels of knowledge co-construction: (1) the teacher educator's visits to the breakout rooms and intentional dissonance, (2) the teacher educator asking for a synthesis, (3) the collaborative, open-ended task along with multiple guiding questions, and (4) the socioemotional atmosphere that allowed for relaxed humor, expressions of anxiety about the task's difficulty, and metacognitive statements. The students were well familiarized with each other and had worked together in a face-to-face setting previously, which may be one of the reasons underlying the observed relaxed and humorous atmosphere. The study also considered the role of webcams in creating presence, for example, by expressing active listening through nodding. Interestingly, no off-task sharing of personal lives was observed in the analyzed breakout rooms, but identities and self-disclosure were present in task-related interactions.

Theoretically, the study sheds light on how online small group collaboration differs from face-to-face and text-based contexts, and how online breakout rooms afford learning. It also highlights the significance of a safe socioemotional space and the role of teacher educators in creating dissonance and deeper thinking. Methodologically, the study contributes to the understanding of how the analytical tools used in exploring face-to-face and text-based online collaborative learning can be applied to video-based online learning.

5.2 Sub-study 2: Pre-service teachers co-constructing narratives about the future of education

The aim of sub-study 2 was to examine pre-service teachers' (n = 5 and n = 4) narratives about the future of education in relation to two megatrends: digitalization and ecological sustainability. The study also sought to understand how they positioned themselves in the future of education. Inductive qualitative analysis and thematic narrative analysis (Smith, 2016) were employed, along with using counter-narrative as an analytical tool (Heikkilä et al., 2022).

The findings—partly reported via nonfiction comic strips—showed that the pre-service teachers (1) viewed digitalization in education through antonyms and ambivalence (good and useful vs. bad and dangerous), (2) emphasized critical media literacy, (3) viewed ecological perspectives through a main and counter-narrative (taking root more deeply vs. not everyone needs to get excited), and (4) highlighted the role of action and learning by doing. When it comes to positioning, dynamic tensions were identified between, for example, passive and active positions and individual and societal perspectives on change.

While the teacher education department in the study seeks to support transformative agency, and some pre-service teachers spoke of embedding ecological and societal issues more deeply in education, one student voiced a counter-narrative, saying that ecological perspectives do not need to touch every pupil, nor are they even possible to address in his discipline, mathematics (see

Fig. 4). The student used disciplinary boundaries to justify his counter-narrative. Overall, the findings revealed that pre-service teachers hold a somewhat passive stance on societal issues. For example, changes related to digitalization were seen as inevitable and beyond one's influence. Nevertheless, some indications of a more active position were found, since students foregrounded the role of action. This is an important finding, as attitudes alone are insufficient for building a sustainable lifestyle, and many educational interventions tend to emphasize knowledge and attitudes rather than action. In addition, the participants argued that teachers should be more involved in schools' digitalization development and considered critical media literacy as a key perspective when it comes to digitalization. In summary, some cues of collaborative and transformative agency were present, but ambivalence remained: the pre-service teachers were observed as being both passive and active.

Theoretically, ambivalence and critically reflexive thinking as well as staying with dissonance were highlighted in the context of becoming teachers (see also Section 6.1). Methodologically, this study advances the use of creative and narrative methods in analyzing collaborative learning and contributes to the research on pre-service teachers' orientation to societal changes.

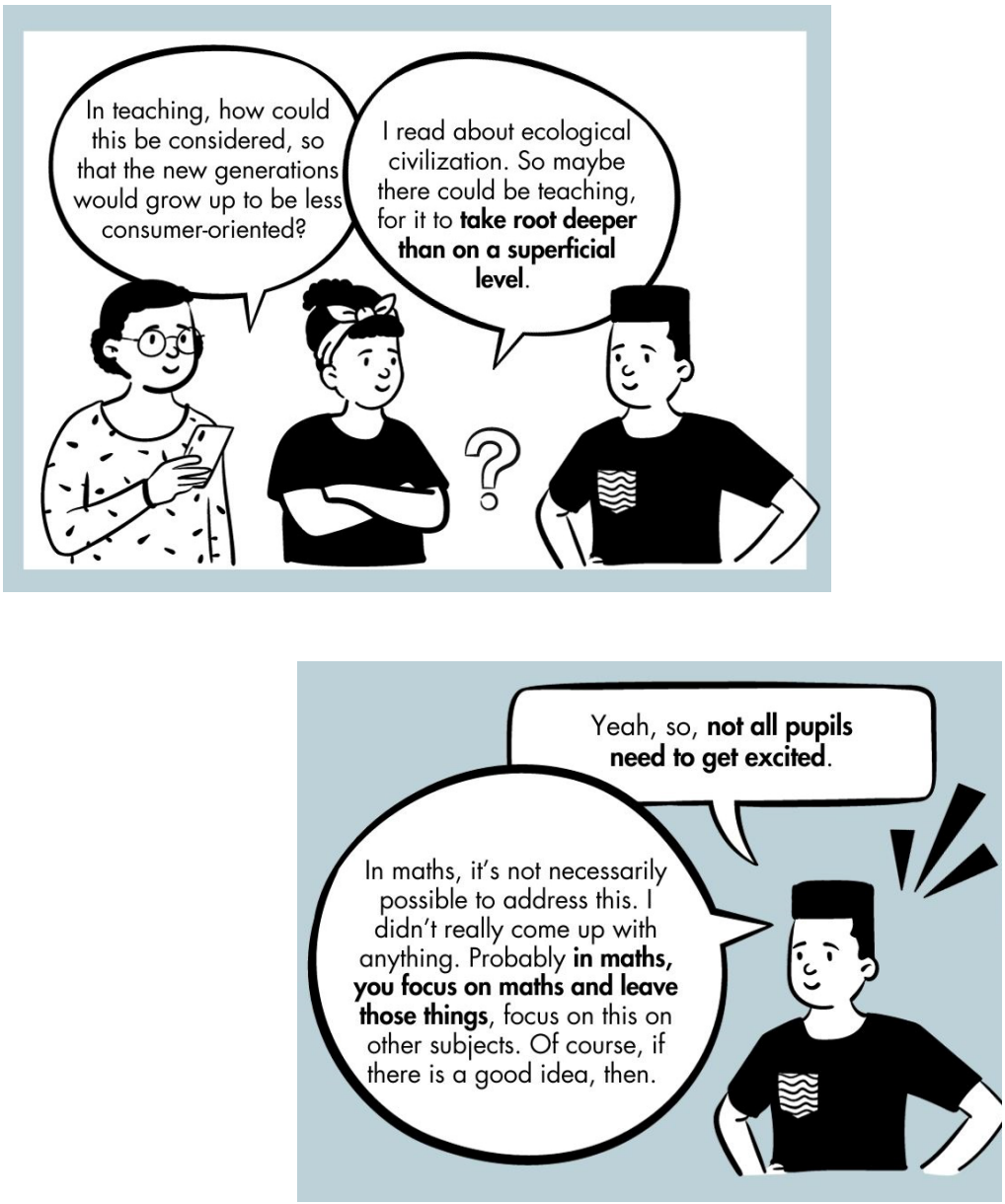

FIGURE 4. Narrative and counter-narrative, part of the comic strip (Lehtinen et al., 2024)

5.3 Sub-study 3: Crossing boundaries—pre-service teachers' situated and imagined views of socioemotional competence and dialogicality

Sub-study 3 sought to understand what kind of situated views pre-service teachers (N = 14) have of the socioemotional and dialogical dimensions of becoming a teacher during a pandemic and in multidisciplinary collaboration. Furthermore, the aim was to find out how they imagine teachers' socioemotional competence and dialogicality in their future work. Potential tensions between the situated and imagined perspectives were also considered. Reflexive thematic analysis (Braun & Clarke, 2021) was applied, and the concept of boundary crossing (Akkerman & Bakker, 2011) was employed in the analysis.

The findings revealed three types of boundaries: between (1) being a student and being a teacher—between the situated and the imagined, (2) disciplines, and (3) online and face-to-face practices. In their situated views, pre-service teachers identified and crossed disciplinary boundaries in multidisciplinary collaboration with the help of social cohesion; perceived a threshold in interaction while studying and working collaboratively online, meaning that it was difficult to participate and to invite others to participate and it became difficult to "*be in front of people*"; and held a normative conception of talkativeness, viewing being shy or silent as negative. Some participants expressed voices of exclusion and non-belonging, and these were related to the norm of talkativeness and the boundary between belonging and non-belonging to educational science.

In their imagined future, pre-service teachers found it difficult to specify socioemotional competence; marked the boundary between being a student and being a teacher by focusing on challenging situations; expressed both dialogical and monological voices regarding teachers' competences; and held conceptions of teacher competences that moved along a continuum from normative and "correct" to a more flexible understanding. The learning mechanisms that pre-service teachers employed while crossing disciplinary boundaries involved identifying boundaries, reflecting on them, and potentially transforming practices.

There were some tensions at the boundary between situated and imagined views (see Fig. 2). First, pre-service teachers held a situated norm of talkativeness, while largely prioritizing respect for diversity in their imagined profession. Second, students valued social cohesion as a situated experience in teacher education; however, matters concerning group-level cohesion or related issues were peripheral in the imagined future.

Theoretically, the results shed light on socioemotional competence and dialogicality in teacher education in the post-COVID era and the boundary between the situated and the imagined. Methodologically, the study demonstrates how reflexive thematic analysis (Braun & Clarke, 2021) can be used through a primarily inductive orientation while also applying theory-driven ideas in the later stages of analysis.

5.4 Synthesis of the main findings

Table 3 summarizes the main findings related to research questions 1 and 2. These findings are discussed further in the next section. The synthesis for research question 3, the potential offered by collaborative learning and boundary crossing, is illustrated in the next section, in Figure 5.

TABLE 3. Synthesis of main findings related to RQ1 and RQ2

RQ	**RQ1 How do pre-service teachers engage in critical, transformative thinking processes?**	**RQ2 How do pre-service teachers demonstrate and perceive socioemotional competence and dialogicality?**
Findings	Participants engaged in complex processes of knowledge co-construction regarding megatrends and education	Participants built a positive atmosphere, characterized by active listening, humor, feelings, and self-disclosure; Cohesive atmosphere was meaningful as an experience
	The small groups showed distinct temporal patterns: one fluctuated between lower and higher thinking levels, while the other achieved higher levels only after the teacher educator's visit	The small groups differed most significantly in the extent to which they shared feelings and self-disclosure
	Some students demonstrated low-level participation or a lack of participation; Some students expressed voices of exclusion, non-belonging, and social anxiety	
	Participants showed little disagreement, but the teacher educator introduced dissonance that prompted deeper thinking and metacognitive statements	Participants rarely explicitly encouraged each other's participation; They experienced a "threshold" (boundary) in online interaction
	Personal experiences from school and university shaped meaning making	Socioemotional competence was difficult to analyze both as a situated phenomenon and as a future competence
	Participants struggled with the societal level, showing ambivalence between passive and active orientations	Participants perceived the boundary between competent and non-competent by imagining challenging interactions
	Participants engaged in identifying disciplinary boundaries, reflecting on them, and possibly transforming practices; Crossing disciplinary boundaries was meaningful as an experience	
		Boundary between the situated and the imagined: participants held a situated norm of talkativeness, while valuing respect for diversity in their imagined profession
		Participants expressed both dialogical and monological views about teachers' competences
Main tensions	**Dissonance** **Ambivalence** **Boundary between disciplines**	**Boundaries: situated & imagined, online & face-to-face**
Potential	**Reflexivity, growth, living with uncertainty and ambivalence**	

6 GENERAL DISCUSSION

6.1 Exploring tensions and crossing boundaries

Overall, this thesis contributes to the understanding of pre-service teacher learning as a holistic and situated process, particularly in relation to critical and transformative thinking and socioemotional competence. In the context of this thesis, the following aspects of space and time are specifically relevant: multidisciplinary collaboration, online teaching and collaborative learning, and the later stages of the COVID pandemic. Furthermore, the thesis aims to develop both methodology and theory. In this section, I draw together the answers to the research questions dealing with pre-service teachers' critical and transformative thinking processes as well as their views and expressions of socioemotional competence (RQ1 & RQ2). The findings from the three sub-studies indicated that **tensions** are crucial in the process of becoming teachers. I synthetize and discuss the findings via three tensions: dissonance, ambivalence, and boundaries. In the end of this section, I sum up the potential of multidisciplinary collaborative learning and boundary crossing (RQ3). I also consider the **spaces** that enable meaningful and collaborative becoming for future teachers (Section 6.2).

6.1.1 Dissonance was linked to higher-level thinking and facilitated discussions about the societal level of education

In sub-study 1, one of the main findings was that **dissonance**—that is, conflict between opposing thoughts—led to higher-level thinking and had an influence on socioemotional interaction. The pre-service teachers worked on an open-ended collaborative task regarding megatrends and education. The teacher educator visited the online collaborative learning situations and restated their position as "*a devil's advocate*" while bringing cognitive dissonance to the discussions. That, in turn, influenced the pre-service teachers' knowledge co-construction processes, leading to higher-level negotiations of meaning and metacognitive statements. Furthermore, the pre-service teachers expressed less

active listening and indications of participation (part of socioemotional interaction) when the teacher educator expressed dissonance, which, along with the pre-service teachers' comments and humorous accounts of the "*heavy stuff*" expressed by the teacher educator, indicated that the dissonance was partly overwhelming for them.

The results align with research showing that teacher intervention is essential in online discussions to achieve higher-level thinking (Hull & Saxon, 2009; Xie & Ke, 2011). Moreover, the importance of dissonance (Gunawardena et al., 1997) and questioning (e.g., Lorencová et al., 2019) has been widely recognized. The teacher educator provided the students with "the gifts of teaching" (Biesta, 2013), something that really entered their being from the outside. It was something that they did not ask for, but it helped them move their conversation from the individual to the societal level—something that could be described as uncomfortable truths or difficult knowledge (Biesta, 2013). Whether someone is open to receiving the gift is beyond the teacher's control. After the educator had left, the pre-service teachers laughed at the "*heavy stuff*", but soon after they stated: "*but that was actually a good point, that like, how the individual versus like the society, so, how could that kind of questioning be brought up in schools, like who's responsibility* [laughter] *it really is*" (negotiation of meaning). They continued with complex negotiations and metacognitive statements about the societal perspective and its complexity.

In sub-study 1, pre-service teachers generally reached higher levels of knowledge co-construction than in most studies that focus on text-based online collaborative learning (De Wever et al., 2007; Lucas et al., 2014). This finding can also be reflected against studies that examine face-to-face situations, where university students often struggle to engage in argumentative or critical discussions, even when argumentation and collaborative learning are scaffolded (Isohätälä et al., 2018). In addition to the significance of dissonance, the open-ended nature of the task with multifaceted guiding questions allowed for high-quality negotiations of meaning. This is in line with studies suggesting that open-ended tasks dealing with complex real-world problems reinforce deeper-level learning and critical thinking (Heo et al., 2010; Ke & Xie, 2009; Lucas et al., 2014).

Moreover, socioemotional atmosphere, enabling relaxed humor, expressions of anxiousness toward the difficulty of the task, and metacognitive statements facilitated critical thinking processes. Tension and dissonance were nevertheless not too much to handle within a cohesive atmosphere, it seemed. The role of the safe atmosphere was noticeable, for instance, in the observed tension–relaxation (Andriessen et al., 2011) and in the directness with which the pre-service teachers expressed their anxiety about the challenging task (see Isohätälä et al., 2020). The fact that the pre-service teachers had worked together in a face-to-face setting before the online course contributed to the observed relaxed and humorous atmosphere. This was supported by sub-study 3, as the pre-service teachers described how getting to know each other in person was essential in their experience, and how it made it easier to express disagreements, for example, because they had already talked about personal matters (see also Section 6.2). Although the socioemotional space appeared safe and supportive,

the students very rarely encouraged each other's participation, by, for example, asking others for their opinion. This kind of a threshold in interaction is further discussed in Section 6.1.3.

6.1.2 Ambivalence: problematic for transformative action or promising for reflexive thinking?

This section relates to the research question about pre-service teachers critical and transformative thinking processes (RQ1). In sub-study 2, which took a narrative stance to pre-service teachers' collaborative negotiations about the future of education, **ambivalence** was a central finding. Ambivalence means simultaneous and contradictory attitudes (such as attraction and dislike) toward something, constant fluctuation between one thing and its opposite, and uncertainty about which approach to take (Merriam-Webster, 2024). Ambivalence was found in (1) the dynamic tensions within the societal positions that the pre-service teachers took, which were at the same time passive and active, (2) the main narrative and counter-narrative regarding education for sustainability, and (3) the way in which the pre-service teachers viewed digitalization in education.

Overall, the pre-service teachers expressed a relatively passive stance toward societal dilemmas. They made ironic remarks about not being societal agents but, rather, "*amoebas.*" With this humorous expression and, for example, by regarding technological changes as inevitable, the students distanced themselves from the transformative and societal role. In addition, there were two simultaneous voices on sustainability: one emphasizing the need to embed environmental and social issues more deeply in education and the other arguing against it. Other more active voices included, for example, focusing on action instead of just knowledge.

Such an ambivalent positioning can make it difficult to engage in transformative action when future teachers are confronted with expectations coming from different directions, whether from parents, colleagues, stakeholders, or businesses. Teachers must take initiative and make informed decisions in their daily activities as they manage the growing complexities in their classrooms (Brevik et al., 2019). In other words, a certain degree of decisiveness is needed. However, an active position is not always guaranteed; studies show that active citizenship is not often emphasized in the Finnish school culture or in teachers' perceptions of their role (e.g., Fornaciari & Rautiainen, 2020; see also Männistö & Moate, 2023) and that most Finnish teacher education programs have had a strong focus on didactics and psychology rather than on societal dimensions (Furuhagen, et al., 2019; Juvonen, 2024).

Although ambivalence can be problematic, it can also be seen as promising for reflexive thinking and practices. To build a sustainable and democratic future, Walker and Shove (2007) argued that it may be beneficial to live with and openly handle ambivalence, rather than eliminate it, because ambivalence is crucial for reflexivity. Dynamic, questioning, and critical policies may be challenging, but they are still better than unquestioning certainty. For example, "sustainable" can

seem like a universally agreed pursuit, characterized by consensus, cooperation, and common interest, even though struggles and contests over what is sustainable are constantly present (Walker & Shove, 2007). This is similar to other political goals, such as social justice and democracy, which may be easy to agree with but which still involve conflicts over how they should be understood and implemented (Walker & Shove, 2007). Ljunggren (2014) suggested that in a multicultural society where questions of national identity and patriotism are debated, we should "teach ambivalence," which means living with uncertainty and plurality. This opens the way for new meanings and alternative perspectives instead of seeking one definitive truth. There is a tension between cohesion and plurality (Ljunggren, 2014), and this applies to education in general, as education involves working with people from very different backgrounds. Theoretically, these perspectives on ambivalence resemble what dialogical theories have to offer: highlighting the differences, otherness, and multiplicity of meanings instead of a fixed, shared endpoint (Arvaja & Hämäläinen, 2021; Sullivan, 2010).

In sub-study 2, the pre-service teachers viewed digitalization, in particular, with ambivalence and contradictions, as being at the same time good and bad, useful and dangerous. They also emphasized critical media literacy. This partly contrasts with earlier studies, which found that only a small number of pre-service teachers viewed digital literacy as something that involved critically reflective technology use (List et al., 2020; see also Castellví et al., 2020). In the previous studies, data was collected through individual questionnaires; it may be that in the present study, collaborative learning encouraged critical thinking (Lehtinen et al., 2023; Yukawa 2006). Questioning, reasoning, and taking different perspectives is an inherent part of collaborative learning (Rochelle & Teasley, 1995). However, research has also shown that pre-service teachers in collaborative situations do not always engage in critical, argumentative thinking, but rather quickly settle for consensus-based discussion (Isohätälä, 2020).

As in the case of sub-study 2, I am left with ambivalence. The pre-service teachers were observed as being both active and passive. Ambivalence in itself can be both promising and problematic. Reflexive and open thinking may require ambivalence; the ability to doubt and a critical self-understanding developed with others (Ljunggren, 2014). At the same time, a strong and active professional identity and position is needed to take initiative and to act in the world as an active, responsible subject in a democratic society (Biesta, 2022). One goal of teacher education might be to be able to live with the ambivalence and uncertainty involved in the changing society (see Aly et al., 2022).

6.1.3 Boundary crossing as a task for teacher education—boundaries between the situated and imagined, between disciplines and practices

The third tension that I discuss is **boundary.** The findings indicated boundaries (1) between the situated context and the imagined future, (2) between disciplines, and (3) between online and face-to-face practices. This section specifically addresses the research question about pre-service teachers' perceptions of socioemotional competence and dialogicality (RQ2) but also relates to the

question of critical thinking (RQ1). The theoretical contribution I wish to make is to highlight the three boundaries that I identified as essential sites of boundary crossing in teacher education and in times when technology creates both barriers and advances for teaching and learning. Particularly important is the boundary between the situated and the imagined. This is not to say that these are the only boundaries, but they were the significant ones found in the empirical studies.

Boundary has some similarities with ambivalence. Ambivalence can be seen as a "language-specific disorder" (Walker & Shove 2007, p. 215; see also Bauman, 1990), because language tends to segregate, separate, and classify, and ambivalence is then a disruption of such a separating linguistic function. Similarly, a boundary is ambivalent and ambiguous, at the same time in between something and belonging to both one world and another (Akkerman & Bakker, 2011). The ambivalent nature of boundaries makes explicit the need for dialogue, negotiation of meaning, and critical reflection. Akkerman and Bakker (2011) argued that:

> it is precisely this ambiguous nature that explains the interest in boundaries and boundary crossing as phenomena of investigation for education scholars. Both the enactment of multivoicedness (both–and) and the unspecified quality (neither–nor) of boundaries create a need for dialogue, in which meanings have to be negotiated and from which something new may emerge. (p. 142)

The boundary **between the situated and the imagined** was particularly evident in that the pre-service teachers expressed a situated norm talkativeness while largely valuing respect for diversity in their imagined profession. Talkativeness was framed in many ways: collaborative learning, particularly in the online setting, was surrounded by the idea that "*everyone should just talk*." Further, participants had a normative view of future teachers being talkative, and being silent or shy was seen as negative. For example, one pre-service teacher mentioned that she needed to develop courage or initiative because she was shy and tended to be a "*bystander*." Another pre-service teacher, although describing herself as shy, said that "*maybe our group worked precisely because, I think, no one there was very shy*." Thus, there was a conflict between identifying as a shy person and valuing not being shy.

It is a good idea that introverted future teachers develop their "*courage and initiative*." However, such a normative view of participation through talkativeness is problematic. This "tyranny of participation" (Gourlay, 2015) can mean a lack of appreciation for diversity, where less privileged and less powerful participants may be silenced by more confident and higher-status participants (Lambert, 2019). The emphasis on talkativeness may result in undervaluing quiet practices such as silent reflection and the collaborative act of listening (Gourlay, 2015; see also McNaughton et al., 2008; Remedios et al., 2012). In their imagined future, many students talked about taking into account that every pupil is different and treating everyone with equal respect. Yet there was an imbalance in the imagined—perhaps idealized—views and in the fact that pre-service teachers stressed the importance of everyone speaking up, rather than highlighting the need to ask questions and engage others.

This was just one example of the boundary between the situated and imagined. It raises questions about how idealized pre-service teachers' conceptions are, and a further question arises: if there is an imbalance between these views, what about actual actions and practices? In line with my findings, Moate (2023) found that pre-service teachers showed a nuanced understanding of insideness and outsideness in their situated reflections, but this multidimensionality was lacking when they imagined their future as teachers. Prospective teachers may indeed have idealistic views about involving others (Moate, 2023) and about caring (Goldstein & Lake, 2000; Laletas & Reupert, 2016). Moreover, researchers have observed a gap between student teachers' stated intentions to teach, say, democracy and justice, and their actual classroom practices (e.g., Adams, 2023). I was not able to detect the instructional practices of the pre-service teachers, but observational methods allowed me to look at socioemotional competence as embedded in collaborative learning situations. The imbalance between the students' views of "*everyone should just talk*" and the extent to which they talked about engaging others and asking questions was also evident in how little they encouraged each other's participation in online collaborative learning.

These kinds of boundaries suggest the need for critical dialogue and reflection, which also links to critical thinking. In these processes, time and investment are needed, and it is expected that teachers can develop reflexive dispositions that integrate into their regular thought processes (Clarà et al., 2019; Moate, 2023). However, reflection does not necessarily lead to learning or to building bridges between theory and practice (Clarà et al., 2019; Moate, 2023). Moate (2023) stressed the complexity of reflection in teacher education and the need for further research and theorization.

Sub-study 3 found that students perceived the boundary between competent and non-competent by imagining challenging interaction situations, situations of conflict, or unexpected events. Indeed, one of the main goals of teacher education is to prepare future teachers for challenging and unpredictable relationships and situations (Aspelin & Jonsson, 2019). Focusing on these may help with the complexity of reflection. Reflection alone is not enough, but overt teaching of competences is needed. Sub-study 3 also indicated that the pre-service teachers partly held static and authoritative conceptions of "*how to be*" a teacher in the "*right*" way. Although most teachers believe that socioemotional competences are teachable (Schonert-Reichl et al., 2015), there remains a risk of static categorization of teachers (Arvaja et al., 2022). Thus, we need to highlight the openness and unfinalizability of becoming teachers (Adams, 2023; see Rule, 2011) and the role of actually practicing (socioemotional) competences in teacher education.

Another significant boundary was found **between disciplines**. Pre-service secondary teachers major in various fields, such as history or languages. Multidisciplinary collaboration afforded identifying disciplinary boundaries and the uniqueness of educational science, reflecting on the boundaries, and possibly even transforming practices (see Akkerman & Bakker, 2011; Lehtinen et al., 2025).

The pre-service teachers grasped the differences between disciplinary practices, thereby gaining new insights into their own and others' practices. The distinct nature of education was perceived in terms of, for example, open-ended reflection, in-depth discussions, social interactions, and interactive teaching. Such reflections on disciplinary differences also make it possible to become aware of different conceptions of learning and of the human being. What was valuable was that the pre-service teachers appreciated being part of both worlds: educational science and their major discipline. They were "*cut from different cloth, but* […] *found a common path*."

There were three "buts" that challenged this positive view of dialogical collaboration and boundary crossing. First, one pre-service teacher talked about her experiences of being an outsider and how she learned best alone. She said that she preferred individual assignments and felt she learned the most from them. She described herself as a "*quieter*" person who was the one just following and somehow left aside. This connects to the earlier-mentioned norm of talkativeness. At the same time, it has been shown that collaborative mindsets and dispositions tend to be quite stable and resistant to change in teacher education (Valtonen et al., 2021). Thus, attention must be paid to both challenging the underlying static norms of teachers and at least attempting to cultivate a collaborative mindset. One can remain introverted but must be able to work in multidisciplinary teams, including with student support staff.

Second, another student talked about insecurities regarding her developing teacher identity and tensions related to being first and foremost a subject matter expert (see Peterman, 2017). She called for more support for pre-service teachers who major in their subject to be included in the group of teachers. She described:

> I just have a feeling that since I'm like a chemist [laughter], **I can't go there**, I don't even, like, know what I'm studying yet and what's expected of me and whether I am a subject teacher, **can I call myself a subject teacher?** [...] I would maybe need a bit like, something that would really combine the fact that subject teachers study something else [their major] and that everyone is welcome, so that even though you mainly study chemistry, but you are also a teacher, so come here, **come here, you belong here.**

The boundary between disciplines and **between belonging and non-belonging** to educational sciences and to the group of teachers was even perceived in spatial terms. The student said that coming to the interview premises, which house the department of teacher education, felt difficult, although she did not know why. When I assured her that she was very welcome, she mentioned that she would try to "*make this a kind of second home*," rather than just the buildings where her major's department was located. These observations suggest that although such support for belonging to the field of educational science is embedded in the culture of the studied department, more explicit attention may be needed. However, it may be that this is more a matter of ongoing support during the program, as the pre-service teachers were in their first year. It is challenging, though, that there is only a relatively small number of educational studies in secondary pre-service teacher education (Husu & Toom, 2016).

The third "but" is that of a student who used disciplinary boundaries to justify his counter-narrative regarding education for sustainability (see Section 6.1.2; Lehtinen et al., 2024). In his small group, the rest of the students discussed integrating ecological and societal issues more thoroughly into education. He, however, said that these perspectives are not possible to address in mathematics. It seemed that he rejected the "transformative agent" role. Nevertheless, a sustainable and socially just future requires transcending disciplinary boundaries (Lotz-Sisitka et al., 2015); it can even be seen as a moral obligation (Markauskaite et al., 2024). If not all teachers become transformative agents in their work, there is at least a need to participate in the organization of collaborative multidisciplinary school activities that cross disciplinary boundaries (see Finnish National Agency for Education, 2016). It can, of course, be asked whether we ask too much of teachers, and this along with teacher turnover is discussed in Section 6.1.4.

One more boundary was found in sub-study 3: that **between face-to-face and online practices**. The pre-service teachers expressed that there was a "*threshold*" (*kynnys* in Finnish) in interaction as they studied and worked collaboratively online during newly established COVID restrictions. This meant that it became difficult to participate, to invite others into dialogue, and to "*be in front of people*." Some students mentioned increased social anxiety, even a student who had never experienced it before. These findings highlight that we need to consider whether prospective teachers, whose education has been affected by the pandemic and pandemic-related practices, such as increased online study, need additional support as they begin their careers (see Darling-Hammond & Hyler, 2020). The transition from student to teacher can cause anxiety even without the disruption of the pandemic; teaching is a complex and unpredictable profession, and the pandemic has added to that unpredictability (Wells & Daniels, 2024). At the same time, we need to be willing to hear new teachers' thoughts and practices that have been influenced by their experiences—an example might be increased awareness of equity issues highlighted by the pandemic (Darling-Hammond & Hyler, 2020; Glenn et al., 2020). Furthermore, the results affirm that to be prepared for future crises, there should be comprehensive pedagogies of online education, collective and governmental support for inclusion and engagement, and teacher educators should be well prepared to teach online and incorporate socio-affective dimensions in their teaching (Carillo & Flores, 2020). These aspects are equally important when considering continuing education.

6.1.4 Synthesis of tensions—how much dissonance is too much?

The findings from the three sub-studies indicate tensions as essential in initial teacher education and its identity negotiations, in collaborative learning, and in multidisciplinary teamwork. Tensions were part of both the critical thinking processes and the socioemotional growth (RQ1 & RQ2). There is extensive research showing a similar role for tensions and dilemmas. One of the crucial triggers for critical thinking is working with a disorienting dilemma (Brookfield, 2012; Gunawardena et al., 1997). Dilemmas are often seen as essential sparks for

developing critical reflection skills in teacher education (Arvaja et al., 2022; Galman, 2009; Kagan, 1992; Moate, 2023). Similar terms include contradictions, questioning, and ruptures (Moate, 2023) or moments of being struck (Arvaja et al., 2022). Dialogical theories emphasize dilemmas that come from outside the student, as they point to difference as a key motivator for dialogue (Arvaja & Hämäläinen, 2021; Sullivan, 2010). Different, outer voices can disturb and even resolve some of our "sore spots" (Sullivan, 2010). In my studies, the outer voices came in large part from the teacher educator, who helped prospective teachers challenge their initial thoughts and assumptions about teaching (see Kagan, 1992). According to Marble (2012), prospective teachers need new and disruptive events to break dogmatic ideas of teaching, and these unfamiliar grounds call for "what could be's" instead of what is.

Tensions have also been considered in terms of identity development (Akkerman & Meijer, 2011; Alsup, 2006; Beijaard et al., 2004). For example, the study by Anspal et al. (2019) showed how pre-service teachers encounter tensions in their perceptions of self versus their professional role, in their initial feelings of being prepared for the profession versus their struggles during teaching practice, and within varying professional role expectations, along with the worry that teaching is a consuming job that may sacrifice their private lives (Anspal et al., 2019). In my studies, as pre-service teachers encountered the idea of the transformative teacher role in multidisciplinary collaboration, they expressed anxiety toward the difficult task as well as metacognitive statements, manifesting transformation in their thinking. While collaboratively sketching their "identities-in-the-making" (Bamberg & Georgakopoulou, 2008), they simultaneously engaged in open and rich negotiations about teachers' roles and their emerging relationship to them. The boundary between disciplines brought into light perspectives that helped in reflective identity work (see Akkerman & Bakker, 2011; Williams et al., 2007). Crossing boundaries was both linked to critical thinking and socioemotional and dialogical aspects of becoming teachers.

It may be that some pre-service teachers were not able to resolve the tensions that came from the transformative teacher role or from the different underlying principles and cultures of their disciplines, such as history or chemistry. Accepting ambivalence means that these tensions do not necessarily need to be resolved (Walker & Shove, 2007). It is unclear, however, whether that seemed like an option for the pre-service teachers, or whether they considered that they may not be fit for the profession if they were left baffled. Stillman and Anderson (2015) noted that there are consequences if we overburden teachers who are under pressure and public scrutiny without adequate support for their own learning. Galman (2009) stated that too much dissonance in teacher education can lead to unwanted outcomes and even dropping out from teacher education (see also Alsup, 2006). She wrote aptly about living with dissonance:

> If we as teacher educators urge students to be comfortable with not knowing, with uncertainty and the learning process, we should also encourage them to reflect upon their feelings of discomfort rather than seek to eliminate them. Dissonance can be powerful and generative and teacher education programs should be forthcoming with students about the challenges of the profession and of teacher preparation, about the

> hard work of examining and even disrupting their stories about why they are becoming teachers, as well as accepting the bureaucratic and politicized terrain and responding agentively to it. (p. 479)

When prospective teachers encounter dissonance, support for staying with discomfort and ambivalence should be provided. Otherwise, students may start to consider changing their field early in their studies. We may not be able to afford this, as the situation is already quite challenging; the study by Räsänen et al. (2020) found that 50% of Finnish comprehensive schoolteachers had intentions to leave the profession. Teachers choose their profession by intrinsic and altruistic motivations, and maintaining this initial drive is crucial for them to stay in the field (Casely-Hayford et al., 2022). Pre-service teachers have chosen their careers, in part, because of the very beliefs and assumptions that teacher educators seek to challenge (Galman, 2009).

Finally, it can be asked how the aim of transforming pre-service teachers' beliefs and practices—via tensions—is justified. First, research suggests that teacher education may have limited impact on teachers' classroom behavior due to a gap between theory and practice (Korthagen, 2017). Second, Dolan (2017), applying systems theory, argued that attempting to transform future teachers' beliefs is problematic because it assumes that they are uniform, unproblematic, and in need of change to fit in the educational system, the "product" of which they themselves are. This raises the question of which system students are prepared for: the current one or a more idealized version? If, as I would like to think, we are educating for an (at least partially) idealized[3] version of the educational system, pre-service teachers may encounter significant dissonance between their teacher education programs and the realities of schools (see also Adams, 2023; Anspal et al., 2012; Galman, 2009). Teacher education can only foster change if other parts of the system, such as school leadership and experienced teachers, are open to it (Dolan, 2017).

I believe that there are no easy answers to these questions of tension and transformation—be it the struggles in taking an active position toward societal perspectives or the boundary between the situated and the idealized. It helps to think that "there is no final solution; there is no packageable remedy" (Greene, 2003, p. x). Instead, the dialogical idea of constant becoming and the unfinalizability of being a teacher (see Rule, 2011) can be useful. This includes openness to alternative points of view and diversity, empathy, respect for others and for oneself, and responsibility for the common good, all part of the so-called democratic habits of the heart (Bellah et al., 1985; Mezirow, 2000). The open-ended becoming is also illustrated in Figure 5, which aims to sum up the kinds of potential that collaborative learning and boundary crossing offered for becoming teachers (RQ3). In addition to the potential, the figure shows the main constraints found in this context.

[3] In a sense that we thrive for purposes that have not yet been realized, e.g., by building a more equitable education system.

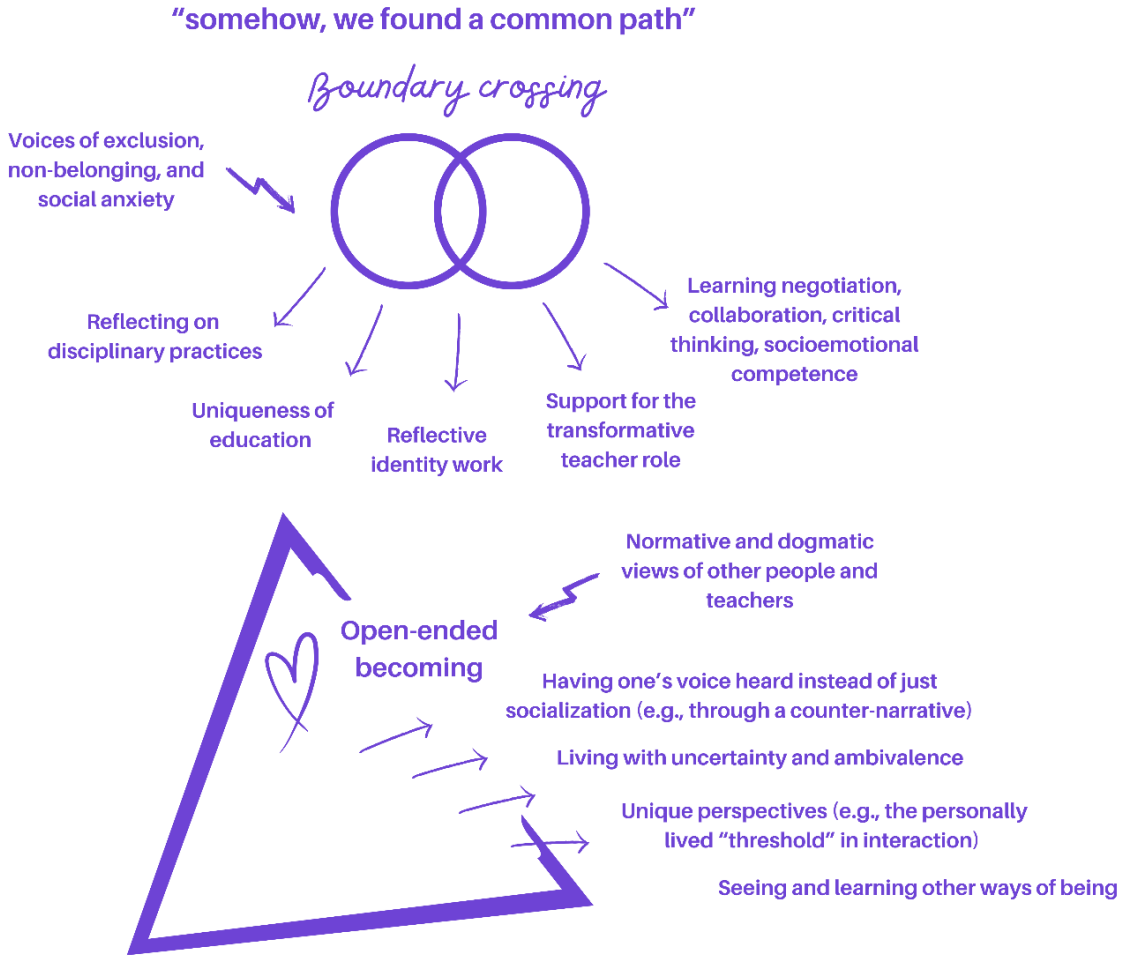

FIGURE 5. What kind of potential do collaborative learning and boundary crossing offer for becoming teachers?

6.2 Creating spaces and time for meaningful and collaborative *becoming*—practical implications

In this section, I draw together the practical implications from my research for teacher education and for multidisciplinary learning in general. In Table 4, I sum up pedagogical and policy implications through boundary crossing. Many of my suggestions relate to multiple boundaries. For example, the overt teaching of competences is related to all the mentioned boundaries. Teaching socioemotional competence helps in co-creating across different backgrounds and in crossing the boundary of online collaboration, for instance, by learning how to invite others to participate. Using open-ended tasks that deal with real-life issues is equally important in building high-quality online collaborative learning and in crossing disciplinary boundaries (see Fortuin et al., 2024).

TABLE 4. Pedagogical and policy implications: how to cross the boundaries

Boundary	**Suggestions for practice: how to cross the boundary**
What is part of me and what is not (yet) part of me: transformative and socioemotional teachers	Ensuring enough cohesive, safe spaces and time for collaborative identity work; not to replace face-to-face educational studies with solely self-study or online studies
	Equipping teacher educators with vision, knowledge on societal phenomena, and empathy; expressing dissonance in a safe atmosphere
	Overt teaching of competences
	Teaching to cope with ambivalence and uncertainty
	Incorporating playfulness into creating dialogic spaces
Situated and imagined: situated normative views and idealized imaginaries	Using situated analyses of professional competences (e.g., socioemotional competence) together with imagined accounts of them—engaging in critical reflection of possible differences between the situated and the imagined
	Emphasizing that professional competences, although built on one's personality and strengths, are something to be learned, rather than seeing them as unilateral "right ways" of being
	Tapping into social norms and beliefs, such as the norm of talkativeness, through written or collaborative reflection
Disciplinary boundaries	Providing support for engagement in the studies and in the community of professionals early in the study program
	Teaching cross-cutting courses, such as education, in multidisciplinary groups that work together over a relatively long time
	Assigning problem-solving tasks that explicitly target disciplinary practices and differences
	Teaching boundary-crossing competences, such as recognizing, naming, and negotiating tensions and co-creating something hybrid together
Boundary between online and face-to-face practices	Developing comprehensive pedagogies of online education and support for (teacher) educators
	Using open-ended, collaborative tasks that deal with complex, real-life issues

	Providing high-quality scaffolding, using rich guiding questions and requiring syntheses throughout the process
	Negotiating how to express presence and socioemotional support
	Sharing experiences, as well as literature-related thoughts

In addition to these suggestions, I wish to highlight the role of creating dialogic spaces (Rule, 2004, 2011). Rule (2004) described how space as a concept implies movement and freedom, and how this makes it valuable for higher education. There needs to be enough spaciousness, enough light and space for learning to happen. Conditions for creating dialogic spaces include a foundation of trust and responsibility, openness to learning from others and an encouraging atmosphere for expressing oneself, and a commitment to resolving issues through discussion and reflection rather than forceful persuasion (Rule, 2004), similar to the idea of the democratic habits of the heart (Bellah et al., 1985; see previous section).

Dialogue must take place at different levels: intersectoral, interpersonal, and intrapersonal. It takes place between teachers and students, within each participant as they engage in dialogue by asking new questions, between the activity and other sectors of society such as future workplaces, and between different discourses such as disciplinary, critical, and political discourses (Rule, 2004). The pedagogical and policy implications in Table 3 relate to all these levels, but the main focus is on the interpersonal level—between the pre-service teachers themselves and teacher educators—as well as on the different sectors of society. Teacher education, while in dialogue with policymakers and stakeholders, should ensure, for example, that there are enough cohesive spaces for open, collaborative becoming. It is the freedom to express and reflect on oneself within a safe group that the pre-service teachers of the empirical studies appreciated, as one of them, majoring in physics, described:

> It's always nice to come to these [educational science] classes when you know that it's **such a different world** from the other one [laughter], the other one is so theory-driven and you just work hard and keep going forward, but here you can **stop and really think** about, like, what I'm thinking and [...] what kind of person I am [...] you can **stop and think about yourself too**.

Another important aspect is that teacher educators should have sufficient support for their own learning and sufficient freedom to create such cohesive spaces. At the same time, they should be aware of the power differences between themselves and the becoming teachers. If pre-service teachers are not able to live with ambivalence and negotiate dissonance, it can lead to dropping out from teacher education. Teacher educators should recognize the power imbalance between staff and students and approach this with sensitivity, encouraging prospective teachers' patience in the process of becoming (Galman, 2009). In addition, it is important to show alternative career paths that build on the field of education. Finally, the continuum of professional development could be

further emphasized and developed (see also Darling-Hammond & Hyler, 2020), building on the idea of continuous becoming throughout the career.

6.3 Methodological becomings

This thesis aimed to develop methodological and theoretical approaches to the study of collaborative and dialogical learning. Theoretical perspectives have been elaborated in Section 6.1. Methodologically, sub-studies 1 and 2 provided new ideas and applications for studying collaborative learning. Sub-study 1 gave insights into how the analytical tools used for analyzing face-to-face and asynchronous online collaborative learning can be adapted for exploring synchronous, video-based online collaborative learning (Lehtinen et al., 2023). The study was one of the first to use video data to explore small groups' collaboration in synchronous online breakout sessions. Video data was segmented in 30-second segments, which were used as units of analysis (see Isohätälä et al., 2018) and analyzed for both socioemotional interaction and knowledge co-construction. Hence, the analysis was done directly on the timeline of the video (using qualitative data analysis software ATLAS.ti). Data were analyzed at both the individual and small group levels. One of the unique contributions was how small group level interactions were visualized (Fig. 6), showing how levels of collaborative thinking progressed and were intertwined with socioemotional phenomena and what happened during and after the teacher educator's visit into the breakout session.

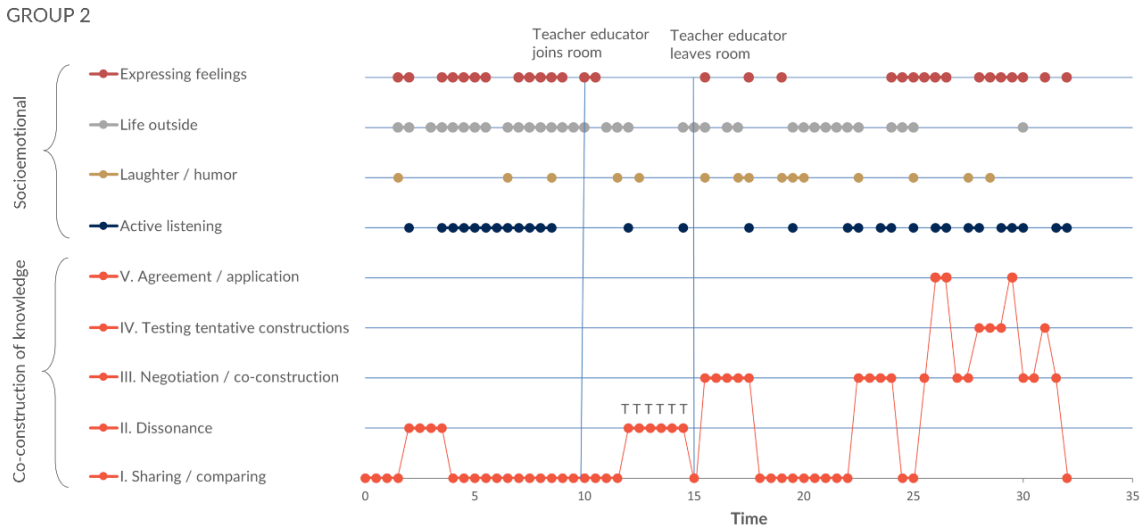

FIGURE 6. Co-construction of knowledge and socioemotional interaction at the small group level during an online breakout session (Lehtinen et al., 2023)

For future research that is interested in studying video-based online collaborative learning, specific methodological questions include considering how to record collaborative sessions or breakout sessions. I asked the pre-service teachers, who had given their consent, to record their breakout room collaborations using the software's recording function and to send the files via a secure, university-approved cloud service. I did not enter the breakout sessions, preferring to leave the students to their own peace. The recording may still have made them more self-aware. While this approach allowed them to decide whether to record and share files, it also resulted in some missing data. Still, I would consider doing the same, as observational approaches can disrupt the studying experience, especially during a crisis like the pandemic. The situation and students' affective states may be different if collaboration occurs online for other reasons and if working online is a normal study routine for them.

When it comes to sub-study 2, new perspectives included using a narrative orientation to studying collaborative learning, which seems like an understudied combination (Lehtinen et al., 2024). Researchers have criticized collaborative learning studies for the emphasis on coding and counting, which can reduce nuanced relationships into categories that do not adequately reflect group dynamics and practices (e.g., Näykki, 2014). There are some previous studies on collaborative learning that use narrative analysis, such as the one by Yukawa (2006). However, the study focused on dyadic, text-based collaboration, not small-group collaboration or synchronous interaction.

Thus, sub-study 2 brings something new to the scene by taking a narrative approach toward small group collaboration. A thoroughly data-driven approach helped tap into the lived experience of the pre-service teachers, and fresh combinations of methodology were employed, including data-driven qualitative analysis (Miles et al., 2020) and a thematic narrative analysis combined with a storyteller researcher position (Smith, 2016). Furthermore, the results were partly reported via nonfiction comic strips, a medium that researchers have largely and "somewhat unfairly" ignored (Tatalovic, 2009, p. 2). Comic strips helped visualize the dialogic nature of collaborative learning. Visual and artistic expressions can create links between narrative, experience, and meaning (Bochner & Ellis, 2003) as well as bring practice closer by being concrete and accessible (Moen, 2006). This line of research could be strengthened in the future, and it may be fruitful for studying various interactional and discourse-based situations.

6.4 Ethical considerations

The ethical guidelines that steered this thesis are those of the Finnish National Board on Research Integrity (2019). Participation was voluntary, and the participants acknowledged that they could withdraw from the study at any point without facing any consequences. They filled in a consent form to validate that they had received sufficient information about the research. Video data was

analyzed as identifiable due to the nature of such data. The transcripts were pseudonymized. Data was protected according to the guidelines of the University of Jyväskylä, using a cloud service that the university considered secure. The participants' privacy was protected in the articles, and only information about their major discipline and age was given.

An important ethical issue is the intention not to cause significant risk or harm to participants (Finnish National Board on Research Integrity, 2019). The main risk I see in this research is that observation may influence students' learning and study experience. Furthermore, similar effects may influence the teacher educator being observed. I considered this throughout the studies and felt it was particularly important as the data collection took place in the context of a crisis, a prolonged COVID pandemic (see also previous section). Practically, I made my role as an observer visible by openly explaining my role and having my webcam on in the online main sessions, but as mentioned previously, I would not enter the collaborative spaces, to give more freedom to the students.

Another perspective related to harm is that reading the research reports can cause anxiety for the participants, as there are some critical comments, for example regarding their perceptions. I wanted to highlight this in the limitations of sub-study 3, which looked at the pre-service teachers' perceptions. Although recognizing some potentially problematic beliefs that call for critical reflection, I do not wish to criticize the participants' belief systems as such. Their belief systems are evolving, which means that the study dealt with emerging thoughts rather than well-established and tested ideas (McGraw et al., 2023). Additionally, there may be limitations in the participants' capacity to express their beliefs and in my ability to interpret them (McGraw et al., 2023). It should be noted that research situations and, for example, the reading of research reports can involve similar mental and emotional tension to everyday life experiences (Finnish National Board on Research Integrity, 2019).

Researchers ought to familiarize themselves with the studied community and its culture in advance to avoid unnecessary harm (Finnish National Board on Research Integrity, 2019). This was relatively straightforward in my studies, as I had been working as a teacher educator for several years within the department where the data was collected. However, I tried to familiarize myself with the characteristics of the exact group by discussing with the teacher educator in advance and along the way and by being open and sensitive during the observations and the interviews.

The "insider" position brings forth different challenges. It is difficult to not be biased by one's experience, although my intention was to be aware of my presuppositions and pre-understandings (see Ogden, 2008). For example, confirmation bias involves interpreting and favoring information in a manner that aligns with one's existing beliefs or values (Roulston & Shelton, 2015). It is possible that this has led me to emphasize some aspects of pre-service teachers' views more than others. I have recognized the tendency of interpreting through my own beliefs and discussed this during investigator triangulation. In addition, providing enough data excerpts allows for readers to evaluate the validity of

interpretations. Also, in qualitative research, reflexivity and subjectivity are a resource, rather than something to do away with (Roulston & Shelton, 2015).

6.5 Limitations and future perspectives

This thesis is not without limitations. Due to the reasons explained above, there was some missing data. Therefore, the overall data from the collaborative learning situations could have been larger. Even without the missing data, the sample size would have been relatively small. However, the fine-grained analyses revealed new insights into issues that had been largely unexplored, such as video-based online collaborative learning and pre-service teachers' collaborative negotiations about societal issues and the transformative teacher role. I did not aim to generalize the findings of these mainly qualitatively oriented studies but rather to offer in-depth accounts of the studied phenomena in a unique setting (Patton, 2002), to develop methodological and theoretical questions, and to encourage further exploration of the topics. Studying real-life interactions results in smaller datasets, because an in-depth qualitative analysis of interaction and nonverbal communication is time consuming (Jones et al., 2021). This may not be the case if, for example, artificial intelligence is used in the analysis process.

The strength of the peer discussion data is that it may have provided more genuine insights into beliefs than, for example, interviews (see Bamberg & Georgakopoulou, 2008), where the likelihood of socially desirable responses may be greater (DeMaio, 1985). Students were encouraged to express themselves as freely as possible in their collaborative learning situations. As noted by Lehmann-Willenbrock and Allen (2014), observations such as negative comments about absent supervisors (in my data, humorous comments about the absent teacher educator's contributions, among others) suggest that the video recording was largely ignored by participants. However, future research could triangulate the data using various data collection methods, such as written accounts.

This thesis suggests various directions for future research. It would be interesting to collect similar data both nationally and from various countries to have a more comprehensive view of pre-service teachers' narratives about societal issues (see also Juvonen, 2024) and their views and behaviors related to both socioemotional and critical thinking perspectives. Multi-case or longitudinal study designs could be used. Teachers' critical thinking could be analyzed in relation to emerging technologies, such as generative AI, and media landscapes, such as social media and information operations. The perspectives of critical thinking used in this thesis bring only some facets to light; future studies could, for example, focus on evidence-based argumentation.

Moreover, it would be valuable to explore how pre-service (secondary school) teachers are educated for dialogue and for creating dialogic spaces in their future work. Perspectives of teachers' socioemotional competence,

including active and emphatic listening and responsible self-expression in authentic classroom situations, could be more thoroughly studied. I studied active listening through back-channeling turns ("mmm") and nodding, but emphatic listening involves more complex processes of asking open-ended questions for better understanding and paraphrasing and summarizing the speaker's talk and emotional experiences (e.g., McNaughton et al., 2008). However, the way in which participants built on each other's perspectives in co-constructing knowledge also illustrates active listening. Future studies could also observe teaching practicums, as in this thesis, pre-service teachers were studied in their study situations. To further develop teacher education, more research is needed on how pre-service (secondary) teachers cross various boundaries: between disciplines, between their imagined and situated views, and between, for example, social and cultural differences. Within all these suggested lines of research, pedagogies that support purposes such as inclusion, engagement, social justice, and democracy could be further studied.

Finally, this thesis brings together a variety of theoretical and methodological lenses to the study of becoming a teacher. Using multiple perspectives in a novel way can be valuable, because no single theory can fully illuminate the complexity and variation of educational phenomena (Markauskaite et al., 2024; Stolp, 2023). Such a multi-perspective account may still challenge the striving for coherent research. For example, there is a tension between sociocultural theories that involve the idea of becoming a member of a professional community, the idea of socialization, and (dialogical) theories that embrace the alterity, uniqueness, and subjectivity of all participants (see Biesta, 2013; Sullivan, 2010). A similar tension exists in the notion of transcendence in education (Section 2.1.4) and transformative agency in relation to sociocultural theories. The question that arises is how change or something radically new is possible when the social context so strongly influences our being. However, sociocultural theories also consider that communities are not static and that "newcomers" can shape community practices (see Cherrington, 2017).

Coherent research does not mean that tensions are completely eliminated (Markauskaite et al., 2024). Tensions were not only central to the studied pre-service teacher learning but also remained at the center of my personal research process, in which multiplicity felt at the same time rewarding and exhausting. In the end, I see the nuances more as an opportunity because they open up rather than bring closure or a fixed ending. My own growth has indeed been that of open-ended becoming, where multiple voices are present at the same time (Arvaja & Hämäläinen, 2021; Rule, 2011).

7 CONCLUSIONS

This thesis explored the learning of pre-service secondary school teachers as a situated process, in relation to critical and transformative thinking and socioemotional competence. The study took place in a sociocultural context of multidisciplinary collaboration, online teaching and collaborative learning, and the later stages of the COVID pandemic. The study identified key tensions and spaces that influence this learning process. Tensions included dissonance (conflicts between opposing thoughts), ambivalence (simultaneous and contradictory attitudes toward something or fluctuating between one thing and its opposite), and boundaries (sociocultural differences between various sites). Boundaries were identified between the situated context and the imagined future, between disciplines, and between online and face-to-face practices.

The thesis provides several key insights. First, teacher educators play a crucial role in creating **dissonance**, which helps pre-service teachers challenge their initial ideas and engage in deeper, collaborative learning and critical thinking. Second, a supportive **socioemotional space** that includes active listening, humor, open expressions of anxiety, and metacognitive statements can enhance critical thinking. The role of teacher educators in creating these spaces is indispensable. Third, adopting a transformative and active teacher role during teacher education involves dynamic tensions and **ambivalence**. While ambivalence can hinder transformative action, it can also encourage reflective thinking and practices. However, excessive dissonance and ambivalence may lead to negative outcomes. Fourth, collaborative **boundary crossing** helps pre-service teachers to reflect on disciplinary practices, recognize the uniqueness of education, engage in reflective identity work, respond to the transformative teacher role, and develop negotiation, critical thinking, and socioemotional competence. Fifth, more attention needs to be paid to addressing experiences of **exclusion and non-belonging**, and to **critically reflecting** on normative and dogmatic views of others and teachers, as well as the boundary between the situated and the imagined. Teacher education systems, together with policymakers, should ensure enough cohesive spaces for open, collaborative becoming and enough support for teacher educators.

YHTEENVETO

Väitöstutkimukseni tarkastelee aineenopettajaopiskelijoiden monialaista yhteisöllistä oppimista. Tutkin yhteisöllistä oppimista kriittisen ja transformatiivisen ajattelun, vuorovaikutusosaamisen ja dialogisuuden näkökulmista. Tavoitteenani on myös kehittää metodologisia ja teoreettisia lähestymistapoja yhteisöllisen ja dialogisen oppimisen tutkimiseen. Tutkielma nojaa sosiokulttuurisiin ja dialogisiin viitekehyksiin. Tarkastelen opettajaopiskelijoiden kasvua (*becoming*) avoimena, päättymättömänä ja yhteisöllisenä prosessina.

Tutkimus toteutettiin monialaisen yhteisöllisen oppimisen, etäopetuksen ja COVID-pandemian myöhemmän vaiheen kontekstissa opettajankoulutuksessa. Oppimistilanteissa opettajaopiskelijat pohtivat omaa rooliaan muutostoimijoina ja syventyivät siihen, millainen suhde on koulutuksella ja globaaleilla megatrendeillä, digitalisaatiolla ja kestävyydellä. Tarkemmin perehdyin siihen, millaisia opettajaopiskelijoiden yhteisölliset ajattelun prosessit olivat suhteessa kasvatukseen ja yhteiskuntaan. Lisäksi tutkin, miten he yhtäältä ilmaisivat vuorovaikutusosaamista ja toisaalta kokivat sen tilanteisessa kontekstissa sekä miten he kuvittelivat sen tulevassa työssään. Hahmotin myös tilanteisen ja kuvitellun välisiä jännitteitä.

Väitöstutkimukseni vastaa useaan tutkimusaukkoon. Suomalaisilla opettajaopiskelijoilla ei usein ole kovin vahvaa ja aktiivista orientaatiota yhteiskunnallisiin kysymyksiin, ja tutkimusta tarvitaan niihin liittyvistä opettajankoulutuksen käytänteistä (Juvonen, 2024). Yhteisöllinen oppiminen tarjoaa merkityksellisen kontekstin tutkia opettajaopiskelijoiden kriittistä ajattelua ja vuorovaikutusosaamista, sillä heidän tulisi oppia neuvottelemaan ja asemoimaan itseään suhteessa kasvatuksellisiin kysymyksiin opettajayhteisöissä. Opettajien yhteistyö on tärkeää muun muassa siksi, että opettajatiimit ovat kouluissa muutoksen toimeenpanijoita ja siksi, että yhteistyö voi tukea reflektiota ja työn kehittämistä, ehkäistä uupumusta sekä mahdollistaa paremman tuen oppijoille (Muckenthaler ym, 2020). Opettajien yhteistyöhön vaikuttaa merkittävästi vuorovaikutusosaaminen, ja siihen liittyvää tutkimusta tarvitaan lisää, erityisesti suhteessa muuttuviin teknologisiin ympäristöihin. Lisääntynyt etävuorovaikutus voi vaikeuttaa yhteisöllisyyden kokemuksia ja johtaa esimerkiksi sosiaaliseen ahdistukseen.

Tarkastelen vuorovaikutusosaamista paitsi kokemusten tasolla, myös hienosyisen vuorovaikutusanalyysin keinoin, mikä on toistaiseksi harvinaista videovälitteisen yhteisöllisen oppimisen tilanteissa (Lehtinen ym., 2023; Mykota, 2018). Lisäksi monialainen yhteisöllinen oppiminen on yksi vähiten tutkituista ja teoretisoiduista kasvatuksen alueista (Markauskaite ym., 2024). Monialaiset oppimiskokonaisuudet ja moniammatillinen yhteistyö ovat tärkeässä roolissa opetussuunnitelmien perusteissa. Käytän käsitettä ylirajaisuus (*boundary crossing*), kun tarkastelen opettajaopiskelijoiden oppimista ja identiteettityötä, monialaista yhteisöllistä oppimista sekä rajoja käytänteiden, kuten kasvokkais- ja etäkäytänteiden, välillä. Tutkimukseni ylittää aihe- ja teoriarajoja ja tuo yhteen edellä mainittuja eri näkökulmia, joita usein tarkastellaan erillisinä tutkimuskohteina.

Aineisto koostui neljäntoista ensimmäisen vuoden aineenopettajaopiskelijan haastattelusta ja etäopetuksen videohavainnoinnista suomalaisella opettajankoulutuslaitoksella vuonna 2022. Tarkemmin analysoin tilanteita, joissa opiskelijat työskentelivät breakout-huoneissa etävuorovaikutuksessa. Videopohjaisissa etätapaamisissa breakout-huone on erillinen tila, jossa pienryhmä voi keskustella ja josta voidaan palata yhteiseen tapaamiseen. Niiden tavoitteena on usein luoda matalan kynnyksen tila keskustelulle. Ohjaaja tai kokouksen järjestäjä voi myös liittyä tilaan. Videoaineistoa analysoin sisällönanalyysilla ja vuorovaikutusanalyysilla sekä aineistolähtöisellä laadullisella analyysilla ja narratiivisella analyysilla. Haastatteluaineistoa analysoin refleksiivisellä temaattisella analyysilla.

Ensimmäisessä osatutkimuksessa (Lehtinen ym., 2023) tutkin videoaineiston kautta, miten opettajaopiskelijoiden pienryhmät rakensivat yhdessä tietoa ja ymmärrystä sekä ilmaisivat sosioemotionaalista vuorovaikutusta breakout-huoneissa. Tämä oli ensimmäisiä tutkimuksia, jotka tarkastelivat pienryhmien yhteisöllistä oppimista breakout-tiloissa videoaineiston avulla. Opiskelijoiden tehtävänantona oli hahmottaa koulutuksen ja megatrendien välistä yhteyttä sekä opettajia transformatiivisina toimijoina. Opettajaopiskelijat edustivat eri pääaineita: englantia, suomen kieltä ja kirjallisuutta, matematiikkaa, kemiaa, tietotekniikkaa ja historiaa. Lisäksi tarkastelin opettajankouluttajan roolia. Tiedonrakentelua ja kriittistä ajattelua analysoin sosiokulttuurisesta tulokulmasta: tiedon ja kokemusten jakamisen, erimielisyyden ja dissonanssin ilmaisun, merkitysneuvotteluiden, yhdessä rakennettujen synteesien ja metakognitiivisten ilmausten kautta (Gunawardena ym., 1997). Sosioemotionaalista vuorovaikutusta analysoin aktiivisen kuuntelun, huumorin ja naurun, tunteiden ilmaisun, ulkopuoliseen elämään liittyvien kokemusten jakamisen sekä toisten osallistamisen kautta (Hod ym., 2020; Isohätälä ym., 2018).

Tulosten perusteella ensimmäisen vuoden opettajaopiskelijat osallistuivat rikkaisiin merkitysneuvotteluihin ja tiedonrakentelun prosesseihin. Avoin pienryhmätehtävä megatrendeistä ja koulutuksesta osoittautui hedelmälliseksi kriittisen ajattelun kannalta. Osallistujat saavuttivat korkeampia kriittisen ajattelun ja tiedonrakentelun tasoja kuin useimmissa tutkimuksissa, joissa on tarkasteltu tekstipohjaista etävuorovaikutusta ja toisaalta suhteessa siihen, että kasvokkaisessa vuorovaikutuksessa opiskelijat usein tyytyvät nopeaan konsensuksen hakemiseen eivätkä välttämättä antaudu argumentoimaan. Samanaikaisesti opettajaopiskelijat loivat myönteisen ilmapiirin, jossa aktiivinen kuuntelu, huumori ja muu sosioemotionaalinen vuorovaikutus olivat vahvasti läsnä. He ammensivat omista henkilökohtaisista koulu- ja yliopistokokemuksistaan. Osallistumisessa oli kuitenkin suuriakin eroja, ja yksittäisellä opiskelijalla oli lähes täydellistä poissaoloa yhteisestä toiminnasta. Opettajaopiskelijat hyvin harvoin pyrkivät osallistamaan hiljaisempia osallistujia. Tutkimuksen eräs keskeinen tulos oli havainto siitä, että opettajankouluttajan breakout -huoneissa vierailujen aikana esittämät kriittiset näkökulmat ja dissonanssi johtivat metakognitiivisiin ilmaisuihin ja korkeamman tason ajatteluun. Dissonanssi kuitenkin vaikutti osittain häkellyttävältä opettajaopiskelijoille.

Tulosten perusteella hahmottui piirteitä, jotka tukevat korkeamman tason ajattelua: (1) opettajankouluttajan vierailut tilanteissa ja tavoitteellinen ajatusten haastaminen, myös huumorin kautta (2) synteesien kysyminen prosessin aikana, (3) yhteisöllinen, avoin tehtävä ja useat ohjaavat apukysymykset sekä (4) sosioemotionaalinen ilmapiiri, joka mahdollisti rennon huumorin, tehtävän vaikeuteen liittyvän ahdistuksen ilmaisun ja metakognitiiviset ilmaisut. Tutkimuksessa tarkasteltiin myös kameroiden roolia läsnäolon luomisessa, esimerkiksi aktiivisen kuuntelun ilmaisemista nyökkäämällä. Kiinnostavaa oli, että analysoiduissa ryhmätilanteissa ei havaittu tehtävään liittymätöntä ajatusten ja elämän jakamista, mutta identiteetit ja henkilökohtaisesta elämästä kertominen olivat läsnä tehtävään liittyvässä vuorovaikutuksessa.

Toisen osatutkimuksen tavoitteeksi muodostui tutkia, millaisia narratiiveja opettajaopiskelijat yhdessä rakensivat koulutuksen tulevaisuudesta suhteessa digitalisaation ja ekologisen kestävyyden megatrendeihin. Lisäksi tutkin, miten he asemoivat itseään suhteessa koulutuksen tulevaisuuteen. Analyysimenetelminä sovelsin aineistolähtöistä laadullista analyysia ja temaattista narratiivista analyysia sekä vastanarratiivia analyyttisena työkaluna. Vain harvat yhteisöllisen oppimisen tutkimukset ovat hyödyntäneet narratiivisia menetelmiä. Narratiivisen analyysin kautta voidaan tavoittaa elettyä todellisuutta, ja luovat menetelmät voivat rakentaa siltoja kerrotun, koetun ja merkitysten välille (Bochner & Ellis, 2003). Osa tuloksista raportoitiin sarjakuvien muodossa, mikä on melko harvinaista tiedejulkaisuissa (Tatalovic, 2009), vaikka sarjakuvat ja visuaalinen ilmaisu voivat tehdä julkaisuja lähestyttävämmiksi.

Tutkimuksen perusteella opettajaopiskelijat (1) näkivät digitalisaation vastakohtien ja ambivalenssin kautta (hyvä ja hyödyllinen vs. paha ja vaarallinen) ja (2) korostivat ratkaisuna kriittistä medialukutaitoa, (3) hahmottivat ekologiset näkökulmat päänarratiivin ja vastanarratiivin kautta (”juurtuisi syvemmälle kuin pintapuoliseksi” vs. ”kaikkien ei tarvitse innostua”) sekä (4) korostivat toiminnan ja tekemällä oppimisen merkitystä. He asemoivat itseään tulevaisuudessa samaan aikaan sekä aktiivisina että passiivisina toimijoina.

Osa opettajaopiskelijoista puhui ekologisten ja yhteiskunnallisten kysymysten juurruttamisesta syvemmälle opetukseen. Kuitenkin eräs opiskelija esitti vastanarratiivin sanoen, että ekologisten näkökulmien ei tarvitse koskettaa jokaista oppilasta, eikä niitä ole edes mahdollista käsitellä hänen oppiaineessaan, matematiikassa. Opiskelija käytti oppiaineiden rajoja perustellakseen vastanarratiivinsa. Ylipäätään opettajaopiskelijoiden puheesta välittyi melko passiivinen suhtautuminen yhteiskunnallisiin kysymyksiin. Esimerkiksi digitalisaatioon liittyvät muutokset nähtiin vääjäämättöminä ja oman vaikutusvallan ulkopuolella olevina. Kuitenkin joitain merkkejä aktiivisemmasta asemoitumisesta löytyi, sillä opiskelijat korostivat toiminnan roolia. Tämä on tärkeä havainto, sillä pelkät asenteet eivät riitä kestävän elämäntavan rakentamiseen, ja monet koulutukselliset interventiot painottavat tietoa ja asenteita toiminnan sijaan. Lisäksi opiskelijat argumentoivat, että opettajien tulisi olla vahvemmin mukana koulujen digitalisaation kehittämisessä, ja pitivät kriittistä medialukutaitoa keskeisenä näkökulmana digitalisaation suhteen. Joitain merkkejä yhteisöllisestä, trans-

formatiivisesta toimijuudesta oli siis havaittavissa, mutta ambivalenssi säilyi: opettajaopiskelijat näyttäytyivät sekä aktiivisina että passiivisina.

Kolmannessa osatutkimuksessa tutkin haastatteluaineiston kautta sitä, millaisia kontekstisidonnaisia käsityksiä opettajaopiskelijoilla oli opettajaksi kasvamisen sosioemotionaalisista ja dialogisista ulottuvuuksista sekä vuorovaikutusosaamisesta pandemian aikana ja monialaisessa yhteistyössä. Lisäksi tavoitteena oli selvittää, miten he kuvittelivat opettajan vuorovaikutusosaamisen ja dialogisuuden tulevassa työssään. Analysoin myös jännitteitä kontekstisidonnaisten ja kuviteltujen näkökulmien välillä. Analyysimenetelmänä käytin refleksiivistä temaattista analyysiä (Braun & Clarke, 2021), ja sovelsin analyysissa ylirajaisuuden (*boundary crossing*) käsitettä (Akkerman & Bakker, 2011).

Tulosten kautta hahmottui kolme rajaa: (1) opiskelijan ja opettajan roolin välillä – tilanteisen ja kuvitellun välillä, (2) eri tieteenalojen välillä ja (3) etä- ja kasvokkaiskäytänteiden välillä. Kontekstisidonnaisissa näkemyksissään opettajaopiskelijat ylittivät tieteenalojen välisiä rajoja sosiaalisen yhteenkuuluvuuden tuella, kokivat *kynnyksen* etävuorovaikutuksessa, mikä tarkoitti, että osallistuminen ja muiden osallistaminen oli vaikeaa ja "ihmisten edessä oleminen" tuli hankalaksi, sekä ilmaisivat puheliaisuuden normia ja pitivät ujoutta tai hiljaisuutta negatiivisena. Osa opiskelijoista ilmaisi ulkopuolisuuden ja kuulumattomuuden ääniä.

Kuvitellussa tulevaisuudessaan opettajaopiskelijat kokivat vuorovaikutusosaamisen määrittämisen vaikeaksi, merkitsivät rajan osaavan ja ei-osaavan välillä pohtimalla haastavia tilanteita, ilmaisivat dialogisia ja monologisia näkemyksiä opettajien osaamisesta sekä kuvailivat opettajan osaamista jatkumolla, joka ulottui normatiivisesta ja "oikeasta" tavasta kohti joustavampaa näkemystä. Oppimismekanismit, joita tunnistin tieteenalojen rajojen ylittämisessä (ks. Akkerman & Bakker, 2011), olivat rajojen tunnistaminen, niiden reflektointi ja mahdollisesti uusien käytänteiden luominen tai käytänteiden muuttaminen.

Kontekstisidonnaisten ja kuviteltujen näkemysten välillä oli jännitteitä. Ensinnäkin opettajaopiskelijat ilmaisivat vahvan kontekstisidonnaisen puheliaisuuden normin, mutta korostivat kuvitellussa työssään erilaisuuden kunnioittamista. Toiseksi opiskelijat arvostivat koettua sosiaalista yhteenkuuluvuutta opettajankoulutuksessa, mutta ryhmätason yhteenkuuluvuus tai siihen liittyvät kysymykset olivat lähes kokonaan poissa kuvitellusta tulevaisuudesta. Tulokset korostavat kriittisen reflektion merkitystä ja tuovat esiin tarpeen painottaa opettajan osaamista avoimena ja päättymättömänä prosessina, jossa myös erilaisuutta arvostetaan.

Kokonaisuutena väitöskirjan tulosten perusteella hahmottui jännitteitä, jotka ovat keskeisiä opettajaksi kasvussa: dissonanssi (ajatusten väliset konfliktit ja ristiriidat), ambivalenssi (samanaikaiset ja ristiriitaiset asenteet) ja rajat (sosiokulttuuriset erot käytänteiden välillä). Rajoja oli tilanteisen kontekstin ja kuvitellun tulevaisuuden välillä, tieteenalojen välillä sekä etä- ja kasvokkaiskäytänteiden välillä.

Väitöstutkimukseni tarjoaa näkökulmia ja implikaatioita opettajankoulutukseen ja monialaiseen yhteisölliseen oppimiseen. Ensinnäkin opettajankoulut-

tajilla on merkittävä rooli dissonanssin luomisessa, mikä auttaa opettajaopiskelijoita haastamaan alustavia käsityksiään ja syventämään oppimistaan ja kriittistä ajatteluaan. Toiseksi sosioemotionaalinen tila, jossa on läsnä aktiivista kuuntelua, huumoria, avointa epämukavuuden ilmaisua ja metakognitiivista puhetta, voi edistää kriittistä ajattelua. Opettajankouluttajien rooli on keskeinen myös näiden tilojen luomisessa. Kolmanneksi ambivalenssi värittää transformatiivisen ja aktiivisen opettajan roolin omaksumista. Vaikka ambivalenssi voi olla rajoittavaa, se voi myös edistää reflektiivistä ajattelua. Liiallinen dissonanssi ja ambivalenssi voivat kuitenkin johtaa kielteisiin seurauksiin, kuten etääntymiseen koulutuksesta. Neljänneksi monialainen rajojen ylittäminen auttaa opettajaopiskelijoita reflektoimaan tieteenalakohtaisia käytänteitä, tunnistamaan kasvatuksen ainutlaatuisuuden, yhteisöllisesti neuvottelemaan ja reflektoimaan identiteettejään, ottamaan kantaa transformatiivisen opettajan rooliin ja kehittämään neuvottelutaitojaan, kriittistä ajatteluaan ja vuorovaikutusosaamistaan.

Opettajankoulutuksessa tulisi kiinnittää enemmän huomiota ulkopuolisuuden ja kuulumattomuuden kokemuksiin sekä kriittiseen pohdintaan normatiivisista ja dogmaattisista käsityksistä, jotka liittyvät toisiin ihmisiin ja opettajiin. Kontekstisidonnaisten ja kuviteltujen käsitysten rajalla tarvitaan kriittistä reflektiota. Opettajankoulutuksen järjestäjien ja päättäjien tulisi varmistaa tarpeeksi yhteisöllistä ja avointa tilaa opettajaksi kasvuun sekä riittävästi tukea ja vapautta opettajankouluttajille. Tulokset myös vahvistavat, että tuleviin kriiseihin varautuessa on tarpeen kehittää kattavaa ja laadukasta etäopetuksen pedagogiikkaa, kouluttajien osaamista sekä rakenteellista tukea inklusiivisille ja yhteenkuuluvuutta rakentaville käytänteille (ks. Carillo & Flores, 2020).

Teoreettisesti väitöskirjani luo uutta tietoa kriittisestä ajattelusta, vuorovaikutusosaamisesta ja dialogisuudesta suhteessa opettajankoulutuksen monialaiseen yhteistyöhön, yhteiskunnallisiin kysymyksiin sekä opettajaksi kasvuun pandemian jälkeen ja kriisien aikana. Tutkimukseni myös kehittää edelleen ymmärrystä tilanteisen ja kuvitellun välisestä rajasta. Metodologisesti tutkimus luo uusia avauksia videovälitteisen etävuorovaikutuksen ja -oppimisen tutkimiseen sekä edistää luovien ja narratiivisten menetelmien käyttöä yhteisöllisen oppimisen analysoinnissa.

Aineistona vertaisten väliset keskustelut voivat tarjota autenttisempia näkymiä käsityksiin kuin esimerkiksi kurssitehtävät tai haastattelut, joissa osallistujat saattavat vastata sosiaalisesti hyväksyttävällä tavalla. Jatkossa voitaisiin kuitenkin paitsi havainnoida opetustilanteita, myös hyödyntää muita aineistoja, kuten kirjoitettua reflektiota. Vastaavaa aineistoa olisi kiinnostavaa kerätä eri maista ja käyttämällä pitkittäisasetelmaa. Narratiivista tutkimusotetta voitaisiin soveltaa monipuolisesti erilaisten opetus- ja oppimistilanteiden tutkimuksessa. Jatkotutkimus voisi tarkastella vuorovaikutusosaamista ja kriittistä ajattelua erilaisista näkökulmista; esimerkiksi aktiivista kuuntelua olisi hedelmällistä tutkia opetusharjoitteluissa, luokkahuonevuorovaikutuksessa ja moniammatillisessa yhteistyössä kouluissa. Opettajien ja opettajaopiskelijoiden kriittistä ajattelua voitaisiin tarkastella suhteessa muuntuviin digitaalisiin ympäristöihin, kuten generatiiviseen tekoälyyn, sekä kriittiseen mediakasvatukseen.

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APPENDIX

INTERVIEW PROTOCOL

Background information

- What is your major discipline? Which subjects will you qualify to teach?

Interaction processes during the educational studies and online teaching in education

- How did you experience the online teaching in the Basic Studies in Education?
- Please describe a situation where you think there was quality interaction in online teaching.
    - Could you describe a highlight moment in terms of the interaction in the course [that focused on societal issues of education]?
- Please describe a situation that you found challenging in terms of interaction in online teaching.
- What are the features that make it easy for you to interact online?
- In your opinion, what does presence in online learning mean?
- How did you experience your own participation during the course [that focused on societal issues of education]?
    - What aspects influence your willingness/motivation to participate in online learning?
- How did you experience the functioning and interaction of your small group during the megatrend task?
- In which situations did you have your webcam off? Why? How do you feel about having a webcam on?
- How have you experienced "being face-to-face" in Zoom?
- How have you experienced your well-being in relation to online teaching?

Online teaching vs. face-to-face teaching; organization of educational studies

- To what extent have you had face-to-face teaching in your studies this spring?
- What kind of thoughts or feelings did you have when the transition to face-to-face teaching was delayed [during the third course in education]?
- In what ways, if any, has face-to-face learning been different from online learning, especially during the educational studies?
- How would you organize teacher education studies or your subject studies if you had the choice?

    - Online or face-to-face teaching? How?
- How do you experience the role of meeting other students between lectures?
- Are there some situations where you think face-to-face teaching is important? What kinds of situations?
- Are there some situations where you think online teaching is important? What kinds of situations?

Socioemotional competence

- What kinds of situations have you encountered in online learning that required socioemotional competence?
- What do you consider important or most important when it comes to a teacher's socioemotional competence?
- When you think of yourself as a future teacher, which areas of socioemotional competence would you like to develop during your studies (before entering working life)?

Closing questions

- What would you like to say to those who decide on the organization of studies and the future of university education/teacher education?
- What else would you like to say about the themes we discussed or anything else?

ORIGINAL PAPERS

I

CO-CONSTRUCTION OF KNOWLEDGE AND SOCIOEMOTIONAL INTERACTION IN PRE-SERVICE TEACHERS' VIDEO-BASED ONLINE COLLABORATIVE LEARNING

by

Auli Lehtinen, Emma Kostiainen & Piia Näykki, 2023

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Research paper

Co-construction of knowledge and socioemotional interaction in pre-service teachers' video-based online collaborative learning

Auli Lehtinen *, Emma Kostiainen, Piia Näykki

Department of Teacher Education, University of Jyväskylä, P.o.box 35, Fi-40014, Finland

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ABSTRACT

Building on social constructivist theory, this case study analyzed how pre-service secondary teachers co-constructed knowledge and expressed socioemotional interaction in online breakout rooms during a collaborative task. Video data was analyzed by content and interaction analysis. There was more higher-level knowledge construction than in most studies from asynchronous settings. Active listening and humor were thoroughly present. Talk about personal experiences occurred at both lower and higher levels of thinking. The teacher educator's visits to the breakout rooms and purposeful dissonance affected knowledge co-construction and socioemotional interaction. The findings will help in designing high-quality online and blended teacher education.

1. Introduction

In teacher education (TE), collaboration is essential since teachers need to both guide learners' collaborative learning and to collaboratively work as a professional learning community (García-Martínez et al., 2021; Muckenthaler, Tillmann, Weiß, & Kiel, 2020; Näykki et al., 2021). Collaborative learning has the potential to support learning as it requires participants to explain and reason their emerging understanding (Mercer & Howe, 2012; Van den Bossche et al., 2006). To reach a favorable atmosphere for learning, joint and socioemotionally positive interaction is crucial (Baker et al., 2013; Isohätälä et al., 2018; Kreijns et al., 2003). Recently, researchers have increasingly focused on how sociocognitive and socioemotional aspects of learning dynamically shape each other and teamwork outcomes (Baker et al., 2013; Hod & Katz, 2020; Isohätälä et al., 2020; Rogat & Adams-Wiggins, 2015). Learners, even in university contexts, often do not reach higher levels of knowledge construction, critical thinking, or argumentation (Isohätälä et al., 2018; Lucas et al., 2014), and collaboration can be disrupted by unregulated socioemotional challenges, such as overruling others' ideas or expertise (Näykki et al., 2014). Furthermore, although successful collaborative learning of small groups, involving negotiation and the co-construction of knowledge, has been proved beneficial for learning, studies of collaborative activity in schools show that genuine collaborative activity rarely happens (Mercer & Howe, 2012).

Online small group collaboration brings forth similar cognitive, motivational, and emotional challenges to those of face-to-face learning situations (Järvenoja & Järvelä, 2009), and, furthermore, other issues arise. Among these are reduced social and visual cues in interaction (Sherblom, 2010), physical and social distance, lack of reciprocity and a sense of community (Kreijns et al., 2003; Oittinen et al., 2022), problems related to technology and competencies in using them (Grammens et al., 2022; Oittinen et al., 2022), and fatigue associated with video-based interaction (Bailenson, 2021; Fauville et al., 2021).

Despite the growth of online education, there is limited research on synchronous video-based online learning (Mykota, 2018; Tyrväinen et al., 2021). In addition, little is known about university students' virtual teamwork processes (Ismailov & Laurier, 2021) and the teacher's role in guiding online collaborative learning. Within the field of TE, more research is needed about the affordances of online and blended modes (Perry et al., 2021). As societal changes, including continuing education, and future crises could increase the role of online education, it is important to better understand online collaborative learning and to develop pedagogical support for high-quality learning in online and hybrid TE.

The current study is among the first to use video data to explore small groups' collaboration in synchronous online breakout sessions. We focus on how pre-service teachers (PSTs) engage in knowledge co-construction and socioemotional interaction, as well as on the teacher

* Corresponding author.
E-mail addresses: auli.m.lehtinen@jyu.fi (A. Lehtinen), emma.kostiainen@jyu.fi (E. Kostiainen), piia.t.naykki@jyu.fi (P. Näykki).

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educator's role. The context is a synchronous online TE course focusing on societal issues of education and taught through Zoom sessions and breakout rooms.

2. Theoretical framework

2.1. Co-construction of knowledge in online collaborative learning

Promoting critical thinking is essential in TE (Lorencová et al., 2019). Its goals extend to learners' thinking skills and their effect at both the individual and societal levels – i.e., learners' ability to face global problems and to achieve "full expression of humanity" (Hager & Kaye, 1992, p. 27), as thinking is central to humanity. Researchers have debated over the different definitions of critical thinking (Lorencová et al., 2019). In the present study, we define critical, higher-level thinking through a social constructivist lens: as content, e.g., talk, that shows the application of cognitive and metacognitive skills through the collaborative process of negotiating meaning, where higher-level refers to the Vygotskian idea of higher mental functions, such as the use of mediating tools to have more "conscious control" over cognitive processes (Gunawardena et al., 1997, p. 409). In collaborative groups, the zone of proximal development can help mediate higher-level learning and thinking (Gunawardena et al., 1997; Smith, 1994). Social constructivists view an individual's learning as socially mediated and collaborative by nature (De Wever et al., 2010; Schrire, 2004). Knowledge is not transferred but co-constructed in an authentic, social context through interactive dialogue, questioning, and the improvement of ideas (De Wever et al., 2010; Scardamalia & Bereiter, 2003; Xie & Ke, 2011).

Thus, building on the social constructivist theory, we address higher-level thinking in TE through the five-phase interaction analysis model (IAM) by Gunawardena et al. (1997). The five phases of the *co-construction of knowledge* in the IAM are: (I) sharing and comparing of information, (II) discovering and exploring dissonance or inconsistency, (III) negotiating meaning or co-constructing knowledge, (IV) testing of proposed synthesis or co-construction, and (V) stating a summary of agreement, application of new knowledge, or metacognitive statements.

The IAM distinguishes between the kind of learning where participants only provide additional examples of ideas that are already understood, the so-called "pooling of knowledge," (lower level) as opposed to the "process of negotiation which must occur when there are substantial areas of inconsistency or disagreement to be resolved" (higher level) (Gunawardena et al., 1997, p. 413). Ultimately, the model asks whether knowledge is constructed through negotiation and whether participants create new understanding through interaction, hence, analyzing the "quality of the learning" (Gunawardena et al., 1997, p. 398). The phases have similarities with other conceptualizations of higher-level thinking, such as *critical thinking* (Gunawardena & Wilson, 2021; Newman et al., 1995), *cognitive presence* (Garrison et al., 1999), and the concepts brough forth by Mercer (2000), *accumulative* and *exploratory talk* (Onrubia & Engel, 2009).

In addition to considering its theoretical underpinnings, we selected the IAM to be used in the analysis since it has been theoretically and empirically validated in asynchronous online discussions and within instructional sciences (De Wever et al., 2006, 2010; Lucas et al., 2014) and implemented in student-centered collaborative environments (Buraphadeja & Dawson, 2008). Other analytical methods used in online discussions, for example, the community of inquiry model (Garrison et al., 1999), are more teacher-centered. The IAM has mainly been used in asynchronous online contexts, mostly within instructional science or TE (Lucas et al., 2014). With only a few exceptions, the results are similar to the ones obtained in the original study (Gunawardena et al., 1997): the proportion of higher-level, complex thinking is scant, while most discourse is at the lowest level of sharing information (Lucas et al., 2014). Overall, research is scarce on the co-construction of knowledge in synchronous video-based online learning, and, to our knowledge, the IAM has not been applied to such settings before.

2.2. Socioemotional interaction in collaborative learning

The second main concept in this study is socioemotional interaction. The role of socioemotional interaction in TE is manifold. PSTs' abilities and motivation to engage in socioemotional interaction contribute to their social and emotional competence as future professionals. Teachers' socioemotional competence is crucial as it affects teacher–student relationships, classroom management, and a healthy classroom climate, which all mediate students' social, emotional, and academic outcomes (Jennings & Greenberg, 2009). PSTs need opportunities for socioemotional growth, but studying online might deteriorate such opportunities (Carthy et al., 2022). Moreover, it is necessary for future teachers to understand and to support the socioemotional climate in collaborative learning (e.g., Isohätälä et al., 2018).

We define *socioemotional interaction* as interaction, through talk and nonverbal communication, that builds a cohesive and mutually respectful social and emotional atmosphere (Barron, 2003; Isohätälä et al., 2018), for example through the expressions of support and active listening. Socioemotional interaction affects participants' perceptions about social cohesion and psychological safety (Isohätälä et al., 2018). Strong social cohesion is positively related to student achievement (Hattie, 2009). Socioemotional interaction is also vital in supporting students' well-being, intrinsic motivation, and creativity (Boelens et al., 2017; Haerens et al., 2016).

Our focus is particularly on active listening, humor, expressing feelings, encouraging participation (Isohätälä et al., 2018; Kauffeld & Lehmann-Willenbrock, 2012), and self-disclosure (Hod et al., 2020). For example, active listening promotes positive interaction outcomes in education (McNaughton et al., 2008). Listening to the meanings of others is essential in collaboration, as highlighted already by Bakhtin (Remedios et al., 2012). Remedios et al. (2012) note that listening as a collaborative act might have been underrated due to the emphasis of learning through speaking. Active listening can be conceptualized in a variety of ways (e.g., Gordon, 2003); we focus on the expressions of attentiveness and listening through nodding and back-channeling, such as "mm" and "yeah" (Isohätälä et al., 2018). Self-disclosure, in turn, plays a significant role in relationship building (Song et al., 2019) and supports identity development (Davis, 2012). We view identities as constantly evolving and socially constructed perceptions of who one is, shaped by one's background, experiences, values, and beliefs (Davis, 2012; Ke et al., 2011). From a social constructivist perspective, learning cannot happen without opportunities to express one's identity within the social learning space (Ke et al., 2011). The potential of interaction for knowledge-building can be fostered "when opportunities encouraging students' emergent identities are embedded into the curriculum" (Delahunty et al., 2014. p. 243).

When studying collaborative learning in TE, we need to explore how cognitive, socio-relational, and affective dimensions relate to each other (Baker et al., 2013). Group research has a long history of concurrently exploring the "task function" and the "socioemotional function" (Brabender, 2010; Hod & Katz, 2020), with the former referring to appropriately pursuing the task and the latter to creating a comfortable and safe atmosphere. Baker et al. (2013) note that learning researchers have traditionally been biased toward the cognitive, at the expense of the affective. Recently, more attention has been paid to socioemotional dimensions of learning (Cress, et al., 2019; Hod & Katz, 2020; Isohätälä et al., 2018). Nevertheless, socioemotional processes are rarely examined as fine-grained sequential interaction in face-to-face groupwork (Jones et al., 2021), let alone in synchronous online interaction (Mykota, 2018). Studies analyzing affect in face-to-face collaborative learning have typically examined socioemotional phenomena for their role in serving the group's shared goals (Jones et al., 2021). We study socioemotional phenomena in relation to the "task function," but also acknowledge them as valuable in themselves.

2.3. Collaboration and interaction in video-based online learning

Social interaction and socioemotional processes are even more critical in computer-supported collaborative learning due to the features of communication, for example, chat form and restricted nonverbal information (Delahunty et al., 2014; Kreijns et al., 2003). In online environments, social and off-task communication are often neglected, and task execution is predominant (Kreijns et al., 2003). During an online lesson, it is not usually possible to exchange thoughts and feelings beforehand and afterwards (see also Grammens et al., 2022), although technologies should afford social and emotional aspects (Hod & Katz, 2020; Tarchi et al., 2022). Furthermore, turns are more likely to be minimally dialogic online (Delahunty et al., 2014). Monologic contributions can foster knowledge construction, but might discourage community building (Delahunty et al., 2014). University students have reported problems with reciprocity and connectedness, especially in the absence of video connection (Oittinen et al., 2022).

The use of web-cameras can reinforce social interaction by supporting shared attention and building a positive image of others (Castelli & Sarvary, 2021; Oitt inen et al., 2021). Video-based discussions enhance social cohesion and a positive learning climate (Grammens et al., 2022; Tyrväinen et al., 2021), reduce misunderstandings, and can make collaboration more productive (Clark et al., 2015). On the other hand, as Oittinen et al. (2021) note, the use of web-cameras might result in social anxiety and increased self-focus (Castelli & Sarvary, 2021). Recent studies have addressed the issue of "Zoom fatigue" (Bailenson, 2021; Nesher Shoshan & Wehrt, 2022), namely general, social, emotional, visual, and motivational fatigue in video-based meetings (Fauville et al., 2021). Another issue in videoconferencing is latency, which can make turn-taking frustrating and result in overlapping talks (Seuren et al., 2021).

Video-based collaboration can be facilitated using breakout sessions. A breakout session is an active learning method to engage a small group in collaboration within a larger class meeting (Lougheed et al., 2012). In video-based meetings, an *online breakout room* is a separate space where a small group can have a discussion before returning to the main meeting. They are used to enable a comfortable space for discussion (see also Reinholz et al., 2020). The instructor might be able to join the space. Some efforts have been made to study collaboration in online breakout rooms. For example, Saltz and Heckman (2020) studied how university students' team behavior changed when using structured activities in breakout rooms. Based on their observations, breakout rooms increased student-to-student interaction during and outside class. Structuring was considered useful.

2.4. Temporal perspectives to collaborative learning and the teacher's role

Collaborative learning evolves as a temporal process (Isohätälä et al., 2020; Reimann, 2009). Learning in a collaborative group means participating in a dynamic and constantly evolving social system, where everything builds on previous discussions and events, creating new opportunities for learning and participation (Mercer, 2008; Näykki et al., 2017). This is similar to the overall cumulative quality of the educational processes (Mercer, 2008; Reiman, 2009). The constant moment-by-moment fluctuations of, for example, emotions can play a key role in how learners participate and how they succeed in collaborative learning situations (Isohätälä et al., 2020; Näykki et al., 2014). Because the variables involved in collaborative learning interact in very complex ways, there has been a shift toward a more process-oriented approach, which seeks to identify features of interaction that are critical to learning and cognitive change (Mercer & Howe, 2012). Lucas et al. (2014) identify a research gap in visualizing interaction processes related to knowledge co-construction to provide more holistic insights into collaborative activity.

In online learning processes, the teacher's role is essential. However, there is a lack of studies exploring the teacher's role in guiding collaborative learning in video-based online sessions. According to Grammens et al. (2022), teachers' competences in synchronous online learning are relatively unidentified. In their systematic review, they found five teacher roles in synchronous settings: instructional, technical, social, managerial, and communicational roles. Contrary to asynchronous text-based interaction, teachers can intervene "ad hoc," providing more information and guiding the process. Important competencies include stimulating active learning, for example, using breakout rooms, facilitating social interaction, and creating a learning community (Grammens et al., 2022).

3. Purpose of the study and research questions

This study addresses several gaps in the research area. It is necessary to better understand how sociocognitive and socioemotional aspects of learning shape each other in technology-enhanced environments (Hod & Katz, 2020) and how online and hybrid modes afford learning in teacher education (Perry et al., 2021). More research is needed on video-based teaching (Oittinen et al., 2022; Tyrväinen et al., 2021), on knowledge construction in emerging learning environments (Lucas et al., 2014), and on critical thinking in university contexts (Gunawardena & Wilson, 2021). Finally, little is known on how teachers enact various roles in synchronous video-based learning (Grammens et al., 2022).

The aim of this study is to analyze the quality of knowledge co-construction and socioemotional interaction in a synchronous online TE course, specifically in Zoom breakout rooms. The research questions are.

1. What is the quality of co-construction of knowledge in pre-service teachers' breakout room discussions during a collaborative task?
2. What kind of socioemotional interaction do pre-service teachers express in breakout room discussions during a collaborative task?
3. What characterizes the temporal processes of knowledge co-construction and socioemotional interaction, and how does the teacher educator's visit to the breakout room influence these processes?

4. Methods

We implemented a naturalistic case study (Stake, 1995) to gain in-depth understanding of knowledge co-construction activities and socioemotional interaction within online breakout rooms. A natural design within a real-life setting can be considered ecologically valid (Lipponen et al., 2003).

4.1. Context

Data were gathered from January to April 2022 at a Finnish university during an online TE course that took place in Zoom due to COVID-19 restrictions. The course was part of pre-service secondary teachers' compulsory studies in education (60 EC TS), the focus in this course being on societal issues of education. In Finland, prospective secondary teachers from different disciplines usually become teachers for grades 7 to 9 (ages 13–16) and for upper secondary school or vocational school (ages 16–19), teaching one to three school subjects. This course was part of the PSTs' first academic year. The course design aimed at promoting collaboration in several ways, as PSTs worked in mixed subject groups and as course tasks involved small group collaboration. Students had worked in the same mixed subject groups during the fall of 2021, but in a face-to-face setting. The sudden changes to COVID-19 restrictions just before the start of the course furthered our interest in looking at online teaching during turbulent times, as the pandemic had influenced teaching practices for almost two years.

The main task in the course dealt with teachers as transformative agents in society. In small groups, students chose one global megatrend (e.g., Naughtin et al., 2022), such as digitalization, social and cultural

diversity, or consumer behavior. They were instructed to collaboratively answer the questions while working in small groups in Zoom breakout rooms: What makes this megatrend interesting in terms of education? How does it challenge educational traditions? How does it appear from the perspective of different school subjects? What kind of change would you like to bring to schools as transformative teachers? Based on discussions and reading of relevant articles, students prepared a presentation where the emphasis was on generating discussion among peers.

4.2. Data collection

Data were collected using video recording. The first author observed the Zoom main sessions in real time but did not enter the breakout rooms. Instead, the participants were asked to record them and send the videos to the first author after class. Participation was voluntary, and PSTs filled in a written consent form to confirm having received sufficient information about the research. Participants acknowledged that they were free to withdraw their participation at any time and without consequence.

We analyzed the processes of two small groups (n = 4 and n = 5 PSTs and one teacher educator). Participants were given pseudonyms, and their majors and ages are described in Table 1. Group1 worked on the megatrend "consumer behavior" and Group2 on the megatrend "digitalization." The durations of the analyzed breakout rooms were 33 and 54 min for Group1 and 33 and 47 min for Group2, yielding altogether 2 h 47 min of data. These groups worked during two Zoom sessions held on consecutive weeks (Fig. 1), discussing and planning the main task. The teacher educator visited each of the breakout rooms, with the visits varying from 5.5 to 10 min.

We chose the case groups and the situations after the first author broadly examined all the videos and observation notes from the main sessions and breakout rooms (12 h 15 min). The analyzed situations were chosen for several reasons: (a) they enabled analyzing longer processes of planning and meaning-making, as opposed to short breakout rooms; (b) the complete process was available for these two small groups; (c) the task was collaborative, open, student-centered, and process-oriented; and (d) themes were challenging and relevant regarding global megatrends.

Robin from Group2 dropped out of the course during the process and was present only during the first group situation. Robin did not have a web-camera on and contributed little (5.9% of the duration of the video). Dropping out is common for online learning courses (Strauβ & Rummel, 2021). Additionally, Laura from Group1 was present only during the second session.

4.3. Data analysis

We used content and interaction analysis in this study to demonstrate dynamic patterns of interaction and for making students' online learning visible (De Wever et al., 2006; Derry et al., 2010; Xie & Ke, 2011). The aim was not only to count the number of codings but to reveal phenomena below the surface (De Wever et al., 2007; Rourke et al., 2001).

Table 1
Participants.

Group1, consumer behavior megatrend		
Pseudonym	Major	Age in Jan 2022
Elias	Mathematics	20
Emma	History	not available
Laura	Educational technology	19
Nea	Finnish language and literature	20
Group2, digitalization megatrend		
Pseudonym	Major	Age in Jan 2022
Ida	English	20
Ella	Chemistry	not available
Sara	Mathematics	20
Sofia	English	not available
Robin (dropped out during the process)		

The small group was treated as the primary unit of analysis (Barron, 2003), along with individual contributions. Thus, our perspective is social constructivist while also considering individuals' actions (Xie & Ke, 2011). Individual processes are necessary but not sufficient when addressing collaboration (Arvaja et al., 2007). We argue that exploring both the small group and individual levels enriches the analyses. We coded the teacher educator's contributions with the same categories but treated them separately due to the teacher's different role.

The first author conducted the video analysis using qualitative data analysis software ATLAS. ti 22. Coding was done directly on the timeline of the video. The transcribe feature of Microsoft Word was used to automatically generate transcripts, which were read only momentarily alongside the video data to help return to specific moments.

4.3.1. Unit of analysis and video analysis process

Following Isohätälä et al. (2018, 2020), we selected 30-s segments of video data as units of analysis. Other similar studies have used 5-min segments (Sinha et al., 2015; Sullivan & Wilson, 2015). The segmented timeline has been considered a manageable framework for closely analyzing video data (Sullivan & Wilson, 2015). We chose 30 s since it is short enough to analyze small groupwork as fine-grained sequential interactions and long enough to observe different aspects of social interaction converging in the same episodes (Isohätälä et al., 2020). A total of 333 episodes of 30 s were analyzed.

De Wever et al. (2006) stress the importance of setting the granularity of content analysis by the choice of unit of analysis and linking the choice to the theoretical framework. The 30-s segments enabled us to analyze the flow of interaction and meaning-making processes, as phases of interaction are rarely clear-cut and as transcripts might not give justice to their complexity. This choice allowed exploring nonverbal communication as thoroughly embedded in talk (Jones et al., 2021; Richmond et al., 2012). Additionally, the same segment could be coded to various categories. Building on a social constructivist approach, such decisions are coherent with the Vygotskian idea that analysis should examine the activity as a whole and not isolated elements (Hull & Saxon, 2009; Moll, 1990). Thus, for example, the analysis of knowledge co-construction required profoundly examining the whole context, and gradual changes in collaborative thinking could be illustrated. Turn-by-turn coding within the 30-s segments was the basis for the analysis. This is explained in more detail in Section 4.3.2.

The analysis process was iterative. Through several cycles of viewing the video data and literature review, the main- and sub-categories were constructed. We used theory-driven categories but chose and modified them inductively. In computer-mediated communication research, the use and further validation of existing codes has been considered important, as it enhances replicability and validity (De Wever et al., 2006; Marra et al., 2004). The use of existing codes can be criticized for limiting the "analyst's sensitivity for what actually happens" (Mercer, 2004, p. 142). We considered this by not predefining codes before the analysis but by inductively choosing and modifying them in dialogue with data and literature.

4.3.2. Categories for the co-construction of knowledge

The co-construction of knowledge was analyzed using the IAM categories (Gunawardena et al., 1997), namely (I) sharing/comparing of information, (II) dissonance, (III) negotiation/co-construction, (IV) testing tentative constructions, and (V) agreement statement/application. First, levels of co-construction of knowledge were coded on an individual level, yielding altogether 654 codings.

When several participants spoke in the same segment, we coded one level for each of them. If a participant's turn went on for several 30-s segments, each of the segments were coded, but only with one level of co-construction of knowledge. In this way, the analysis unit resembled a

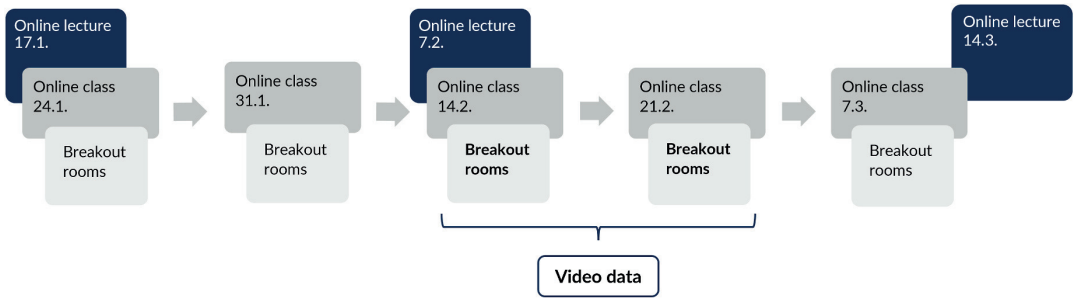

Fig. 1. The course design.

complete message used in asynchronous settings (De Wever et al., 2010; Lucas et al., 2014). Following De Wever et al. (2007), when the turn "comprises elements of two different levels of knowledge construction, the highest level was assigned" (p. 439). Thus, for example, when a student's turn lasted for 1 min 17 s, extended to three segments, and the student firstly expressed ideas on level I and then on level II, all three segments were coded to level II. This decision was made since often the meaning of the turn could be interpreted only by analyzing all the segments in which the participant spoke. Turns were considered separate when another participant contributed something in between them and not only reacted through back-channeling. All verbal contributions were coded according to the levels of knowledge construction, except for the back-channeling turns. At the group level, we assigned the highest level of individual codings to the segment.

4.3.3. *Categories for socioemotional interaction*

We explored socioemotional interaction with the following categories: active listening (Isohätälä et al., 2018), laughter or humor (Isohätälä et al., 2018; Kauffeld & Lehmann-Willenbrock, 2012), life outside (Hod et al., 2020), expressing feelings (Hod et al., 2020; Kauffeld & Lehmann-Willenbrock, 2012), and encouraging participation (Kauffeld & Lehmann-Willenbrock, 2012). We chose and modified the codes and their definitions in the process, vis-à-vis with the analysis cycles. The individual-level analysis of socioemotional interaction yielded 1309 codings.

We firstly coded socioemotional interaction at an individual level (e.g., laughter or humor/Laura), and codes were not mutually exclusive. This means that the same 30-s segment could receive several socioemotional codes, for instance nonverbal active listening and laughter or humor. Life outside and expressing feelings were coded to the segments in which they were explicitly mentioned.

Nonverbal data offer unique information and are less often analyzed as embedded in talk (Jones et al., 2021). In this study, we analyzed nodding, smiling, and laughter. The way participants used or did not use web-cameras formed an integral part of nonverbal communication in breakout rooms.

At the small group level, active listening and laughter or humor were coded for the segment when 50% or more of the PSTs expressed them, because they are elementarily reciprocal. The rest of the socioemotional categories were assigned at the group level when at least one PST expressed them. Table 2 shows both the individual- and group-level descriptions of categories. Grounded data examples for each code (individual level) can be found in Table 3.

Table 2
Categories of co-construction of knowledge and socioemotional interaction.

Category	Sub-codes	Individual-level description Participant …	Group-level description
Co-construction of knowledge	I Sharing/comparing of information	(see full description in Gunawardena et al., 1997) states observations or opinions, provides additional examples, or asks for clarifications	Highest individually coded level was assigned for the whole segment
	II. Dissonance	identifies cognitive dissonance, inconsistency, or disagreement; or restates one's position and introduces arguments (based on, etc., formal data, literature, or experience)	
	III. Negotiation/co-construction	proposes new co-constructions that embody compromise, or negotiates the meaning of concepts or the value of different arguments	
	IV. Testing tentative constructions	tests the newly constructed knowledge against personal understanding or other resources (e.g., literature)	
	V. Agreement statement/ application	summarizes agreement, applies the newly constructed knowledge, or expresses metacognitive statements	
Active listening	Verbal	signals listening by back-channeling turns, e.g., "mmm," "yeah" (not applicable when participant directly starts their turn, e.g., "yeah, yeah, I think …")	The segment was coded when 50% or more of the pre-service teachers expressed active listening (any sub-code)
	Nonverbal	signals listening by nodding	
	Nonverbal & verbal	signals listening by nodding and back-channeling turns	
Laughter/humor		shows amusement by laughing or smiling amusedly when something funny happens or is said; humor is inoffensive	The segment was coded when 50% or more of the pre-service teachers expressed laughter/humor
Life outside	On-task	shares or discloses details about one's life outside the community that are related to, e.g., experiences from school/education, or to other experiences; talk is related to task	The segment was coded when at least one pre-service teacher talked about life outside (any sub-code)
	Off-task	shares or discloses details about one's life outside the community; talk is not related to task	
Encouraging participation		addresses quiet participants, e.g., "What do you think, Anne?" "How about you?"	The segment was coded when at least one pre-service teacher encouraged participation
Expressing feelings		mentions positive, negative, or mixed feelings, e.g., "I'm so happy to see you," "I was afraid we would not be able to do this"	The segment was coded when at least one pre-service teacher expressed feelings

Table 3
Coding examples.

Code	Example
Co-construction of knowledge	
I. Sharing/comparing information	Emma: "how could it be, like, taken into the school world in an explicit way?" (I) Nea: "well, as a student of the Finnish language, it comes to my mind, that for example, some texts that touch the topic can be addressed in language arts, in such a way that it is not the actual theme, but it appears in it" (I); Nea: "before the next time we work on this, could everyone please make something like a synthesizing, like a mind map or something like that, so that there would be a basis from which to start" (I)
II. Dissonance	Emma: [reading instructions] "how does your megatrend challenge school traditions?" (I) Nea: "what is meant by school traditions?" (I) Emma: [reading instructions] "ways of thinking, procedures, background assumptions" (I) Nea: "well, I think that maybe it isn't exactly the case that this only applies to school, but rather this is more broadly, like, sort of a societal background assumption, this consumer behavior" (II, Identifying and stating areas of disagreement); Emma: "then when you think about that as well, what like, one should personally be like, it feels wrong, in a way, that students are forced to do things that one doesn't even personally do [as a teacher or adult]" (II, Identifying and stating areas of disagreement)
III. Negotiation/co-construction	Emma: "but that was actually a good point, that like, how the individual versus like the society, so, how could that kind of questioning be brough up in schools, like who's responsibility [laughter] it really is" (III, Negotiation of the relative weight to be assigned to types of argument; Identification of areas of agreement or overlap among conflicting concepts); Nea: "it came to my mind from that coffee cup example [by the teacher educator], that at school you could like, or when [the teacher educator] said one should like, or should that coffee cup be made from some other material which could be more easily, like, reused, recycled, etc., so could schools, in a way, encourage the development of new kinds of innovations which would then be more sustainable, and that kind of thing, because they don't just appear on their own, those more sustainable alternatives, could the school be such an environment that would, like, encourage the adults of the future to develop more ecological alternatives, and how could it be done" (III, Proposal and negotiation of new statements embodying compromise, co-construction; Proposal of integrating or accommodating metaphors or analogies)
IV. Testing tentative constructions	Nea: "but, like, could it be that consumerism has sort of like become a norm in our society?" (III) Laura: "yeah exactly, yeah, that was what I sort of tried to point out [Nea laughs], but just like, that it has become a norm that one has to" (I) Nea: "okay, yeah" [laughter] Laura: "and of course, from society's point of view, you can think about all that, in a way, where does the consumer behavior sort of like drive us, so like climate change affects society awfully lot, it affects the individual level, it affects the school level, but it also affects the societal level, if you think about something like taxation or something else like that, also bigger things" (IV, Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture)
V. Agreement statement/ application	Teacher educator: "what kind of ideas do you have on how it [ecological perspectives related consumer behavior] could be influenced?" Emma: "well didn't we think, sort of like, well, either that there would be a specific school subject or that it would be, like, brought along into every school subject, in some way, that kind of ecological thinking, or what is it, ecological civilization [laughter]" (V, Summarization of agreement(s)); Nea: "[the teacher educator] had some really good points, but somehow I feel like they were even, like, extra broad and somehow they completely emptied my own thoughts [laughing], and that individual level is indeed much easier, so when you start thinking about the societal level, and what can be changed there and how, well, it's like, it really, really, feels distant and somehow difficult" (V, Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction)
Active listening	
Verbal	"mmm"; "yeah"
Nonverbal	nodding
Verbal & nonverbal	"yeah" and nodding
Laughter/humor	
	Nea: "for instance, I terribly like buying things from flea markets or buying second hand from [an online secondhand service] and then, for example, my mom is always, like, why is it sold and is it broken and is there an infection or something else" [mimicking one's mother's talk and laughing]; smiling when something funny is said
Encouraging participation	
	Nea: "okay, how about the rest of you?"
Expressing feelings	
	Nea: "so nice that this group was formed, because I was afraid it wouldn't" [laughing]
Life outside	
On-task	Elias: "like some kind of, say, thematic days or such, they would be like, at least it came to my mind that we have had those in school"
Off-task	N/A

Table 4
Reliability of group level analysis (86 min).

Category	Krippendorf's alpha (n = 173)	Percent agreement
Co-construction of knowledge	.53	66.5%
Active listening	.77	88.4%
Laughter/humor	.80	91.3%
Life outside	.73	87.9%
Expressing feelings	.70	87.9%
Encouraging participation	.91	99.4%
Reliability of individual level analysis (33 min)		
Category	Krippendorf's alpha	Percent agreement
Co-construction of knowledge	.58 (n = 133)	71.2%
Active listening (with sub-codes)	.66 (n = 158)	77.3%

4.3.4. Reliability

The first author and a research assistant conducted an interrater reliability check at both the individual and group level coding (approximately 20% and 50% of the data, respectively). Before coding, the research assistant received 4 h of face-to-face training and read relevant articles (Gunawardena et al., 1997; Isohätälä et al., 2018). First, having coded one video, disagreements were fully resolved by discussion. The analysis scheme was elaborated, and more grounded examples were provided. Next, the videos were coded independently. After the independent coding, we identified a part where one particularly long turn was interpreted differently. Disagreements of knowledge construction (n = 11) were resolved. Then, we calculated inter-rater reliability at both the individual and group levels (Table 4). At the individual level, interrater reliability values were calculated for the categories of knowledge co-construction and active listening, as these categories are presented at the individual level in the results.

Krippendorf's alpha values for different categories were situated between .53 and .91, which represent fair to good agreement (De Wever et al., 2010; Neuendorf, 2002). Reliability of co-construction of knowledge was similar to earlier studies (De Wever et al., 2007, 2010). It does not deal with surface content but with hidden facets of social cognition (Rourke et al., 2001); thus, it was presumable its reliability would not be equally high. After the reliability check, the first author compared the codings and revised them where it seemed justifiable before coding the rest of the data (47 min).

5. Results

The results are presented according to the research questions. Firstly, we explore how PSTs engaged in knowledge co-construction (Section 5.1) and socioemotional interaction (Section 5.2) in the breakout rooms. In Section 5.3, we illustrate the temporal processes of knowledge co-construction and socioemotional interaction and the role of the teacher educator's visits. The groups are referred to as Group1 (consumer behavior) and Group2 (digitalization).

5.1. What is the quality of co-construction of knowledge in pre-service teachers' breakout room discussions during a collaborative task?

Four breakout room situations, comprising 333 segments of 30 s, were analyzed. First, we present the results at the small group level, and then at the individual level. Knowledge co-construction analysis showed that for both groups, most of the talk was at level I of sharing information or opinions, and level III of negotiation or co-construction (Table 5). A relatively small percentage of talk was at level II and at the highest levels IV and V.

During the first session, Group1 discussed more on the level III of negotiation and co-construction, their talk focusing often on defining the issue on conceptual level, whereas Group2's talk was less on the level of negotiation, and they focused more on sharing experiences (level I). In the second session, differences can be found most notably on level I. Group1 reached the higher levels more often, while Group2's talk was on the lowest level of sharing information for approximately half of the time. Nevertheless, for Group2, the proportion of level III increased when compared to their first session.

Focusing on the individual level, we discovered that the PSTs differed in their ways of contributing to the co-construction of knowledge, and this is visualized in Fig. 2. Contributions by two PSTs (Laura and Robin), one from each group, are not visualized in the figure since they were present only in one session.

Individual differences can be observed mostly in the overall amount of knowledge construction and in the extent to which participants engaged in dissonance (II) or higher levels of knowledge construction (III, IV, and V). Among the seven PSTs, Elias was the only one not having a web-camera on. Elias contributed notably less compared to the rest of the small group. The contributions by Elias and Ida were quite similar since both negotiated or co-constructed meaning (III) only in three or four 30-s segments. They did not engage in discussion on the higher levels, IV or V. Also Robin, who was present only in the first session, did not have a web-camera on and contributed very little.

Table 5
Co-construction of knowledge at the group level (% of time).

	Group1 Video 1 33 min	Group2 Video 1 33 min	Group1 Video 2 53 min	Group2 Video 2 47 min
I. Sharing/comparing	46.6%	57.4%	37.6%	51.1%
II. Dissonance	6.9%	6.6%	8.9%	6.8%
III. Negotiation/co-construction	37.9%	24.6%	34.7%	31.8%
IV. Testing tentative constructions	0%	6.6%	9.9%	8.0%
V. Agreement/application	8.6%	4.9%	8.9%	2.3%

5.2. What kind of socioemotional interaction do the pre-service teachers express in breakout room discussions during a collaborative task?

We present results firstly at the small group level, and then at the individual level. The proportions of socioemotional interaction at the group level are presented in Table 6.

Active listening was the most frequently expressed socioemotional aspect. Also, laughter and humor were frequently expressed in all sessions. The PSTs' first planning sessions differed in the extent to which they expressed laughter or humor, engaged in talk related to experiences from life outside (mostly about school), and expressed feelings. During the first session, Group2 shared experiences from life outside during more than half of the session time, as opposed to 16.7% of Group1. Interestingly, we observed no off-task sharing of personal life. Group1 expressed more laughter or humor, whereas Group2 expressed considerably more feelings. Participation was encouraged rarely or not at all. In the second planning sessions, socioemotional processes were more similar between the small groups.

At the individual level, the PSTs differed in their ways of contributing to socioemotional interaction. This is visualized through the category of active listening (Fig. 3) since it was the most frequently expressed socioemotional facet. Contributions by two PSTs are not visualized in the figure since they were present only in one session.

There were noticeable individual differences. For instance, Elias, who did not have a web-camera on and participated less in knowledge construction (see Section 5.1), also expressed less active listening. However, Elias did express verbal back-channeling though the use of the microphone. Overall, Elias expressed more active listening compared to another less active participant, Ida. Ida did have a web-camera on but used scarcely its affordances for nonverbal active listening. Emma differed from most PSTs by mostly expressing listening through verbal back-channeling.

5.3. What characterizes the temporal processes of knowledge co-construction and socioemotional interaction, and how does the teacher educator's visit influence these processes?

Both the knowledge construction and socioemotional interaction as temporally unfolding processes are presented in Figs. 4–7. The analytical focus is on the small group level. The occasions where the highest level of knowledge construction was by the teacher educator are marked with T. We use the pseudonym Jody for the teacher educator. We did not mark Jody's contributions on socioemotional interaction in the figures. First, we address the main findings of temporal processes in general, and then, we present an illustrative case example of how Jody's visit affected knowledge construction and the socioemotional climate (Section 5.3.2) (see Fig. 8).

5.3.1. Temporal processes

The temporal processes of knowledge construction and socioemotional interaction differed between the small groups. The main findings about knowledge co-construction processes were: (1) the teacher educator affected knowledge co-construction processes by expressing dissonance and asking for syntheses (2) sharing of personal experiences (life outside) occurred simultaneously at both lower and higher levels of knowledge co-construction, and (3) the use of multiple guiding questions helped PSTs in achieving higher levels of knowledge construction. The main results concerning socioemotional processes were: (1) active listening occurred simultaneously with both experiential and conceptual or synthetizing talk, but indications of active listening and laughter or humor diminished as the teacher educator expressed dissonance; (2) laughter or humor was thoroughly present in many phases, both in the teacher educator's and PSTs' talk, and (3) many aspects of socioemotional interaction were present throughout the processes. Next, we further explain these results. Findings about the teacher educator's role are presented in Section 5.3.2.

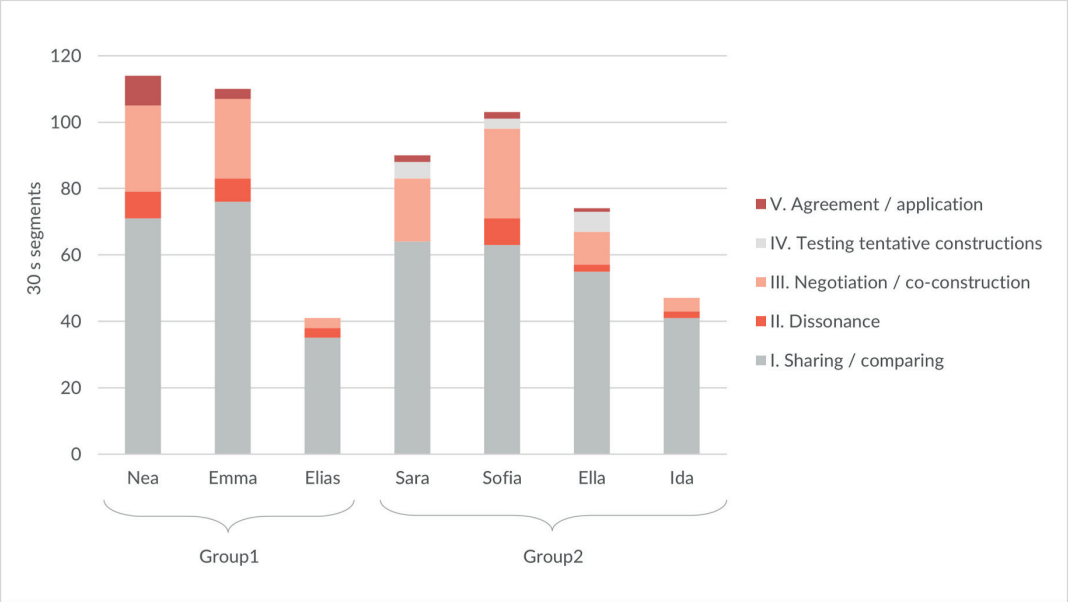

Fig. 2. Co-construction of knowledge in both sessions, Group1 (total 174 segments) and Group2 (total 159 segments).

Table 6
Socioemotional interaction at the group level (% of time).

	Group1 Video 1 33 min	Group2 Video 1 33 min	Group1 Video 2 53 min	Group2 Video 2 47 min
Active listening	57.6%	46.2%	60.2%	70.2%
Laughter/humor	40.9%	23.1%	37.0%	43.6%
Life outside	16.7%	53.8%	25.9%	18.1%
Expressing feelings	15.2%	46.2%	25.0%	20.2%
Encouraging participation	0%	4.6%	0.9%	0%

In Section 5.1, we showed that the overall quality of knowledge construction was of a lower level for Group2. This is also evident in the temporal visualizations. During the first sessions, Group2 reached higher levels (III–V) only after the visit by the teacher educator, whereas Group1's interaction fluctuated constantly between lower and higher levels. During the second sessions, Group2 reached the highest level only once (Fig. 7), while Group1 did so in six separate occasions (Fig. 6). When viewing video data alongside these figures, we observed that successful use of the guiding questions helped Group2 define their perspectives and reach higher levels of knowledge construction (Fig. 5 between 25 and 30 min).

In their first session (Fig. 5), Group2 shared more feelings and experiences related to life outside than Group1. In that session, talk related

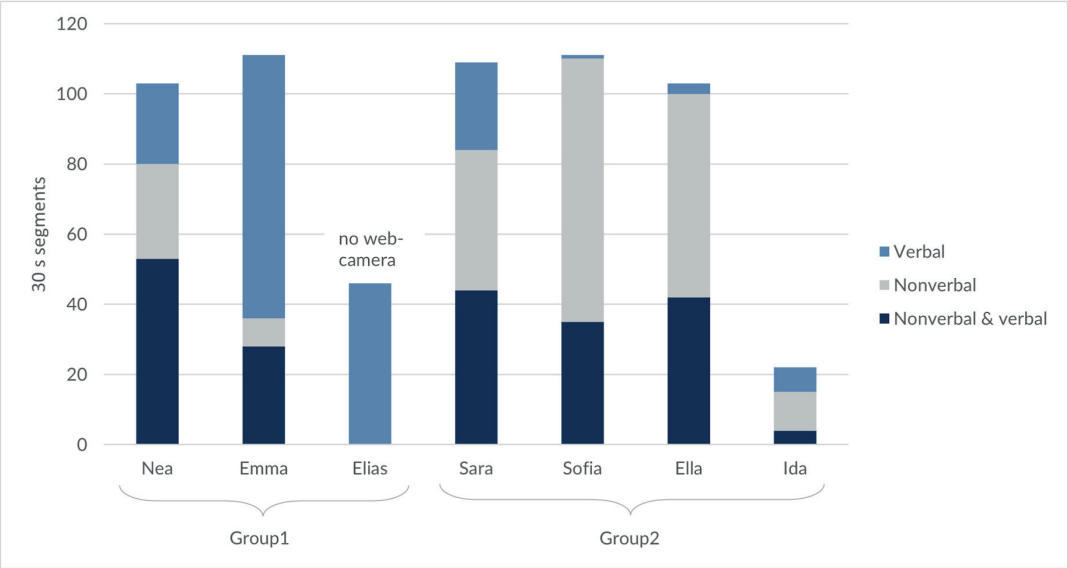

Fig. 3. Active listening in both sessions, Group1 (total 174 segments) and Group2 (total 159 segments).

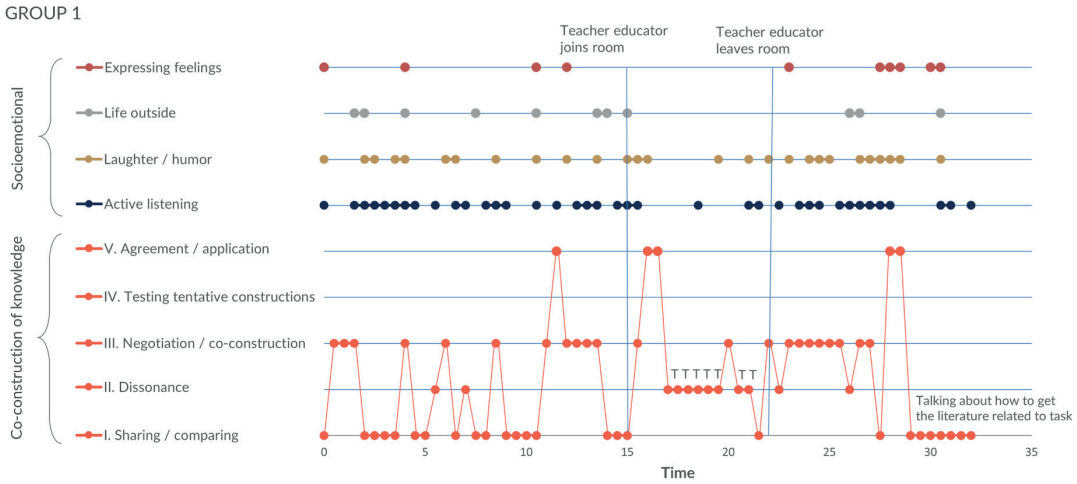

Fig. 4. Group1, first session.

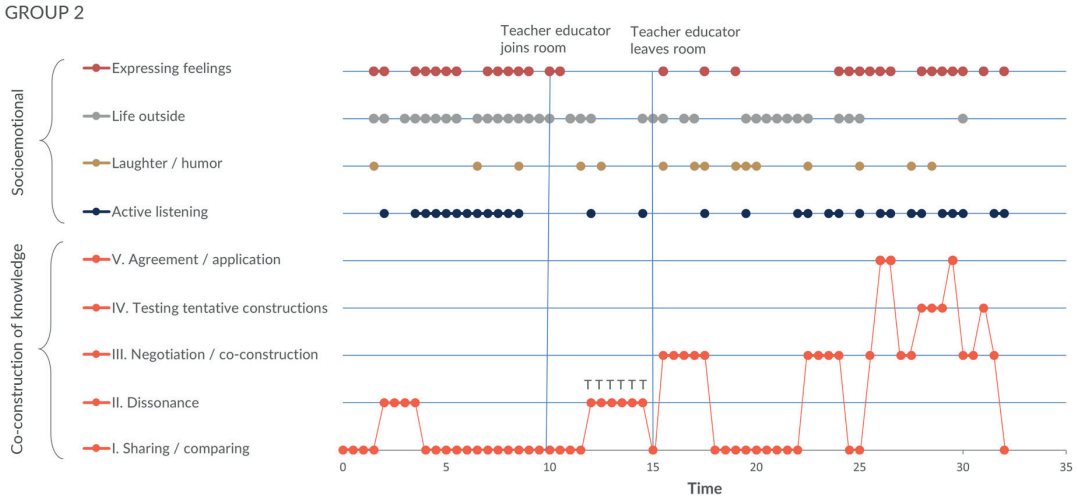

Fig. 5. Group2, first session.

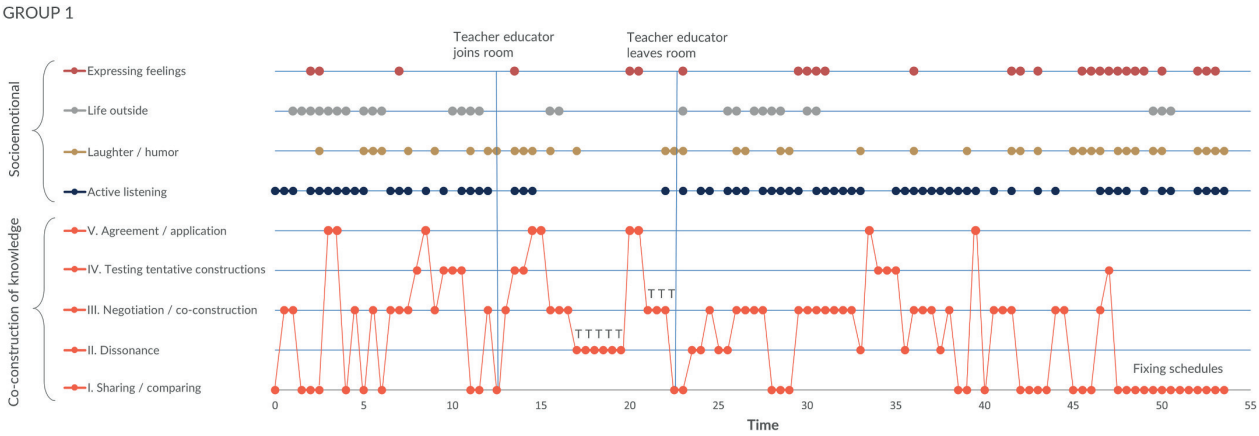

Fig. 6. Group1, second session.

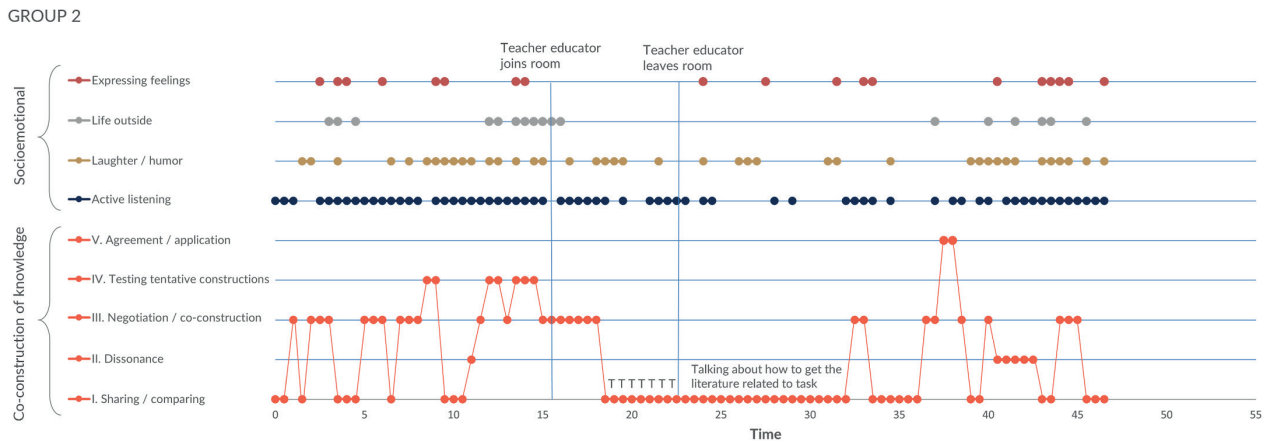

Fig. 7. Group2, second session.

Fig. 8. Nea, Emma, and Elias, and the teacher educator joining the breakout room.

to life outside occurred mostly at the level of sharing and comparing information (level I). In the beginning, while sharing experiences, Group2 also frequently expressed emotions. In other words, they shared personal experiences in an emotionally intensive atmosphere. Moreover, those moments were very attentive in terms of active listening.

This might lead to an idea that sharing subjective experiences can be motivating and emotion-filled but does not provoke higher-level thinking, at least directly. In the second session, as Group2 reached higher levels more often, they disclosed fewer experiences of life outside (Fig. 7), which might support that thought. However, in that session, the fewer life outside codes occurred more often at higher levels (especially IV). The definition of level IV supports this, as it includes testing the proposed synthesis against, for instance, personal experience or socio-cultural knowledge (Gunawardena et al., 1997). Furthermore, for the other group, Group1 (Figs. 4 and 6), life outside emerged at all the levels of knowledge construction—mostly I, but also many times with III, and marginally with II, IV, and V.

The first session by Group2 (Fig. 5) is interesting in terms of fluctuations of group level active listening. In the beginning, PSTs signaled active listening while sharing personal experiences. During and after the teacher educator's visit, active listening diminished. Again, toward the end, as the group's talk was mostly at the higher levels, there was more active listening. This reflects engagement on both the experiential level and the more conceptual level, or the phase of approaching a synthesis. Next, we illustrate how the teacher educator's visit influenced the processes of knowledge co-construction and socioemotional interaction.

5.3.2. "That was a lot of heavy stuff": how does the teacher educator's visit to the breakout room influence these processes?

In three out of four analyzed breakout rooms, Jody expressed dissonance, and during dissonance, there were less expressions of active listening. PSTs looked attentive but reserved. In some sessions, group level laughter was also diminished while Jody was present, but the changes were not as distinct as with listening. The second session by Group2 (Fig. 7) appeared different, as Jody did not bring out dissonance

but instead shared ideas (level I), and that resulted in considerably more active listening.

In the first session by Group1 (Nea, Emma, and Elias), we observed substantial changes both on knowledge construction and socioemotional facets during and after the teacher educator's (Jody's) visit to the breakout room (Fig. 4 between 15 and 30 min). Having joined the room, Jody silently observed for a moment. As the PSTs noticed Jody's presence, Nea advanced the conversation from an experiential level (I) to negotiating meaning (III) by asking "*so are we now choosing as a subtheme, how consumer behavior could be, like, brought up in schools and how that trend could be questioned?*" It might be that Jody's presence supported this synthesis. Then, Jody asked: "*would you like to tell me what the trend is that you want to address, I'll say in advance that I've been in all the other groups now sort of as a devil's advocate* [laughing], *throwing provocative statements, so, can you tell me what that trend is, that you would like to address?*" This question, in turn, elicited a summarization of agreement (V) as Nea and Emma explained that the group's focus had been on ecological sustainability. A similar pattern of Jody asking for a synthesis resulting in a summarization of agreement (V) also happened in their second session (Fig. 6).

Then, Jody brought dissonance (II) to the conversation; at this point, the PSTs' nonverbal interaction changed, and active listening diminished. In their statements, Jody quite multifacetedly expressed dissonance as described in one of the definitions by Gunawardena et al. (1997): restating one's position and supporting it by references to "experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view" (p. 414). Jody restated their position as a "*devil's advocate*" and referred to experiences (recycling) and formal data (climate change assessment report) and suggested a metaphor or analogy (different ways of relating to disposable coffee cups) to demonstrate that the PSTs should move the discourse from the individual to the societal level. Those segments were the rare ones in which there were no socioemotional codings or only one PST slightly nodding.

Only Emma contributed in between Jody's statements, by saying "*yeah, or that material is the source of a good life, that kind of thinking* [laughter]" (III). Reacting to that, Jody brought forth another opposing view (II) of how material has become like dirt that people try to get rid of and how minimalism has become popular. Jody encouraged participation twice during the visit, but responses were scarce, namely "mmm" or "no." Before leaving, Jody humorously referred to having stated ideas "*without listening to anything you had said before,*" to which Emma smiled.

Immediately after the visit, Elias said, "*well that was a lot …*" and Nea continued "*yeah, a lot of heavy stuff,*" and they all laughed together. However, the students then reacted to Jody's dissonance by co-constructing and negotiating meaning (III) and stayed on that level for quite some time. Nea elaborated the coffee cup metaphor used by Jody (see excerpt of level III in Table 3). After the longer episode of mainly level III (between 22 and 27 min), the group expressed metacognitive statements (V), saying that Jody's points of views were good but extra broad, and that they "*somehow completely emptied my own thoughts* [laughing]." They noted that the individual level was much easier, and the societal level felt distant and difficult. They shared many laughs while addressing the difficult nature of the task.

Contrarily to the illustrative example above, Group2 only occasionally explicitly referred to Jody's ideas after the visit in their first session (Fig. 5). This might be because Jody did not ask Group2 for a synthesis, but just started expressing dissonance after listening for a while. Nevertheless, we suggest that Jody's dissonance may have been essential for Group2 as well, since directly after Jody's visit, Group2 moved from an experiential level (I) to negotiation and co-construction (III) (Fig. 5, between 15 and 18 min). They started building on each other's views and negotiating about how to guide students in the future with regard to digitalization. Later (at 26 min), a PST talked about how Jody's statements affected their thinking and said, "*this is a really broad topic, there's a lot more to this than I thought*" (V, metacognitive statement), similarly to Group1. In sum, the teacher educator's visit was significant, but it seems that dissonance was partly difficult to take in.

6. Discussion

The aim of this research was to investigate small group collaborative learning in synchronous video-based online teacher education. This study has been one of the first to thoroughly examine small groups' collaboration in synchronous online breakout sessions with video data. We analyzed collaboration for both the knowledge co-construction and socioemotional aspects. Overall, the results show that first-year preservice teachers engaged in complex processes of knowledge co-construction while addressing the relationship between megatrends and education. Simultaneously, they maintained a positive atmosphere in which humor and other socioemotional aspects were thoroughly present. Groups differed in their processes of knowledge co-construction and in their expressions of feelings and talk related to personal life. We observed no off-task talk related to personal experiences. The teacher educator's visits to the breakout rooms affected knowledge co-construction and socioemotional interaction.

6.1. Knowledge co-construction in synchronous video-based collaboration in TE

In all the analyzed breakout room situations, the majority of knowledge co-construction was on the level I of sharing information. In one video, there was equally as much of level I as of level III. Only a small percentage of talk reached the highest levels of co-construction of knowledge, namely testing proposed co-constructions (IV) or summarization, application, or metacognitive statements (V). The proportions of knowledge construction levels are somewhat similar to the results from asynchronous text-based learning environments (Lucas et al., 2014). However, in this study with synchronous video data, there was more evidence of negotiating meaning (III) than in most previous studies (De Wever et al., 2007; Lucas et al., 2014). Furthermore, many previous studies have reported only 0–4% of levels IV and V (Lucas et al., 2014), and in this study, the proportions were slightly higher. We discuss features that helped PSTs in achieving higher levels in Section 6.2.

Prior studies in university contexts have concluded that online collaboration does not often progress beyond the first phases of knowledge co-construction, in other words surface or individualistic level of sharing information (Ke & Xie, 2009; Lucas et al., 2014; Rourke & Kanuka, 2009). Thus, deep learning, including synthesizing ideas, applying knowledge, or self-reflection and metacognitive notions, does not emerge regularly online (Ke & Xie, 2009). In addition, in face-to-face settings, university students commonly fail to engage in argumentative or critical discussions, even while reasoning and collaborative learning are supported (Isohätälä et al., 2018). However, based on our findings, we argue that PSTs in this context, in an online breakout room with a challenging collaborative task, were able to negotiate their understanding multifacetedly and with relatively high quality. Surely, there were phases in which especially Group2 would have benefited from "rising above" (Scardamalia & Bereiter, 2010), by synthesizing shared views on the complex issues more often. Additionally, the courage to express more dissonance and developing abilities to do it without threatening others' faces, for example, by using hypothetical suggestions and other ego-reducing moves (Asterhan, 2013; Isohätälä et al., 2018), could further enhance PSTs' knowledge co-construction. Avoiding tension does not foster critical thinking and might reduce opportunities for learning (Isohätälä et al., 2018).

From a different perspective, it has been argued that it is a common pattern that socialization and information sharing turns are numerous, while higher levels of thinking are fewer in number (De Smet et al., 2008; Ke & Xie, 2009; Xie & Ke, 2011). When it comes to problem-solving, a similar idea is embedded in the quotation attributed to Einstein, stating that if he were to save the earth in an hour, he would

define the problem for 55 min and solve it within the last 5 min (Neumeier, 2012). For TE students to understand the positions each one is coming from, a larger amount of information sharing might be necessary (Lucas et al., 2014). We observed this as PSTs disclosed numerous details about their subjective experiences, mostly regarding school and university.

However, we also found that sharing personal experiences did not only occur at the lowest level of knowledge construction, but also, on many occasions, with levels III and IV (and marginally with levels II and V). First, this is consistent with the definition of level IV, which includes testing the proposed synthesis against personal or sociocultural knowledge (Gunawardena et al., 1997). Second, this partly contradicts Ke et al.'s (2011) conclusion that experiential statements, demonstrating identity presence, are not tuned toward summarizing different perspectives and, thus, higher levels of knowledge co-construction. Either way, we value experience-oriented talk as it fosters engagement, motivation, and trust (Ke et al., 2011) and, in TE, reflections about how to be a teacher. One can hardly talk about meaningful or dialogic learning without the personalization of learning (Arvaja & Hämäläinen, 2021).

6.2. Features supporting higher-level knowledge co-construction

We observed features that helped PSTs in achieving higher levels of knowledge co-construction: (1) the teacher educator's visits to the breakout rooms and intentional dissonance, (2) the teacher educator asking for a synthesis, (3) the open-ended, collaborative task and multiple guiding questions, and (4) socioemotional atmosphere, enabling relaxed humor, expressing anxiousness toward the difficulty of the task, and metacognitive statements. Next, we discuss these findings.

The teacher educator's visits and their dissonance affected the PSTs' knowledge construction and led to metacognitive statements. This finding is in line with studies indicating that an instructor's intervention is needed in online discussions to reach higher-level thinking (Hull & Saxon, 2009; Ke & Xie, 2011; Rovai, 2007). Furthermore, the significance of dissonance (Gunawardena et al., 1997) and questioning (e.g., Lorencová et al., 2019) has been widely acknowledged. As Scardamalia and Bereiter (2010) put it, ideas are enriched through comparison, distinction, and recombination, and "to understand an idea is to understand the ideas that surround it, including those that stand in contrast to it" (p. 9). In this study, the teacher educator restated their position as "*a devil's advocate*" while bringing dissonance. Interestingly, in the coding scheme by De Smet et al. (2008), the highest stage includes online tutors "playing devil's advocate," which is defined as creating doubts and counterarguments. This was literally manifested in our case study.

Although interventions by the teacher educator were beneficial, another perspective is that students appreciate an online instructor being active, but "not so much that it will overwhelm their ability to interact with others" (Larson et al., 2019; Tyrväinen et al., 2021, p. 134). We observed that the PSTs' participation and expressions of active listening diminished while the teacher educator expressed dissonance, and that dissonance was partly overwhelming for them. Also, it was not possible for the teacher educator to decide when to intervene and pose meaningful questions, an aspect which Hull and Saxon (2009) consider essential in learning through dialogue online. That was due to the nature of breakout rooms, where one has to join the space right in the middle of the discussion. Yet, the teacher educator sometimes asked for a synthesis of the previous conversation, and that both elicited higher-level synthesis and seemed to have a positive effect on the uptake of the dissonance after the visit.

The nature and complexity of the task has been identified as a key variable in small group collaboration in university settings (Onrubia & Engel, 2009; Schellens et al., 2007). The open-ended collaborative task regarding megatrends and education proved to be fruitful in terms of both knowledge construction and reflections about teacher identity. It dealt with complex real-world learning problems, which reinforce deeper-level learning and critical thinking (Heo et al., 2010; Lucas et al., 2014). The given guiding questions were open-ended, which is linked to higher-level knowledge construction (Ke & Xie, 2009). Next, we discuss the overall socioemotional space in the breakout rooms.

6.3. The socioemotional space

The socioemotional space in the breakout rooms facilitated addressing the complex connections between megatrends and education, and this was visible, for example, in tension–relaxation (Andriessen et al., 2011) and in the directness in which the PSTs expressed anxiousness toward the difficult task (see Isohätälä et al., 2020). Also, the PSTs seemed to be motivated toward both sharing their experiences and co-creating new ideas. The results given in Section 5.3 shed light on how various socioemotional aspects evolved simultaneously with knowledge co-construction.

Interestingly, we observed no off-task sharing of personal life in the analyzed breakout rooms. This further supports the idea that in online environments, off-task communication is often neglected (Kreijns et al., 2003). This might lead to issues in creating a learning community, since off-task communication can be an essential part of intersubjectivity (Vygotsky, 1978), which builds relations between participants (García et al., 2020; Jones et al., 2022). However, identities and self-disclosure were present in task-related interactions. This is similar to Ke et al.'s (2011) finding indicating that "identity presence emerges with relationship-based learning interactions rather than interactions solely for the purpose of socializing" (p. 366). They suggest that such learning interactions can be supported by encouraging deep sharing of experiences and values. Questions related to values could have further facilitated this in the breakout rooms.

The online space made it possible to participate without a web-camera, which has previously led to problems with reciprocity among university students (Oittinen et al., 2022). In our study, the two students without a web-camera participated less in knowledge construction and active listening, yet the same was observed with another student using a web-camera. Individual differences are large, but the absence of a video connection makes it easier not to participate and more difficult for others to observe the emotional stance or attentiveness. On the other hand, there is some laboratory evidence (Tomprou et al., 2021) that audio-only communication can enhance pairs' equality of turns and, given that, help reach higher collective intelligence, as measured in a computer-mediated test. However, solving real-life collaborative tasks requires complex meaning-making in which the social space is starkly different to that of a laboratory setting or assessment by a test. Our study shows that when a video connection is not possible, the use of the microphone for back-channeling ("mmm," "yeah") can be essential (Section 5.2). This is contrary to the convention that encourages participants to mute their microphones in video-based meetings, even within a small group.

We believe that the observed relaxed and humorous atmosphere was partly due to the PSTs having worked together in a face-to-face setting previously. Knowing each other and creating a safe atmosphere where one can participate without the risk of being criticized or ignored are essential when striving to foster high-level knowledge construction (Lucas et al., 2014). Students were well familiarized with each other; a condition that may not have been possible in an online-only mode, as online environments eliminate many physical cues, reducing psychological proximity and familiarity between participants and potentially resulting in lower quality learning (e.g., Sherblom, 2010).

However, we also observed a lack of participation or low-level participation. Joint participation does not have to be totally continuous but sustained enough (Isohätälä et al., 2018). The PSTs could have encouraged each other's participation more often to help tackle the issues in video-based collaboration, for example, the lack of a web-camera. Although we concluded that the PSTs were able to engage in high-quality knowledge co-construction, we highlight the importance

of considering how online education, especially during crises, affects engagement, relatedness, and study burnout (Salmela-Aro et al., 2022). Our results reaffirm that in online settings, synchronous discussions are of value since they most closely resemble face-to-face interaction (Reinholz et al., 2020) and that perception of presence can be increased with a video connection (Clark et al., 2015; Oittinen et al., 2022).

Finally, although we addressed collaborative learning through defining lower and higher levels of knowledge co-construction, we appreciate the idea that intersubjectivity in collaboration starts from seeing the value of others, "appropriating different voices, really 'hearing' one another's points without rejecting one's own or other's differing voices" (Arvaja & Hämäläinen, 2021, p. 2). This was enabled in the socioemotional space between peer pre-service teachers.

6.4. Limitations and future perspectives

Despite exploring some regularities in the PSTs' collaborative learning, we acknowledge that the small sample limits the generalization of our results. However, the fine-grained analysis illustrates aspects of synchronous collaboration in breakout sessions that are largely uninvestigated. Also, analyzing interaction in real-life case groups means smaller datasets, since a fine-grained analysis of interaction and nonverbal communication is time consuming (Jones et al., 2021). This design could be adopted in larger-scale studies, multi-case study designs or other contexts. Other perspectives of socioemotional interaction could be examined, such as empathy (Hod et al., 2020). Active listening could be more thoroughly analyzed (Gordon, 2003; McNaughton et al., 2008) since we focused on attunement through back-channeling and nodding. However, the way PSTs built on each other's perspectives in knowledge construction provides a further insight into active listening. Moreover, the processes of knowledge construction could be analyzed using other methods, further analyzing the knowledge content, or considering additional aspects, such as teacher identity.

We drew conclusions of the features that supported PSTs' higher-level, critical thinking together, and about the ways in which socio-cognitive and socioemotional spaces were intertwined. Given the qualitative nature of our study, we cannot propose a causal relationship between the different facets of learning. We cannot be sure whether the socioemotional atmosphere influenced knowledge co-construction, or whether the stimulating experience of sharing ideas resulted in, e.g., laughter and humor. Future studies could further examine the relations between social, emotional, and cognitive facets in synchronous online collaborative learning, and how these relations influence higher-level knowledge construction. Additionally, different tasks could be investigated. Our results on knowledge co-construction might have been different had not the assignment been open-ended, since task complexity is a key aspect (Schellens et al., 2007).

We used observational methods in this study. Content and interaction analysis could be triangulated with self-reporting and learning outcome measures (Jones et al., 2021; Ke & Xie, 2009). Finally, we acknowledge that the larger proportions of high-level knowledge construction are partly due to our focus being on the group level, meaning that we assigned the highest level by the small group to each 30-s unit of analysis. This enabled analyzing and visualizing the overall quality of joint thinking and, as Barron (2003) notes, keeping the group as the primary unit of analysis provides new insights into how and why some discussions are more beneficial for learning than others.

7. Conclusion

The findings shed light on how knowledge co-construction and socioemotional activities are intertwined, and how to support the collaborative learning of future teachers. Theoretically, our study adds to the understanding of how online small group collaboration differs from face-to-face contexts, and what are the affordances of online breakout rooms for learning. The results also advance the field in simultaneously addressing both the small group and individual levels. Methodologically, our study gives insight on how the tools used in analyzing face-to-face and asynchronous online collaborative learning can be applied to synchronous online settings.

Implications such as favorable scaffolding strategies that promote synthesis and provide possibilities to practice critical thinking and negotiation will help to design high-quality online, blended, and hybrid TE. During their studies, PSTs learn not only *about* educational processes, but also *through* those processes. If collaborative learning is well designed and scaffolded in TE, it has the potential to make a difference in how future teachers adopt collaborative learning designs in their classrooms.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this.

Data availability

The authors do not have permission to share data.

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II

PRE-SERVICE TEACHERS CO-CONSTRUCTING NARRATIVES ABOUT THE FUTURE OF EDUCATION

by

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Pre-service teachers co-constructing narratives about the future of education

Auli Lehtinen, Emma Kostiainen, Anne Martin and Piia Näykki

Department of Teacher Education, University of Jyväskylä, Jyväskylä, Finland

ABSTRACT

This study examined the kinds of narratives that nine pre-service teachers shared in online collaborative learning discussions about the future of education in relation to global megatrends, namely digitalisation and ecological sustainability. We also analysed how they positioned themselves in the future of education. We used data-driven qualitative analysis and narrative analysis, and we report our findings partly as non-fiction comic strips. We found that the pre-service teachers (1) viewed digitalisation in education through antonyms and ambivalence, (2) emphasised critical media literacy, (3) viewed ecological perspectives through a main and counter-narrative (taking root more deeply vs. not everyone needs to get excited) and (4) emphasised the role of action. In terms of positioning, we found dynamic tensions between passive and active stances. We discuss our findings in light of teacher identity and education for democracy and sustainability. The results can be used as thinking tools in teacher education.

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Pre-service teacher identity; narrative analysis; digitalisation; sustainability; democracy education

Introduction

Societies today are confronted with a wide range of issues, such as climate change, global pandemics and rising inequality (Aly et al. 2022). Teacher education (TE) plays an important role in addressing them. Education alone is not enough to deal with these problems, but schools and teachers play a crucial role in securing a democratic and sustainable future (Aly et al. 2022; Kranz et al. 2022). Amid wicked challenges and uncertainty, pre-service teachers (PSTs) need to develop collective and transformative capacities (Brevik et al. 2019). This process is intertwined with PSTs' identity work (Akkerman and Meijer 2011; Galman 2009), as they need to negotiate how to incorporate an active, transformative facet as part of their teacher identity.

Identity negotiations may be tacit, taking place in situations that teacher educators cannot fully observe, e.g. during collaborative learning discussions, which is the context of our study. These sites may provide more authentic insights into conceptions than, e.g. written coursework or interviews, in which the likelihood of socially desirable responses is greater. Conversational, non-elicited stories differ significantly from those told during

CONTACT Auli Lehtinen auli.m.lehtinen@jyu.fi Department of Teacher Education, University of Jyväskylä, Jyväskylän Yliopisto, Jyväskylä FI-40014, Finland

interviews (Bamberg and Georgakopoulou 2008). We believe that these less-formal conversations between peers offer interesting opportunities for research. Little is known about the narratives that PSTs share in collaborative learning situations as they address wicked societal dilemmas.

In this study, we use a data-driven, narrative orientation to analyse PSTs' narratives during collaborative discussions about the future of education in relation to digitalisation and ecological sustainability. We also explore how PSTs position themselves in the future of education. Studying future-oriented narratives is important because stories not only build identities, but also motivate collective action (Mayer 2014). Narratives capture the complexity and multivoiced nature of PSTs' imaginative rehearsal (Goffman 1963), and via being concrete and accessible, bring practice closer and can be used as thinking tools in developing TE (Moen 2006). We report our findings partly as non-fiction comic strips, a medium that researchers rarely use (Tatalovic 2009). Our study's overarching concepts are presented in Figure 1.

Theoretical framework

Teacher identity as continuously negotiated and as a struggle

In this study, we define *identities* as narratively, socially and dialogically constructed perceptions of who one is (Arvaja, Sarja, and Rönnberg 2022). These perceptions are influenced by one's beliefs, background and experiences in social and cultural contexts (Arvaja, Sarja, and Rönnberg 2022; Gee 2000). Thus, both external and internal aspects establish the building blocks of identities (Lee and Schallert 2016). A dialogical perspective is consistent with sociocultural theories, suggesting that people construct their identities through patterned behaviour and cultural mediation (Akkerman and Meijer 2011). Identities are not fixed, but rather evolving and relational – continuously (re) negotiated during interactions with other people, institutions and groups (Akkerman and Meijer 2011). According to Gee (2000), people must engage in complex moment-by-moment negotiations to be recognised as, e.g. a certain kind of teacher.

Identity can be viewed as an answer to the question 'Who am I at this moment'? and in relation to others (Beijaard, Meijer, and Verloop 2004). When it comes to PSTs, one important question is 'What kind of a teacher do I want to be'? Thus, PSTs need to project

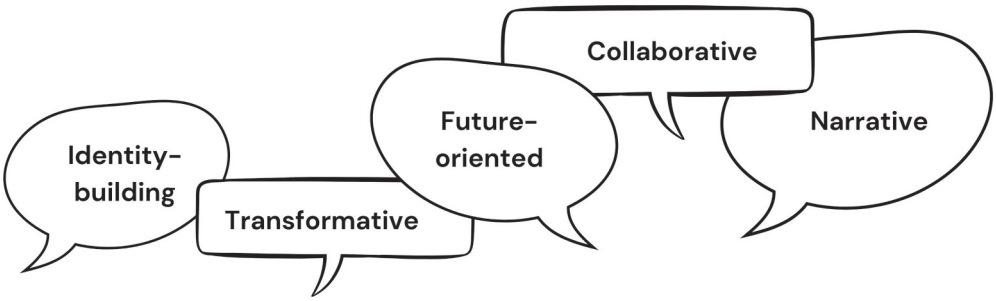

Figure 1. This study's overarching descriptive concepts.

their 'future possible selves' (Lee and Schallert 2016, 77) in the process of becoming a teacher. During TE, initial teacher images and conceptions of teaching are transformed into a more nuanced understanding of teaching and teacher identity as PSTs reflect on past experiences and current learning while imagining themselves as teachers (Lee and Schallert 2016).

We explore PSTs' evolving identities through positioning. By positioning oneself in relation to others and the social world, people narratively construct their identities (Arvaja, Sarja, and Rönnberg 2022; Wortham 2001). Arvaja, Sarja, and Rönnberg (2022) studied PSTs' personal teacher characterisations after pedagogical studies, focusing on how students positioned – voiced and evaluated – pedagogical studies and past school experiences in their narratives of themselves as future teachers. They found that PSTs differentiated themselves from an emotionally distant past teacher and positioned themselves as interactive and caring educators.

A dynamic tension often exists between PSTs' past, present and future, and with the various and sometimes-conflicting expectations and roles that PSTs are expected to undertake (Akkerman and Meijer 2011; Beijaard, Meijer, and Verloop 2004). Researchers have described this process of identity work as a struggle (Alsup 2006; Beijaard, Meijer, and Verloop 2004). For example, Galman (2009) portrayed two competing narratives that can be confusing for PSTs: one coming from a progressive TE faculty emphasising transformative, intellectual and agentic work for change, and the other the product of bureaucratic practice, in which teachers do not 'rock the boat' within the institution. The results suggested that dissonance, that is, conflict between opposing thoughts or stories, can act as a significant catalyst in teacher education and in PST identity development. Tensions can be troublesome, but also essential for learning, identity work and transformative learning (Akkerman and Meijer 2011; Mezirow 2000).

Similar to the two competing stories described by Galman (2009), Matikainen, Männistö, and Fornaciari (2018) depicted two opposing educational ideologies in TE: transformative vs. conservative. Transformative orientation has been highlighted in the context of changing societal needs (Matikainen, Männistö, and Fornaciari 2018), e.g. global megatrends. Furthermore, various narratives may conflict with PSTs' own personal stories as future teachers (Galman 2009). PSTs' identity negotiations have been linked to decisions about remaining in the field (Alsup 2006), as well as implementation of educational policy (Stillman and Anderson 2015).

PSTs as transformative, critical intellectuals in relation to global megatrends

The transformative perspective in TE draws attention to teachers' ethical responsibilities towards both society and students (Matikainen, Männistö, and Fornaciari 2018). Teachers' transformative capacity can be defined as breaking out of the given frame of action and advancing change, often due to conflict or a dilemma (Brevik et al. 2019). Both individual and collective attempts are required, and PSTs need to develop collaborative initiatives of transformative agency (Brevik et al. 2019).

In this study's context, challenging future issues are viewed through the concept of global megatrends. Australia's national science agency defined *megatrends* as 'trajectories of change that typically unfold over years or decades and have the potential for substantial and transformative impact' (Naughtin et al. 2022, 2). In their report, they referred

to John Naisbitt's definition of megatrends in 1982. Such megatrends included 'industrial society to information society' and 'centralisation to decentralisation', and the ideas have passed into common language (Slaughter 1993).

However, such accounts have been criticised. Slaughter (1993) examined various attempts to define megatrends and noted that many simplify the world during difficult times, thereby providing a false sense of security without critical thinking. He also criticised many of them for failing to make their intentions and worldviews clear. From a discourse theory perspective, Von Groddeck and Schwarz (2013) argued that megatrends can be viewed as empty signifiers due to being so overloaded and vague. They also stated that considering megatrends may freeze the discussion and increase blind spots.

Despite criticisms of the megatrend concept, we believe that there are well-defined and current societal perspectives in TE. These include education for democracy (Aly et al. 2022; Raiker and Rautiainen 2017) and education for sustainable development (Kranz et al. 2022; Lotz-Sisitka et al. 2015), that is, thriving for economic, social and environmental sustainability, as proposed by the United Nations' sustainability goals. Both education for democracy and sustainability are essential to building a sustainable future, and such development depends on educated and critically reflective governance and citizenship (Raiker and Rautiainen 2017). TE plays a key role in this (Aly et al. 2022).

In this study, we focus on two megatrends: digitalisation and ecological sustainability. In previous studies, only a small minority of PSTs understood digital literacy as requiring critically reflective technology usage, instead of focussing merely on technological aspects (List, Brante, and Klee 2020), and PSTs struggled with critical digital literacy while analysing online texts on social issues (Castellví, Díez-Bedmar, and Santisteban 2020). In terms of ecological sustainability, studies worldwide have found high levels of environmental awareness and pro-sustainability attitudes, but what is lacking in sustainability education is an emphasis on political literacy and civic action, e.g. collaborating with environmental organisations (Kranz et al. 2022).

Our study's context is Finnish TE. Previous research has indicated that education for democracy or active citizenship is not often central to Finnish teachers' perceptions of their work (Fornaciari and Rautiainen 2020) or within the school culture (see Männistö and Moate 2023). Fornaciari and Rautiainen (2020) interviewed Finnish primary teachers and found that they perceived active citizenship in terms of loose critical thinking and media literacy, while more concrete links to being active can be viewed as problematic because of their perceived political nature. Furthermore, Finnish TE has had a strong emphasis on didactics and psychology, rather than on societal facets or education for democracy (Furuhagen, Holmén, and Säntti 2019). In considering current education for democracy in Finland, Gretschel et al. (2023), through interviews and analysis of curricula, concluded that democracy education is not systematic and does not concern the whole community, and the same applies to TE. Their key suggestion was to make democracy and human rights education mandatory in TE.

Future-related talk and collaborative learning discussions as a site for narrative research

Narrative research has focussed heavily on prototypical narratives, that is, personal stories about past and nonshared experiences gathered through individual interviews

(Georgakopoulou 2006). According to Georgakopoulou (2006), 124), such a canonical approach can be viewed as 'deceptively homogeneous'. She described a field of research that takes a more interactional approach to narratives, analysing stories in everyday contexts. This 'small stories' approach aims to examine under-represented narrative activities, e.g. talking about future or hypothetical events (Georgakopoulou 2006). We are interested in how PSTs collaboratively narrate their future scenarios as teachers, similar to Bamberg and Georgakopoulou's (2008) formulation: analysing small stories to shed light on the processes of identities as 'in-the-making' or 'coming-into-being'.

Some scholars have argued that narratives must be backward-oriented, but Georgakopoulou (2006), 127) asserted that stories about future events, 'the joint piecing together of future scenarios', may be even more common and significant than narratives about the past. These imagined narratives draw on stories about past events, similar to the process of PSTs projecting their future selves (Lee and Schallert 2016) during TE. Galman (2009), building on Goffman (1963), described this as an 'imaginative rehearsal' in which TE plays a crucial role in transforming PSTs' personal stories to expand their repertoire of imagined possibilities for complex professional situations.

We identified a research gap in the use of narrative research orientation to study collaborative learning discussions. Some previous narrative studies on collaborative learning exist. Yukawa (2006) used narrative analysis to study collaborative critical thinking in an online course, focussing on dyadic, text-based collaboration. Narrative analysis was used to discover critical transformations (Mezirow 2000) in students' understanding. Yukawa found transformations in reflection narratives, which followed a plot structure that included addressing cognitive and emotional challenges. In some collaborative learning studies, personal narratives have been among the findings, but the methods have not been narrative. Aldemir, Borge, and Soto (2022) studied multicultural communication during shared meaning-making about politically charged topics. They found that grounding with personal narratives can be associated with productive dialogue and multicultural competence.

Dialogical perspectives provide another intersection of narrative orientation and collaborative learning. Arvaja and Hämäläinen (2021) argued for the need to reconceptualise 'productive interaction' in collaborative learning by focussing on its dialogical features. Although they did not use the notion of narrative, they highlighted Bakhtian views that embrace alterity, i.e. acknowledging difference and the multiplicity of voices. Indeed, Bakhtian ideas about dialogue are central to the narrative research approach (Moen 2006). However, narrative orientation does not seem to be very common within collaborative learning studies.

Finally, studying the narratives of the future of education is important because stories both build our identities and motivate our collective actions. According to Mayer (2014), a good story can evoke passions and reshape beliefs, including non-egoistic interests that can lead to collective action. Stories can transform us from audiences to actors in a way that our identities require that 'we do what the plot demands, do what is right, do what is moral' (Mayer 2014, 8).

Thus, we address the research gap related to PSTs' narratives about wicked societal issues and the use of narrative methods to examine collaborative learning discussions. We seek to explore PSTs' positioning, which can be seen as an integral part of their collaborative identity work (Arvaja, Sarja, and Rönnberg 2022; Wortham 2001).

The following research questions guide our study:

(1) What kind of narratives can be composed from PST groups' collaborative discussions about the future of education in relation to the digitalisation and ecological sustainability megatrends?
(2) How do PSTs co-construct their position in the future of education?

Methods

Context

This study's context was an online TE course (5 ECTS) that focussed on societal issues of education. The data were collected from January to April 2022 at a Finnish university. As the COVID pandemic situation worsened in the beginning of 2022, the course was moved to online learning and held on Zoom. The worsened situation caused almost all university education in Finland to move to distance learning. The course comprised online lectures and classes, as well as small group collaborations in online breakout rooms. We previously analysed video recordings of the same collaborative learning situations to study the phases of knowledge co-construction and socioemotional processes (Lehtinen, Kostiainen, and Näykki 2023). In the earlier study, we identified a need for further analysis, focussing on content and considering teacher identity.

The participants ($N = 9$) were pre-service secondary school teachers who were in their first academic year. The participants were majoring in various disciplines (see the next section for details). In Finland, secondary school teachers study for a master's degree that involves studies in their discipline(s) and compulsory pedagogical studies (60 ECTS). Finnish secondary school PSTs qualify to work as teachers at various education levels, usually secondary-level, upper secondary or vocational school. In our context, PSTs study education in multidisciplinary groups (including, e.g. students majoring in history, physics, English language, and Finnish language). The aim is to prepare for multidisciplinary collaboration in their future work.

The main task in the course, 'the megatrend task', dealt with teachers as transformative agents in society. Students formed small groups based on their interest in a particular megatrend. They worked collaboratively in Zoom breakout rooms on questions related to the relationship between the megatrend and education (e.g. how the megatrend is manifested from the perspective of different disciplines, and what kind of a change they would like to advance). They then prepared a presentation for their peers. Related readings included research articles from a critical perspective on digitalisation in education and sociologically oriented articles on sustainability and education. Although the course was moved to distance mode rather suddenly, the students mostly did not bring up the topic of online learning, even when discussing digitalisation. Instead, they talked about their past school experiences and about their views on the current state of schools. The teacher educator visited each of the breakout rooms and guided the discussions, e.g. by asking for a synthesis of the PSTs' discussion. In most situations, the teacher educator expressed dissonance or inconsistency among ideas. In our previous study, we found that such dissonance influenced PSTs' knowledge co-construction and led to metacognitive statements, thus helping PSTs to engage in higher-level thinking (Lehtinen, Kostiainen, and Näykki 2023).

Data collection

Video data were collected using Zoom's screen-recording function. Participation was voluntary, and written consent forms were collected. Participants acknowledged that they were free to withdraw their participation at any time. We studied the collaborative discussions (2 hours, 47 minutes) from two small groups ($n = 4$ and $n = 5$). The discussions took place over two consecutive weeks. The case groups were chosen after the first author examined all the videos (12 hours, 15 minutes) and observation notes from the course. The situations were chosen because the task was complex and collaborative, viewing teachers as transformative agents. Furthermore, data for the entire process was available for these two groups (Consumer Behaviour Group and Digitalisation Group). Table 1 presents the participants, their majors and ages.

Data analysis

We employed a data-driven qualitative data analysis (Miles, Huberman, and Saldaña 2020) and a thematic narrative analysis combined with a storyteller researcher position (Smith 2016). Furthermore, we used counter-narrative as an analytical tool (Heikkilä et al. 2022). We also were inspired by reflexive thematic analysis (e.g. Clarke and Braun 2018) in analysing the central organising themes. Reflexive thematic analysis has similarities with thematic narrative analysis. The analysis comprised of first- and second-cycle coding (Miles, Huberman, and Saldaña 2020). The first cycle comprised inductive coding that aimed to identify different aspects of the participants' values and beliefs, and the second cycle dealt with identifying narrative themes. The process is visualised in Figure 2.

The analytical process started with transcribing the data, yielding 70 pages of text (font size 12, line spacing 1.5). Next, the first author conducted the data-driven first-cycle coding using *values coding* and *descriptive coding* (Miles, Huberman, and Saldaña 2020). Value codes reflect participants' values and beliefs, thereby illustrating their worldviews

Table 1. Participants.

Pseudonym	Major	Age
Consumer Behaviour Group		
Elias	Mathematics	20
Emma	History	Not available
Laura	Educational technology	19
Nea	Finnish language and literature	20
Digitalisation Group		
Ida	English	20
Ella	Chemistry	Not available
Sara	Mathematics	20
Sofia	English	Not available
Robin (dropped the course)		

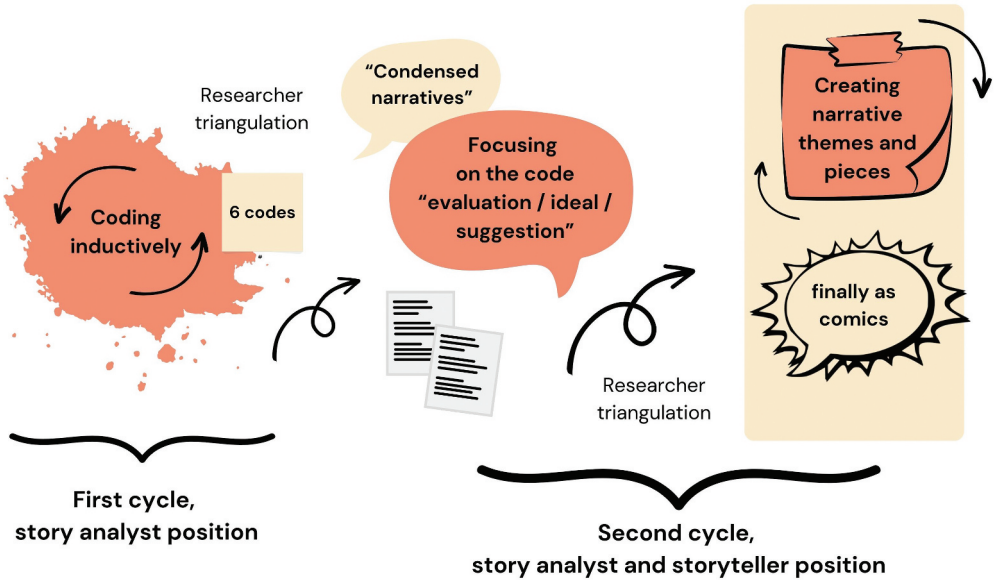

Figure 2. Analytical process.

(Miles, Huberman, and Saldaña 2020). During this process, qualitative data analysis software ATLAS.ti was used. The unit of analysis was a speaking turn. The first author developed the following inductive codes through an iterative process: (1) conception of schools' current state or future direction; (2) conception of society's current state or future direction; (3) personal experiences; (4) evaluation/ideal/suggestion of/for the future of education in relation to the megatrend; (5) conception of the relationship between phenomena and (6) the perspective of school subject(s). Data examples can be found in Appendix 1. We used investigator triangulation to evaluate the codes and grounded examples of them through discussions.

The same turn could receive various codes (usually one or two). The teacher educator briefly participated in the discussions, but the teacher educator's talk was not coded because our focus was on the PSTs' narratives. Moreover, turns that dealt with organising group work (e.g. fixing timetables) were not coded. The coded turns yielded 52 pages of transcribed text.

We also wanted to prioritise and respect the participant's voice (Miles, Huberman, and Saldaña 2020). Thus, the first author summarised each turn, keeping the wording as close to the original as possible. This allowed for having a condensed overview of the discussions.

During the coding process and through various cycles of reading the data, we decided to focus on the code 'evaluation/ideal/suggestion' because these turns also condensed or crystallised the meanings of the experience-oriented talk and the conceptions related to the current state of schools and society. Evaluative talk can be seen as a means of positioning and narrative identity work (Arvaja, Sarja, and Rönnberg 2022). In particular, the narrator can reinforce their positioning through evaluation (Arvaja, Sarja, and Rönnberg 2022; Wortham 2001), e.g. by distancing oneself from the characteristics of

others, such as a certain kind of teacher one does not want to become. Linguistically, Arvaja, Sarja, and Rönnberg (2022) pointed out similar features of evaluative talk that we recognised while coding, including explicit negative or positive evaluations (e.g. 'It's good that … ' in our data), evaluative verb forms ('should') or using future tenses and expressions ('as future teachers, we can … ', 'we would').

The next phase of our narrative analysis – already part of the second cycle – resembled what Smith (2016) called the perspective of a 'storyteller', in which the analysis takes places in a story, and the researcher retells participants' stories to share essential aspects of participants' experiences. Thus, the first author gathered all the summarised speaking turns that dealt with evaluation or ideal level of the future of education. The first author composed them into preliminary texts that indicated the values that PSTs gave to the megatrend's relation to education. Some phrases were excluded, as they did not answer Research Question 1. We termed these texts *condensed narratives*. During this phase, we recognised the need to use counter-narratives as an analytical tool (see Heikkilä et al. 2022). By voicing counter-narratives, people break socially and culturally established expectations and position themselves against the main narratives' ideologies (Heikkilä et al. 2022).

Through an iterative process of composing narratives and rereading them, the first author constructed themes that captured the essence of PSTs' narratives, much like main characters in the story we tell about the data, instead of collection pots of data domains (Clarke and Braun 2018). The themes were named after the phrases that PSTs used to keep them as close to their lived experiences as possible. We termed these *narrative themes* (Smith 2016).

Again, we used investigator triangulation to evaluate critically whether the themes corresponded with the data. The first author and two other authors read through the 'condensed narratives' and the coded data against the preliminary themes and evaluated them through discussions. We formed four final themes in the analysis. The Digitalisation Group's narratives were summarised by the themes of 'Welcome all changes with open arms, but still question them' and 'The most important thing is media literacy'. The Consumer Behaviour Group's narratives were condensed into the themes of 'To take root deeper than on a superficial level' and 'Not everyone needs to get excited', the latter being a counter-narrative to the former. During the iterative process, various antonyms were identified, e.g. active vs. passive stances, which guided the analysis of positioning (see also Arvaja, Sarja, and Rönnberg 2022).

As a result of the two-phased coding cycle and narrative analytical process, the first author composed dialogic and narrative pieces to illustrate the themes. During this phase, the first author repeatedly reviewed the data to ensure that the meanings in the narrative pieces were rich enough and consistent with the data. In most cases, wordings were added. These dialogic pieces were seven pages long altogether. To capture the main meanings within the dialogic pieces, the first author created three non-fiction comic strips (see Tatalovic 2009). In this way, data excerpts are presented within the comics, which were created using the online graphic design tool Canva (credits in Appendix 2).

Even though researchers largely and 'somewhat unfairly' have ignored comics as a medium (Tatalovic 2009, 2), we viewed them as suitable because they visualise collaborative discussions' essential dialogic nature. Tatalovic (2009) defined 'science comics' as aiming to communicate science or inform about a scientific concept or theme. Visual and artistic expressions can bridge connections between narrative, experience and meaning (Bochner and Ellis 2003).

Results

PSTs' narratives about the future of education

Digitalisation: 'Welcome all changes with open arms, but still question them'

The recurring pattern in the Digitalisation Group's discussions was an ambivalent stance towards digitalisation in education. It could be described as evaluating the phenomenon as having a dualistic character: good and useful on one hand, and worrisome and dangerous on the other. Sofia emphasised that digitalisation and education involve 'so many challenges' as to how to keep children off of unwanted websites, whether the ability to concentrate deteriorates and what happens to learning outcomes. Ella summed up the discussion and the 'million aspects', including digital materials in schools, media literacy, mobile phones' ubiquity in children's lives, online bullying and self-esteem issues due to social media, along with the notion that, on the other hand, 'it is such a good tool' and it is highly used in education and working life.

Sofia, Ella and Sara expressed the same hesitant and ambivalent position towards digitalisation and the future of education. Sofia voiced the most antonyms: positive vs. negative; plus vs. minus; good vs. bad; useful vs. dangerous and poor. Sara explicitly suggested that what they can do as future teachers in relation to this change is to 'welcome all changes with open arms, but still question them'. This narrative is illustrated in the dialogic piece created as a comic strip (Figure 3).

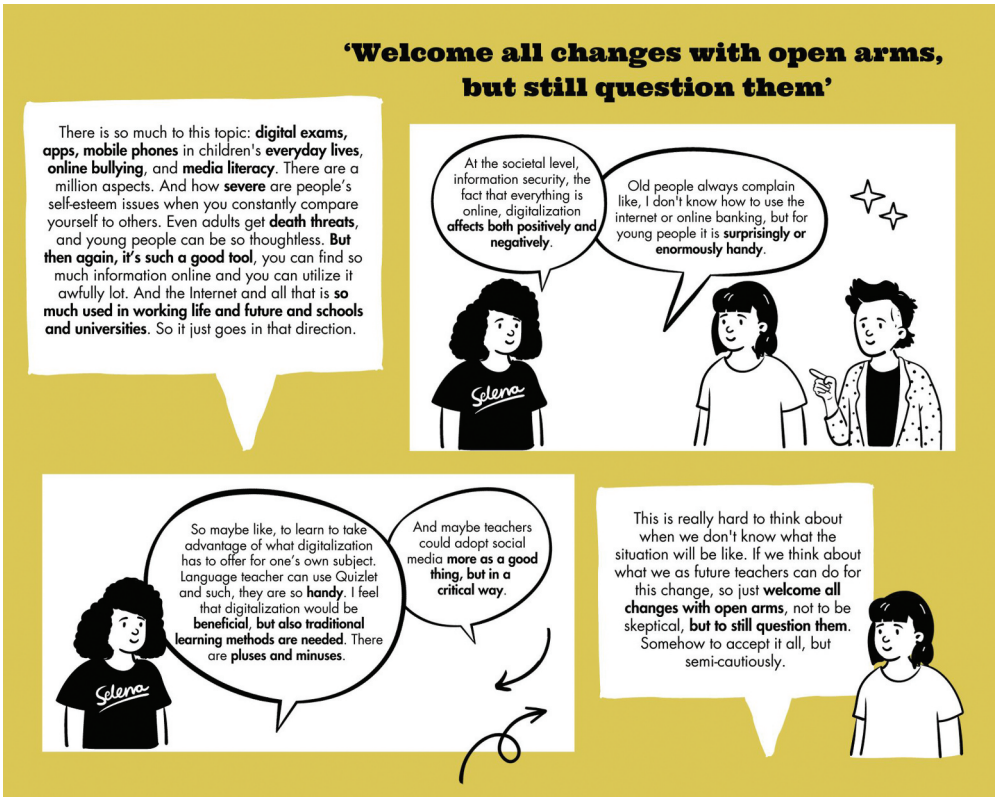

Figure 3. Digitalisation group, first narrative.

Digitalisation: 'The most important thing is media literacy'

The second theme captures the Digitalisation Group's shared understanding that media literacy is key to the future of education. It is the answer to the negative and, as we saw in the previous theme, even dangerous influences of digitalisation. The idea of media literacy and critical media literacy continued to emerge throughout the discussion. Students then took the analogy of 'home economics' teaching and applied it to teaching media literacy. Home economics is part of the Finnish national core curriculum and is compulsory in secondary education, usually for ages 13–14, then optional after that. The aim is to teach competencies required for everyday household management and a sustainable and well-being-promoting lifestyle. Students learn cooking, cleaning and consumer rights and responsibilities.

In the discussions, home economics was viewed as something that represents learning hands-on life competencies, similar to the idea of learning by doing. The analogy of home economics seemed to be supported by the whole group. While discussing the analogy, Sofia described how she learned many things from TikTok, including 'life skills', because she can look for the 'proper things vs. hoaxes' and 'reasonably consider' them. She concluded that teachers could use social media in a more positive, but still critical, way (see previous theme). Sara suggested that in basic education, pupils could administer a social media account to 'learn together how it affects [them]'. Sofia noted that this is already done often and that it involves data and information security aspects, but it would provide an 'opportunity to learn in a different way'. Another perspective presented was that media literacy should be embedded in all subjects. Sofia also stated that teachers need to keep up with their own 'critical thinking skills and media skills'. The media literacy narrative is illustrated in Figure 4.

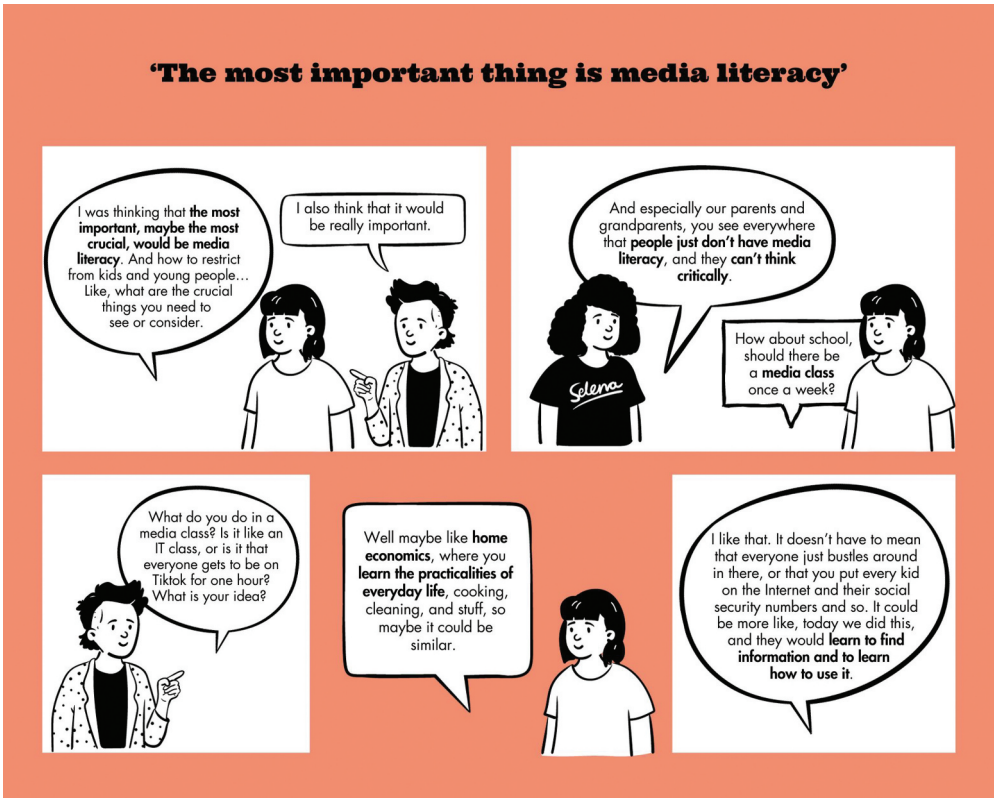

Figure 4. Digitalisation group, second narrative.

Ecological sustainability: 'To take root deeper than on a superficial level' vs. 'Not everyone needs to get excited'

The narrative theme of 'To take root deeper than on a superficial level' manifests the Consumer Behaviour Group's ideas on the dilemma of really making a difference in ecological thinking through education. Nea voiced the group's core issue and question: 'What interests me is that today's society is so, so centred around consuming. Everything kind of revolves around it […] and it's not terribly sustainable. And in teaching, how could this be considered, so that the new generations would grow up to be less consumer-oriented'?

They concluded that through education, they wanted to question the consumerism trend. A recurring pattern emerged: Emma repeatedly stated the antonym of bringing a deeper change and more profound thinking, as opposed to superficial intentions and 'preaching'. Nea and Laura echoed this, as they rephrased the main ideas of their group, e.g. Laura summarised how their discussions had focussed on ecological perspectives and sustainable development, and how to facilitate the ecological aspect of consumer behaviour. Nea also said that in schools, these perspectives should be brought forth in a way that 'pupils would adopt it as part of their lives'. Furthermore, Laura asserted that it would be important to view ecological thinking or ecological civilisation 'as a broad enough matter' within the particular school subject, outside of the subject and even as a potential new school subject.

One angle of the 'deeper' narrative was focussing on action vs. knowledge. For instance, the group discussed 'theme days' (i.e. days that focus on an integrative theme, e.g. well-being), which Elias suggested as one pedagogical solution. Nea said that she hated theme days because they were poorly organised. Emma continued by saying, 'Yeah, but I guess there should be some sort of an activating part as well'. Elias agreed: 'Yeah, absolutely, that you do something yourself'. They also emphasised 'doing more concretely these things', e.g. through a zero-waste campaign. Laura summarised the difficult paradox of knowing what would be for the good and not acting accordingly:

> On an individual level, it is, of course, so easy to say not to consume, not to buy, not to do this, not that, but how can we, like, influence the individual? In my opinion, that's what makes it **such a difficult thing, that it's clearly not enough that we share the theory** that these things are bad things because for some reason, **we still don't act accordingly**. […] **I don't even know how I could influence my own behaviour**, like, in a really permanent way. There are periods when I'm, like, OK, now I'm living super according to sustainable development, but then a month later, I've completely forgotten about it.

Emma, Nea and Laura seemed to share the narrative of 'taking root deeper', while Elias voiced a counter-narrative. On various occasions, he said that in mathematics, his discipline, it is not necessarily possible to address these issues, arguing that 'probably in mathematics, you focus on mathematics and leave those things, focus on this consumer behaviour in other subjects'.

In addition to viewing the teaching of mathematics as detached from ecological perspectives, Elias said that these themes need not touch every pupil, which we interpreted as being part of Elias' counter-narrative. While Nea talked about whether schools could be environments that encourage future adults to innovate more ecological alternatives, and Emma voiced ideas about eliciting deeper thought and change, Elias

answered, 'Not everyone needs to get excited, but if you could get some excited and then offer them more information or something like that'. The group's main narrative and Elias' counter-narrative are illustrated in Figure 5.

PSTs co-constructing their position in the future of education

As ambivalence and counter-narrative were central to our findings, we also began to see the narratives and positioning through antonyms. These included passive vs. active orientations to change, as well as individual vs. societal perspectives, subject-oriented action vs. action embedded in the whole operational culture and challenge vs. solution (see Figure 6). Such antonyms formed dynamic tensions within the collaborative narratives, and the societal position was difficult for PSTs. In this section, we focus mostly on the passive vs. active positioning.

Both groups talked about how **little power** they, as teachers or individuals, will have on societal matters. The Digitalisation Group discussed how difficult it is to anticipate developments and how they should just 'accept it all, but semi-cautiously' (see Figure 3), as Ella stated:

> Of course you need to be critical and [consider] what is too much. But then again, **it's a fact that all the time, this situation just goes more to the, like, digital thing**. Help me, I can't speak, but all the time, more and more of those things are done on the Internet. So yeah, it's

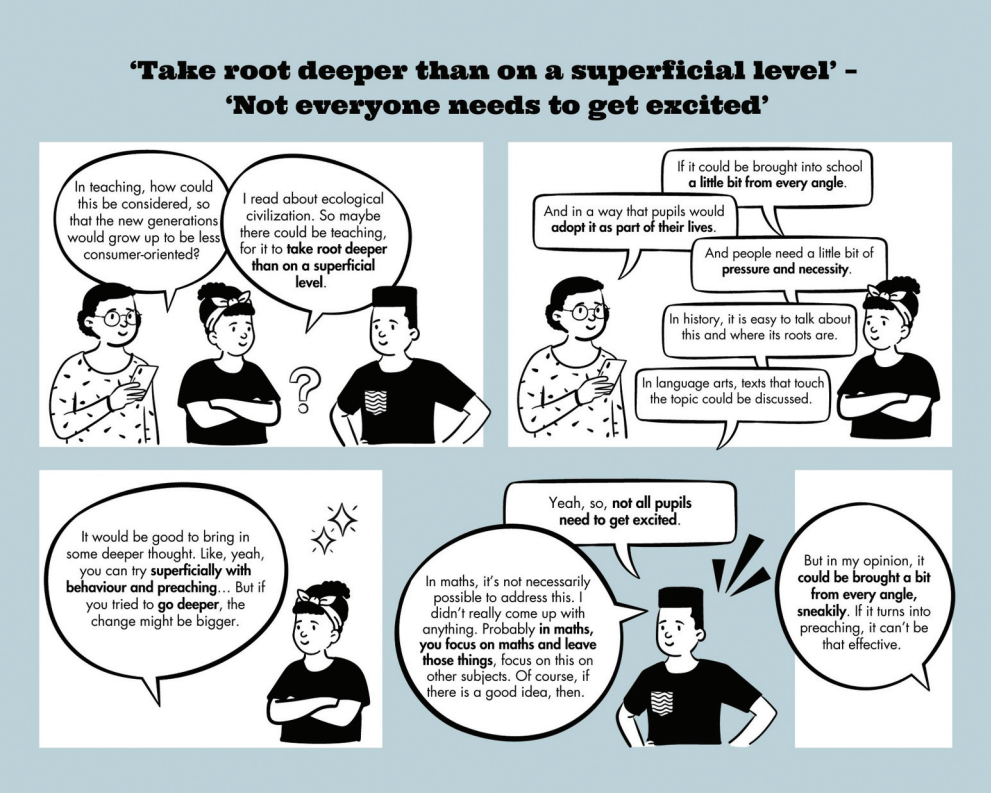

Figure 5. Consumer behaviour group, narrative and counter-narrative.

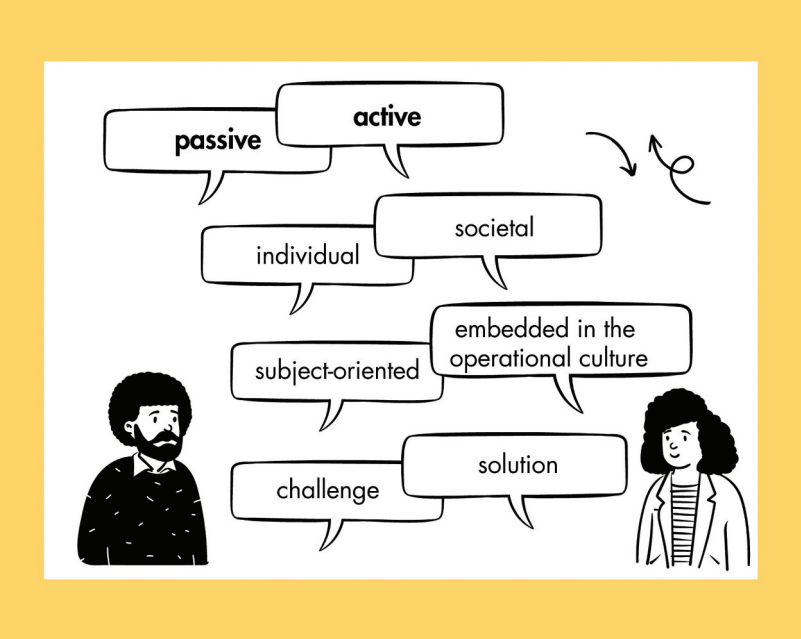

Figure 6. Antonyms found in the narratives.

> pointless to forcefully try to be like, 'I think none of it is good' because **you, as the only single person, can't prevent it anyway.**

This seems to reflect a certain kind of technological determinism, in which changes just happen and, as Sara stated, 'you just go along with that change'. The group also described, in several instances, how mobile phones have become 'extensions of the hand' and have 'grown into the hands'. They considered how difficult it would be to limit the use of mobile phones, the Internet and other technology in education.

In a similar vein, the Consumer Behaviour Group expressed the difficulty in influencing ecological perspectives 'solely at school'. The following excerpt is from the moment when the teacher educator is having a discussion with the group and has introduced some perspectives related to transversal competencies and identity work through consumption:

> Emma: This topic is **so difficult because this is so, like, outside the school**, that it's so strongly related to everything in the environment, and …
> […]
> Laura: Exactly, that **we alone in the school are not able to influence that issue**, but …
> Emma: Yeah, that it should be on the whole socie- or like …

Later in the conversation, Nea said that she was 'terribly distressed' about the difficult and abstract topic. This evoked thoughts about being a societal agent:

> Emma: Yeah, and also the, well, the questions were quite challenging as well: 'What kind of a societal agent are you' [laughter]?

Laura: I don't act as a societal agent [laughter].
Nea: I'm an amoeba [laughter].

This is clearly a humorous and even carnivalistic account of the difficult issue. Simultaneously, it reflects the position that PSTs take. If we put together Elias' counter-narratives and the conceptions of the little power that PSTs view themselves and/or the school as having, the overall image is rather **passive**. However, as a counterpart to the passive stance, we highlight three findings that suggest a more **active** position: (1) the focus on action and learning by doing instead of just knowing (both groups); (2) the idea of rooting ecological perspectives deeper (Consumer Behaviour Group) and (3) viewing teachers and Finnish society as capable of making a difference (Digitalisation Group).

Sofia raised both aspects of the latter, arguing that teachers who 'do the work in practice, who live every day with the books, with the children and with online books and platforms', could be more involved in developing digitalisation in schools. Moreover, she embraced the 'terribly good information technology knowhow' in Finland: 'In Finland, it would be possible to develop tools that would be so much safer for children and youths compared with corporate organisations, Google, Zoom, Teams etc'. And the terms and conditions could be made 'fair and really safe'. These ideas do not reflect an active 'we' position, but rather an indirect idea of being part of the change by identifying with these groups. The more active stance is voiced in the other two aspects, focussing on action and taking root more deeply.

Discussion and conclusions

In this study, we examined PSTs' narratives about the future of education in relation to two megatrends: digitalisation and ecological sustainability. The narratives were composed based on online video-based collaborative discussions among PSTs. We also studied how PSTs co-constructed their positions in the future. Through data-driven qualitative analysis and narrative analysis, we found that the PSTs (1) viewed digitalisation in education strongly through antonyms and ambivalence (good and useful vs. bad and dangerous), (2) emphasised critical media literacy, (3) viewed ecological perspectives through a main and counter-narrative (taking root more deeply vs. not everyone needs to get excited) and (4) emphasised the role of action and learning by doing. In terms of positioning, dynamic tensions were found between, e.g. passive and active positions and individual and societal perspectives on change. We discuss our findings in the light of identity work and education for democracy and sustainability.

In their collaborative negotiations while collectively sketching their future possible selves (Lee and Schallert 2016) and identities in-the-making (Bamberg and Georgakopoulou 2008), the PSTs encountered and voiced many tensions. Indeed, researchers have described the process of PSTs' identity negotiations through tensions and as a struggle (Akkerman and Meijer 2011; Beijaard, Meijer, and Verloop 2004), in line with our results. The PSTs described the societal issues at hand as very difficult and challenging. Tensions can be unsettling and distressing, but also fruitful in terms of identity growth and learning (Akkerman and Meijer 2011; Galman 2009), metacognitive awareness (Alsup 2006) and transformative learning (Mezirow 2000). In our previous study

(Lehtinen, Kostiainen, and Näykki 2023), we found that dissonance expressed by the teacher educator led to higher-level knowledge co-construction and metacognitive statements.

Ambivalence was central to our results. One goal of TE might be to help teachers cope with the ambivalence and uncertainty associated with a changing society and education (see also Aly et al. 2022). As Walker and Shove (2007) argue, in creating a sustainable and democratic future, ambivalence and constantly evolving goals could be harnessed, rather than eliminated, because ambivalence is essential for reflexivity. Dynamic, questioning and critical policies may be difficult, but they are still better than unquestioning certainty (Walker and Shove 2007).

In our data, we found a lot of ambivalence and questioning around digitalisation, and the PSTs emphasised critical media literacy. This is somewhat in contrast to previous studies, which indicated that only a minority of PSTs defined digital literacy as something that required critically reflective technology use (List, Brante, and Klee 2020; see also Castellví, Díez-Bedmar, and Santisteban 2020). Collaborative learning may have facilitated critical thinking (Lehtinen, Kostiainen, and Näykki 2023; Yukawa 2006), distinct from previous studies which were based on individual questionnaires.

Related to dissonance and antonyms, Elias voiced a counter-narrative to his peers, who talked about embedding ecological perspectives more deeply in education. This resembles the scene depicted by Galman (2009), in which two competing stories caused dissonance – that of a progressive TE programme, valuing transformative and agentic work for change and social justice, and that of bureaucratic practice, in which teachers do not 'rock the boat' within the institution. In our context, the TE department seeks to support transformative agency, and the narrative of embedding societal aspects of education more deeply is consistent with this. It seems that Elias rejected this 'transformative agent narrative' or perhaps superficially adopted some components of it (see Stillman and Anderson 2015). Elias used disciplinary boundaries to justify his counter-narrative. Researchers have argued that to create a sustainable and socially just future, we need to cross disciplinary boundaries and broaden epistemological perspectives (Lotz-Sisitka et al. 2015).

Overall, our findings indicated that PSTs hold a somewhat passive position towards societal issues. For example, changes related to digitalisation were viewed as inevitable facts that one cannot prevent from happening. PSTs' attitude reflected a certain technological determinism, an 'idea of technology as an independent entity, a virtually autonomous agent of change' (Marx and Smith 1994, xi). They even made ironic statements about not acting as a societal agent, but rather as being an amoeba. In this way, they distanced themselves from the transformative and societal teacher role. The societal or sociological level of education is understandably difficult in initial TE (Brennan and Canny 2023) and given that most of secondary school teachers' training focusses on their discipline (e.g. mathematics or languages). However, the passive position that we found is in line with previous studies in Finland, which have indicated that education for active citizenship or democracy is, to some extent, peripheral in the school culture or in teachers' conceptions of their work (Fornaciari and Rautiainen 2020; Männistö and Moate 2023).

While schools' role is crucial in ensuring the future of democracy amid wicked problems (Aly et al. 2022), it is, of course, true – as the PSTs noted – that schools *alone* cannot influence these developments. Broad policy frames are also needed (Aly et al.

2022). In any case, teachers do act as meaningful mediators between policy and practice (Stillman and Anderson 2015). Furthermore, we would like to highlight that the myriad demands that teachers encounter can lead to excessive stress. As Stillman and Anderson (2015) suggested, there are consequences if we ask too much of teachers when they are under pressure and public scrutiny while working intensively, without sufficient support for their own learning. This is an ongoing discussion in Finland. In TE, too much dissonance can lead to undesirable outcomes, and if students cannot negotiate the dissonance, it can lead to dropping out from their TE programme (Alsup 2006; Galman 2009). Teacher educators should understand that power is not distributed equally between staff and students and competing stories (Galman 2009). Teacher educators' sensitivity is needed to sit with and encourage students' patience when becoming teachers (Galman 2009).

Finally, we also found indications of a more active position towards societal issues, one of which was that both PST groups emphasised the role of action. This is an important finding, as research has indicated that attitudes alone are not enough to build a sustainable lifestyle and because many educational interventions tend to focus on knowledge and attitudes instead of action (Kranz et al. 2022). According to Kranz et al. (2022), sustainability education is lacking a focus on political literacy and civic and public-sphere action. Thus, the idea that socially oriented perspectives may be overlooked is an issue beyond the Finnish context. Furthermore, PSTs not only recognised the importance of action, but also argued that teachers should be more involved in schools' digitalisation development. This participatory decision-making role of teachers across different school activities reflects democratic ideas about schooling (Aly et al. 2022). Overall, it seems that collaborative, transformative agency cues were present (Brevik et al. 2019). Thus, ambivalence persists, as we observed the PSTs in our study as being both passive and active.

Methodologically, our study contributes to the use of creative and narrative methods in analysing collaborative learning situations and to the field that studies PSTs' orientation to societal changes. We are aware that our experiences and positions as teacher educators influence our interpretations. We are all insiders concerning the 'transformative TE department', but none of us taught the studied group, and we used investigator triangulation during various phases. In our study, the discussion data between peers may have elicited more authentic insights into beliefs than, e.g. interviews (see Bamberg and Georgakopoulou 2008). Nevertheless, future studies could triangulate the data from multiple data collection methods, e.g. written accounts. It would also be fruitful to collect similar data from various countries to gain a more comprehensive view of PSTs' narratives and positioning and about the impact different contexts can have on them. Our qualitative and narrative study does not aim to generalise our conclusions, but to provide an in-depth understanding of the studied phenomena in a unique setting (Patton 2002), to develop methodology and to offer a starting point for further research. Future studies could use longitudinal study designs, which could provide valuable information about evolving narratives and how PSTs continue to navigate ambivalence and uncertainty. However, analysing stories in initial TE affords examining the imaginative rehearsal (Goffman 1963) of what education should be like before PSTs gain more experience in teaching practice (Galman 2009). Another future perspective is to make uncertainty the focal point of PSTs' collaborative discussions and the study.

Narrative analysis enabled us to examine PSTs 'in the complexities of lived moments of struggle' (Bochner and Ellis 2003, 509). We hope that these narratives and creative pieces – comic strips created in the analysis – can be used as thinking tools in TE (Moen 2006), facilitating explicit discussion of the different stories we tell (Galman 2009) about the uncertain future.

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Notes on contributors

Auli Lehtinen is a doctoral researcher at the Department of Teacher Education, University of Jyväskylä, Finland. She has been working as a university teacher in pre-service and in-service teacher education programmes. Her research interests include collaborative learning, socioemotional and critical thinking perspectives in teacher education and creative methods.

Emma Kostiainen PhD (Communication Sciences), is a university lecturer at the Department of Teacher Education, University of Jyväskylä, Finland. Her teaching and research interests include developing social interaction competence and its importance for future school development, constructing the learning community, meaningful, collective, collaborative and creative learning in teacher education.

Anne Martin PhD (Educational Sciences), is a university teacher at the Department of Teacher Education, University of Jyväskylä, Finland. Her research interests are (teachers') professional development, narrative identity work and supporting these through creative expression. Methodologically, Anne is drawn to qualitative methods and especially narrative and arts-based research.

Piia Näykki is an associate professor at the Department of Teacher Education, University of Jyväskylä, Finland. Her research focuses on learning and interaction processes in digital learning. In particular, technology-enhanced collaborative learning and process-oriented approach to cognitive, emotional and motivational challenges and regulation strategies in group interactions.

ORCID

Auli Lehtinen http://orcid.org/0000-0002-4027-8723

Ethical statement

All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Per the ethical regulations of the participating organisation, separate ethical statement was not needed.

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Appendix

Appendix 1. Data examples

Code	Data examples (entire original turns, English translations)
Conception of schools' current state or future direction	Elias: 'Yeah, there really isn't that kind of unnecessary consuming at school, at least in my opinion'.
	Sara: 'And then it came to my mind that there are all kinds of, like, learning tools that are digital. For example, some, I don't know, well, the kinds that, like… From a very young age, nowadays kids have such tools that help, and so'.
Conception of society's current state or future direction	Sofia: 'And then I thought, OK, I've been thinking about this from quite funny perspectives, but like employment, jobs. For example, if [Finnish social insurance institution] or social security services move more and more online, will that affect society for better or for worse'?
Personal experiences	Ella: 'And somehow, for me, it was quite interesting that, or like, at least for me, the phone has grown into my hand, and then somehow, I can't even be in a lecture without checking for messages. So, how hard can it be for the kids, when they don't even have the sort of, that they could themselves think a little like, OK, yeah, if I now check my phone and miss this, then I will have to study this all by myself. They don't even have this kind of, like, "Oh, damn, now I will miss this if I check my phone". And it's just somehow really hard to be, at the moment, studying somewhere else than the university because the phone has grown so badly into my hand'.
	(also coded: conception of schools' current state or future direction)
Evaluation/ideal/suggestion of/for the future of education in relation to the megatrend	Sara: 'No, but what you said, that kind of, like, there is a sort of, or like … Since there is, anyway, the possibility of using it [the Internet and applications], so the thing is that we could guide the pupils in the future, for example, so that we would be able to advise how to use it. And this kind of, well, then it is just, like … '
	Sara: 'But I still don't know. I can't think that far ahead about, like, how it's going to develop because it's developing so fast and so unpredictably anyway that I can't really think about what the changes are going to be, but that is exactly the good thing that it becomes, sort of, equal for all. So, that's just, like … '
	(also coded: conception of schools' current state or future direction)
	Elias: 'It feels like, with this topic, that you can come up with a zillion problems and so on, but it's a lot harder to come up with how to, somehow, influence these things and how they could be changed and so on'.
Conception of the relationship between phenomena	Nea: 'Well, I thought about this. I think that maybe it isn't exactly the case that this only applies to school, but rather this is more broadly, like, sort of a societal background assumption, this consumer behaviour'.
	(also coded: conception of society's current state or future direction)
	Laura: 'That is a bit of a mixture between the individual and the school [as a perspective], so for the individual, it appears as a kind of group pressure, but in the school, it somehow kind of expands'.
	(also coded: conception of schools' current state or future direction)
Perspective of school subject(s)	Emma: 'Well, at least in history, the kind of environmental … environmental history could be brought forth more in teaching, is at least what I thought'.
	(also coded: Evaluation/ideal/suggestion)
	Laura: 'Well, I intend to graduate as a teacher of biology and

(*Continued*)

Code	Data examples (entire original turns, English translations)
	geography at some point, so it's pretty obvious how it will come up there, that it will, of course, come up in that subject. But then in IT, I think it was Elias who mentioned that you could basically talk about, for example, how does information technology last or how to make information technology last longer. And, like, for example, people talk about how companies intentionally make devices that don't last, that are not, like, long-lasting, so to discuss that sort of things'. (also coded: Evaluation/ideal/suggestion)

Appendix 2. Canva credits

Comics template 'Narrative Writing Comic Strip in Colourful Bold Panel Style', made by Rachel Mainero.
Figures within the comic strips made by Pablo Stanley.
Speech bubbles and small illustrations made by Enna Marnawati, Jenzon Lopez and Sketchify.

III

CROSSING BOUNDARIES—PRE-SERVICE TEACHERS' SITUATED AND IMAGINED VIEWS OF SOCIOEMOTIONAL COMPETENCE AND DIALOGICALITY

by

Auli Lehtinen, Emma Kostiainen & Piia Näykki, 2025

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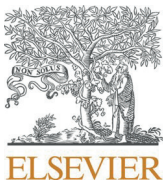

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Crossing boundaries–pre-service teachers' situated and imagined views of socioemotional competence and dialogicality

Auli Lehtinen *, Emma Kostiainen, Piia Näykki

Department of Teacher Education, University of Jyväskylä, Jyväskylä, Finland

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ABSTRACT

Pre-service teachers often hold idealistic or static views of socioemotional competence. More research is needed on their situated reflections and imagined futures. This study focuses on pre-service secondary teachers' situated and imagined views of the socioemotional and dialogical dimensions of becoming and being a teacher. The study took place within multidisciplinary collaboration, online teaching, and the COVID pandemic. Fourteen pre-service teachers' interviews were analyzed with reflexive thematic analysis, applying the concept of boundary crossing. Our findings indicated three boundaries: between (1) disciplines, (2) online and face-to-face practices, and (3) being a student and being a teacher. In their situated views, pre-service teachers crossed disciplinary boundaries in collaboration with the help of social cohesion, perceived a threshold in online interaction, and held a normative conception of talkativeness. In their imagined futures, they struggled to specify socioemotional competence, emphasized challenging situations as a boundary, and expressed dialogical and monological voices regarding teachers' competences. There were tensions at the boundary between situated and imagined views, indicating idealized beliefs. Implications include providing safe spaces and time for collaborative boundary crossing and critical reflection. Our study addresses teachers' socioemotional competence and dialogicality amid crises and further theorizes the boundary between the situated and the imagined.

1. Introduction

Cultivating socioemotional competence and dialogicality has a twofold role in teacher education; to be able to develop such abilities in others, teachers must develop their own competences (Tynjälä, Virtanen, Klemola, Kostiainen, & Rasku-Puttonen, 2016; see also Murray & Male, 2005). Pre-service teachers (PSTs) learn not only about the "discipline" of education, but also through the educational processes they engage in teacher education. The situated practices, resources, and communities, such as peer groups, influence the process of becoming a teacher. From a sociocultural perspective, becoming competent is intertwined with everyday practices and shaped by sociocultural factors like materials and discourses (Ikävalko et al., 2020). During teacher education, PSTs reflect on their past experiences and current learning in the particular context while imagining themselves as future professionals (Lee & Schallert, 2016). Their situated and contextual views may conflict with how they imagine their future as teachers (e.g., Moate, 2023). PSTs may have idealistic or static views about involving others (Moate, 2023), caring (Goldstein & Lake, 2000; Laletas &

* Corresponding author at: Department of Teacher Education, University of Jyväskylä, P.O. Box 35, FI-40014 Jyväskylän yliopisto, Jyväskylä, Finland.
E-mail address: auli.m.lehtinen@jyu.fi (A. Lehtinen).

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Reupert, 2016), and socioemotional competence (Aspelin & Jonsson, 2019; see also Lee & Schallert, 2016).

Such tensions between the student perspective (being a PST) and the teacher perspective underscore the need for critical reflection in teacher education (e.g. Arvaja, Sarja, & Rönnberg, 2022), an area that calls for further research and theorization (Moate, 2023). In this study, we aim to understand PSTs' situated and imagined views of the socioemotional and dialogical dimensions of becoming and being a teacher. We also consider the potential tensions between these situated and imagined perspectives. In the sociocultural context, we highlight the following phenomena: the influence of the COVID pandemic, online learning, and learning within and about multidisciplinary collaboration. We apply the concept of boundary crossing (Akkerman & Bakker, 2011) to study these contextual phenomena and to focus on the boundary between being a student and becoming a teacher, as this is one of the key boundaries in teacher education and is a site of struggle. Our study aims to offer implications for teacher education by addressing socioemotional competence and dialogicality in the post-COVID era and by further theorizing the boundary between the situated and the imagined.

2. Theoretical framework

2.1. Sociocultural theory: lived experience within sociocultural context

This study is grounded in sociocultural and dialogic theories. Sociocultural theory builds on the work of Vygotsky (1978), and its central insights include viewing knowledge and intellectual processes as deeply intertwined with cultural and situated forms of social interaction, such as spoken and written language, and practices within institutions, such as schools (Mercer & Howe, 2012). Language is seen as both a cultural and a psychological tool; it is used both to create knowledge in communities and to organize the processes of individual thought (Mercer & Howe, 2012; Vygotsky, 1978). Teacher development, from a sociocultural perspective, is seen as a dynamic, holistic, and situated process (Olsen, 2008). When people, in this case PSTs, make sense of the world, they navigate across multiple settings and time scales: past and present as well as micro and macro levels (Esteban-Guitart & Moll, 2014). The micro level includes subjective lived experiences, and the macro level includes, for example, socio-political conditions. Lived experience as a construct stresses how thinking and intellectual acts are not separate from the full spectrum of life, including emotional experiences (Esteban-Guitart & Moll, 2014). In this study, we are interested in PSTs' lived experiences (micro level) within the context (macro level) of the COVID pandemic, online teaching, and the educational policies and practices that embrace multidisciplinary collaboration. Particularly, we draw on ideas from situated learning theory (Lave & Wenger, 1991) as part of sociocultural approaches and complement them with dialogic perspectives (see Section 2.5).

2.2. Defining boundary crossing

In this study, we use the term *boundary crossing* (Akkerman & Bakker, 2011) to draw attention to how pre-service teachers, representing various subject disciplines, cross disciplinary boundaries in multidisciplinary collaboration and work at the boundary between being a student and being a future teacher. Furthermore, given the increased role of online teaching, we argue that another boundary can be seen between face-to-face and online practices. Boundary crossing focuses on how to sustain participation and collaboration across different sites despite their differences (Akkerman & Bakker, 2011). Sociocultural differences call for reorganizing action or interaction, which is seen as a resource for learning (Akkerman & Bakker, 2011).

There are various examples of boundaries. In schools, disciplinary boundaries are evident. Moreover, there are boundaries between, for example, formal education, work practice, and everyday life. One example is teachers working as school numeracy coordinators, since they work at the boundary between their teacher colleagues and the research and development group at the university (Akkerman & Bakker, 2011; Williams et al., 2007). In the study by Williams et al. (2007), the teacher–coordinators' talk was characterized mostly by conflict and tensions, but boundary crossing enabled reflective identity work.

Akkerman and Bakker (2011) explained boundaries as a dialogical phenomenon, the notion of boundary being central to Bakhtin's ideas about dialogue (see also Section 2.5). They identified four possible learning mechanisms at boundaries: identification, coordination, reflection, and transformation. Identification involves questioning core features of practices, leading to new insights. An example of this is defining one practice in light of another, that is, *othering* (e.g., contrasting history teaching with chemistry teaching). Coordination, in turn, means effortless movement between practices with minimal dialogue. Reflection involves grasping and explaining differences between practices and learning about one's own and others' practices. Transformation is about collaboration and co-development of (potentially new) practices.

2.3. Situated learning in teacher education amid pandemics and within multidisciplinary collaboration

The *situated perspective* to teacher learning highlights the role of social contexts (Cherrington, 2017; Lee & Schallert, 2016; Putnam & Borko, 2000) and learning within a *community of practice* where participants move from being "newcomers" toward full participation in the sociocultural practice (Cherrington, 2017; Lave & Wenger, 1991). In this sense, there is a boundary between being a novice and being an expert in a particular domain or community. The situated perspective holds that individuals negotiate meaning within the community of practice and "learn though participation – involving social, affective and cognitive aspects – with others" (Cherrington, 2017, p. 162) and with artifacts used in collaborative negotiations. In initial teacher education, PSTs negotiate their membership within social communities, such as teacher education departments or training schools, which is reflected in their developing teacher identities. However, communities are not static; learners also shape others' learning and community practices (Cherrington, 2017). Since teaching as a profession is somewhat familiar to everyone through personal experiences in school, critical reflection is essential

(Arvaja et al., 2022).

The first contextual aspect this study highlights is the influence of the COVID pandemic, which has shaped the learning of a large number of prospective teachers. It has led to a transformative change in the field of education and challenged teacher learning (e.g., Darling-Hammond & Hyler, 2020). Such a disruption can enable the rethinking of education and teacher training (Darling-Hammond & Hyler, 2020) and make explicit some overshadowed aspects of being a teacher. One example is being a professional "teacher body," since online environments – largely used during and after the pandemic – eliminate many physical cues and limit body language and gaze (Godhe & Wennås Brante, 2022). Overall, the COVID pandemic has foregrounded the need to foster social and emotional competences, both in teacher education and among pupils (Sánchez-Tarazaga, Sanahuja Ribés, Ruiz-Bernardo, & Ferrández-Berrueco, 2023). New teachers, whose teacher training has been affected by the pandemic, may need additional support at the beginning of their careers; at the same time, they may bring about original perspectives and practices that are shaped by their experiences, such as awareness of equity concerns highlighted by the pandemic (Darling-Hammond & Hyler, 2020; Glenn et al., 2020). They may also be aware of how different crises affect teaching and learning, even into the future.

The second contextual aspect we address is multidisciplinary collaboration. Teacher collaboration is important for school development processes, school quality, and teacher professional development for several reasons. Among these are that change in schools is not possible without the involvement of teacher teams who are the primary implementers of reform; that teacher collaboration can support teachers' reflection on their practice, help them change their behavior, and protect against burnout; and that it can benefit students, for example, by making teachers more responsive to individual student needs (Muckenthaler, Tillmann, Weiß, & Kiel, 2020). In our context, a specific feature of collaboration is that of multidisciplinary learning. Prospective secondary school teachers study education in multidisciplinary groups to prepare for professional collaboration and development across different disciplines. They major in various disciplines, such as mathematics, English language, or history. Multidisciplinary collaboration is also encouraged in the Finnish educational policy (see also Section 4.1). This brings forth situated perspectives relevant to our study, namely tensions between being a subject matter expert and collaborating across disciplines.

The PSTs' positions as subject matter experts are expected to be reflected in their views of their future profession. In a review of teacher identity as a content expert, Peterman (2017) found that it was mostly contexts (e.g., schools, informal settings, and higher education), not content, that affected identity formation. Yet, personal experiences and the way PSTs felt about themselves as learners of content influenced their approach to teaching. As a conclusion, Peterman (2017) highlighted the importance of collective reflection on identity tensions and safe spaces for collaborative learning in teacher education. In addition, teacher education programs should scaffold PSTs' competences in building collegiality and collaboration, as well as their socioemotional and leadership skills, because such skills are needed to build bonds of trust in schools, which in turn may enhance job satisfaction by reducing loneliness and encouraging dialogue, reflection, and problem solving (García-Martínez, Montenegro-Rueda, Molina-Fernandez, & Fernández-Batanero, 2021).

To prepare for multidisciplinary professional collaboration, boundary crossing competences are relevant. Addressing challenging societal issues, such as climate change, through education, is impossible within single disciplines. Boundary crossing as a competence refers to the ability to collaborate across unfamiliar domains and to integrate knowledge from various fields, that is, to co-create in interdisciplinary and multicultural teams (Fortuin, Gulikers, Post Uiterweer, Oonk, & Tho, 2023). According to Markauskaite et al. (2024), interdisciplinary teaching and learning have been one of the most under-theorized and under-researched areas in education, and our study aims to address this gap.

2.4. *Pre-service secondary teachers' views of socioemotional competence*

According to Goegan, Wagner, and Daniels (2017), despite recognizing the importance of teachers' socioemotional competence, research is scant on teachers' beliefs about their own socioemotional competence. They stated that related research has focused mostly on teachers' beliefs about socioemotional learning. Moreover, the focus has been more on the beliefs of in-service teachers, rather than those of PSTs (Goegan et al., 2017). However, there are many overlapping concepts that may connect with this research gap. Researchers have analyzed PSTs' views of similar competences, such as *social competences* (Sánchez-Tarazaga et al., 2023), *relational competences* (Aspelin & Jonsson, 2019), and *emotional intelligence* (Gallardo, Tan, & Gindidis, 2019). Related concepts include teachers' *interpersonal competences* (Wubbels, Den Brok, Veldman, & van Tartwijk, 2006), *care* in teaching (Laletas & Reupert, 2016), and teachers' competences to foster *dialogic teaching* (Alexander, 2018; Vasalampi et al., 2021).

What these terms have in common is building educational relationships and contexts that are safe, supportive, reciprocal, collective, respectful, empathetic, and dialogical. These concepts are needed to foster broader purposes, such as social justice and equity (McGraw, Fernandes, Wolfe, & Jarnutowski, 2023), inclusion, engagement (Vasalampi et al., 2021), and democracy (Sánchez-Tarazaga et al., 2023). However, without conscious efforts and further knowledge (e.g., on equity), such broader perspectives may be disregarded, and teacher competences may be presented as if they were value-neutral, focusing only on the technical aspects of teaching (Miller Marsh & Castner, 2017).

Competence as a term is more than skills; it encompasses cognitive, affective, and behavioral elements, including knowledge, skills, attitudes, and behaviors (e.g., Spitzberg & Cupach, 2011). For example, Ikävalko et al. (2020) defined emotional competence as the ability to "perceive, understand, recognize, express and practice/apply emotions" (p. 1487). They highlighted that competence is enacted in everyday practices and influenced by sociocultural circumstances. We are interested in how these circumstances and situated reflections shape PSTs' understanding of socioemotional competence. In teacher education, the "discipline" of education and the pedagogical methods for teaching it to prospective teachers are inseparable (Murray & Male, 2005).

More research is needed on PSTs' perceptions of care, particularly in secondary school settings (Laletas & Reupert, 2016). Focusing

on secondary education is important for teacher educators since adolescence is a critical developmental phase where young people become more independent, create influential relationship patterns, build their identities, and often undergo both social and academic anxiety about their futures (Laletas & Reupert, 2016). Moreover, the current turbulent times may be reflected in the anxieties young people face in this regard.

Previous research has found that PSTs need a more nuanced understanding of relationships and socioemotional competence. Laletas and Reupert (2016) concluded that many studies have shown PSTs to have idealistic and unrealistic views of caring. Aspelin and Jonsson (2019) studied PSTs' analyses of teacher–student relationships, based on videos where teachers' relational competence was challenged. They found that PSTs' responses involved abstract explanations, which indicated that they viewed competences via a relatively static and general framing, instead of referring to what had actually happened in the videos. Thus, PSTs struggled with analyzing competence as situated practice.

2.5. Dialogicality – constant becoming with and through others

While PSTs' competences are central to our study, we also highlight the broader idea of dialogue as an authentic way of being in educational relationships and as a foundation for building them. Rule (2011) put two central thinkers, Bakhtin and Freire, in dialogue to address their commonalities and dissonances regarding the notions of dialogue and dialectic. According to Rule, they shared an understanding of dialogue as a way of being, rather than just as a technique or a type of communication. Both emphasized the open-endedness of dialogue and the idea of constant becoming, the unfinalizability of being human (Rule, 2011). Humans become with and through others. The opposite of the authentic – dialogical and open-ended – way of being is monologue (Bakhtin) or anti-dialogue (Freire). Monologue and anti-dialogue reduce the other to the status of an object (Bakhtin, 1984) or suppress the other (Freire, 2018; Rule, 2011). Both Freire and Bakhtin stressed the spatially and temporally situated nature of the world (Rule, 2011), akin to sociocultural and situated learning theory. Moreover, dialogicality presupposes alterity: acknowledging differences and multiple meanings and opinions (Arvaja & Hämäläinen, 2021).

In education, there is always a tension related to power imbalances: teachers need to balance between dialogical practices – giving space to students' voices, experiences, and agency – and social control of students, classroom management, and curricular demands (e.g., Rajala, Kumpulainen, Rainio, Hilppö, & Lipponen, 2016). To create dialogic spaces, it is essential to build trust and responsibility, remain open to learning from others, encourage self-expression, and commit to resolving issues through discussion and reflection rather than forceful persuasion (Rule, 2004). This is not to say that dialogue is without struggle, conflict, or power asymmetries, but that these issues can be worked through in the process of dialogue (Rule, 2004). The teacher and students must creatively navigate the contradiction between agency and control (Rajala et al., 2016).

However, various crises may add to the challenges of control in educational spaces. Crisis, polarization, and rising authoritarian voices are interconnected in the current times (see Aly et al., 2022). Another example is that during the COVID pandemic, there were governmental and institutional restrictions, and teachers had little room to move within those restrictions. When it comes to dialogue, online interactions tend to be minimally dialogic, and while monologic conversations can foster knowledge construction, they may hinder community building (Delahunty, Verenikina, & Jones, 2014). Given these issues, it is important to address dialogicality in the context of crises.

In our study, the notion of dialogue and dialogicality is relevant from various perspectives: as a data-driven notion, as essential for the theory of boundary crossing (Akkerman & Bakker, 2011; see also Rule, 2011), and as a way of looking at PSTs' views of the socioemotional and dialogical dimensions of being a teacher. We view dialogue as a "value-laden process of acknowledging and engaging with the other as a subject" (Rule, 2011, p. 930), as constant becoming with and through others, and as a process in which diversity and otherness are valued. Dialogical relationship is not self-evident, but "a task, a site of struggle, something that requires constant effort and renewal" (Rule, 2011, p. 929).

3. Research questions

The following research questions (RQs) guide our study:

1. What kind of situated understanding do PSTs have of the socioemotional and dialogical dimensions of becoming a teacher
   a. during a pandemic?
   b. in multidisciplinary collaboration?
2. How do PSTs imagine teachers' socioemotional competence and dialogicality in their future work?

4. Methods

4.1. Context and participants

Participants were recruited using purposive sampling, as is common in qualitative research (Etikan, Musa, & Alkassim, 2016). The teacher educator whose group participated was known to be well informed about the phenomena of interest, that is, initial teacher education and related pedagogical choices, particularly regarding secondary PSTs. In addition, geographic proximity and availability at a particular time were part of the practical selection criteria, meaning that there were also elements of convenience sampling (Etikan et al., 2016). According to the teacher educator, the targeted group was a well-functioning group that generally expressed a positive

attitude toward experimentation. These issues were relevant because the data collection took place during sudden COVID restrictions, that is, in the context of a crisis. We wanted to avoid unnecessary harm to the participants, and therefore felt that a generally a well-functioning group might not be negatively disrupted by the research (which overall included video observations). Participation was voluntary, and PSTs acknowledged that they were free to withdraw their participation at any time and without consequence.

The participating PSTs ($N = 14$) were in their first academic year at a Finnish university. They were majoring in various disciplines, such as English, chemistry, and history. Table 1 lists the participants' pseudonyms, majors, and ages. In Finland, prospective secondary school teachers study for a bachelor's degree (180 ECTS) and master's degree (120 ECTS) that involves studies in their discipline(s) and compulsory pedagogical studies (60 ECTS). They qualify to teach one to three school subjects, usually at lower or upper secondary schools or vocational schools. During the first study year, the PSTs complete three courses (à 5 ECTS) of the Basic Studies in Education at the Department of Teacher Education. This study was conducted during these courses, which the participants studied in the same group and with the same teacher educator. The courses focused on 1) interaction and collaboration, 2) societal issues of education, and 3) scientific knowledge and thinking. All courses comprised lectures and classes, as well as small group collaboration.

During the fall of 2021, the students studied the first course in a face-to-face setting. Initially, they were also supposed to study in person during the second course, in the spring of 2022, but new COVID restrictions were put in place by the university just before the start of the course in January. At that time, almost all university education in Finland was moved to online mode due to the worsened pandemic situation. The studied group carried out their educational studies online from January to April 2022. In April, they returned to face-to-face teaching, when the second course was already finished, and the third had started.

Later in their studies, PSTs' teacher education studies continue in such a way that in their second year, PSTs complete the remainder of the Basic Studies, including a course on learning and pedagogy (5 ECTS) and a teaching practice (5 ECTS). The teaching practice is usually organized at the Teacher Training School, which is administratively a part of the university. In addition, they study their subject studies in their discipline's department. Usually during their fourth study year, PSTs study the Pedagogical Subject Studies in Education (35 ECTS) at the Department of Teacher Education, including teaching practices (15 ECTS).

In our context, secondary PSTs study education in multidisciplinary groups (including students of, e.g., mathematics, history, and English language). The aim is to prepare for multidisciplinary collaboration in their future professions and to cross disciplinary boundaries. When it comes to national educational policies, the Finnish national core curriculum for basic education (Finnish National Board of Education, 2016) promotes transversal competences and multidisciplinary learning. Competences such as multiliteracies and "thinking and learning to learn" are framed as necessary to address societal changes. It is argued that personal growth and citizenship demand competences that extend beyond disciplinary boundaries. Schools are required to organize at least one multidisciplinary school activity during the school year. The duration of the activity may vary. The core curriculum describes multidisciplinary learning as an integrative approach where real-world phenomena or issues are examined holistically, particularly across subject boundaries. Furthermore, the core curriculum explicates the need for multidisciplinary collaboration in student welfare which is organized together with educational, social, and health services as well as with the student and their families.

4.2. Data collection

Data were gathered in April 2022. From January to April, the first author also observed and video recorded the PSTs' teacher education courses. As mentioned, the second course on societal issues of education was held on Zoom due to COVID-19 restrictions. We have previously analyzed the PSTs' online collaborative learning situations to study the phases of knowledge co-construction and socioemotional processes (Lehtinen et al., 2023) and the narratives that the PSTs co-constructed about the future of education (Lehtinen et al., 2024).

The first author collected the data via semi-structured thematic interviews. Most of the interviews were held in person as the COVID restrictions had been removed, except for two interviews that took place online. The interview themes focused on PSTs' experiences during online and face-to-face teacher education, interaction processes and their well-being during the courses, their own participation in the courses and in collaborative learning, experiences from working in collaborative teams, and their views of socioemotional

Table 1
Participants.

Pseudonym	Major	Age in Jan 2022
Elias	Mathematics	20
Ella	Chemistry	not available
Emma	History	not available
Ida	English	20
Laura	Educational technology	21
Lisa	Finnish language and literature	20
Mia	Finnish language and literature	22
Nea	Finnish language and literature	20
Niko	English	not available
Oliver	History	21
Oona	Languages	19
Sara	Mathematics	20
Sofia	English	not available
Vera	Physics	20

competence, both as situated in online teaching and as future teachers. The questions were open-ended (Brinkmann & Kvale, 2009) and the PSTs were encouraged to share their experiences and ideas as freely as possible. The interviews were between 21 min and 58 min in length (mean 39 min).

4.3. Data analysis

In the analysis, we employed a reflexive thematic analysis, consisting of six phases (Braun & Clarke, 2021). We applied a primarily inductive orientation but, having done the first rounds of analysis, more theory of dialogicality and boundary crossing was read alongside the analysis. During the final rounds of analysis, we applied the concept of boundary crossing (Akkerman & Bakker, 2011). This was because the PSTs seemed to explicate clear boundaries between various disciplinary practices and in their learning, and the concept thus enriched the analysis.

The analysis started with transcribing audio data, and initial transcripts were created using the transcribe feature of Microsoft Word. The first author then carefully reviewed and edited the initial transcripts, also adding hesitations, longer pauses, and laughter. The transcripts resulted in 231 pages of text (font size 12, line spacing 1.5). The participants were given pseudonyms. The data familiarization phase continued as the first author read through all the transcripts several times on paper and wrote notes and preliminary codes while considering the RQs. Next, the first author drew initial thematic maps, and coded the data systematically. Through this process, initial themes were created, such as "being able to involve others, to observe better and more actively", "cut from different cloth, yet we found a common path" (multidisciplinary collaboration), and "dialogicality and respect for diversity." These themes belonged to three different perspectives, respectively: situated understanding during a pandemic, situated understanding within multidisciplinary teams, and imagined views (as future teachers).

In this phase, we used investigator triangulation to review the themes. All the authors read the coded data against the initial themes. The themes were reviewed through discussion, and thereafter the first author created a new thematic map that aimed to capture all the themes. This new map was again triangulated between the researchers. As a result, some themes were refined. Table 2 shows the final themes and sub-themes, and Fig. 1 presents the final thematic map. The first author translated data excerpts from Finnish into English and bolded some key phrases for readability.

5. Results and discussion

We created nine themes in total (Fig. 1) in the analysis of the situated and imagined views that PSTs held regarding socioemotional and dialogical dimensions of becoming and being a teacher. Five themes relate to RQ 1 (situated views) and four themes to RQ 2 (imagined views). By employing the concept of boundary crossing (Akkerman & Bakker, 2011), we considered what kind of learning

Table 2
Themes and sub-themes.

Themes	Sub-themes
Situated	
Multidisciplinary collaboration: boundaries and crossing them	Identifying boundaries and the uniqueness of educational science
	Teacher educator modeling quality teaching
	Cut from different cloth, yet we found a common path
	Do I belong in the field of education?
	I learn best by myself
Meaningful experiences of social cohesion (face to face)	Getting to know one another and building trust in face-to-face teaching, icebreaker games
	Valuing off-task interaction
Threshold in online interaction	Lack of facial expressions, gestures, and essence; human vs. bot
	Threshold in talking, inviting others to participate, and asking for help
	Getting used to online interaction, increasing social anxiety
	Being excluded
	Fatigue, zero energy
The need to observe better and involve others	
Norm of being talkative, shyness and silence as negative	Everyone should just talk (tyranny of participation)
	Norm of talkative teacher students
	Shy students willing to develop their courage
Imagined	
Difficult to imagine and analyze competence, lack of experience	
Focus on how to deal with challenging situations	Emotional issues
	Group-level issues/understanding
Dialogicality and respect for diversity vs. monologicality	Taking into account and valuing diversity
	Listening to and involving everyone
	Monologic, automatic authority
Teacher competences as stable and "correct" ways of being vs. something to be learned	Continuum from a normative and correct way to a flexible and open way
	Stable personal traits vs. something to be learned

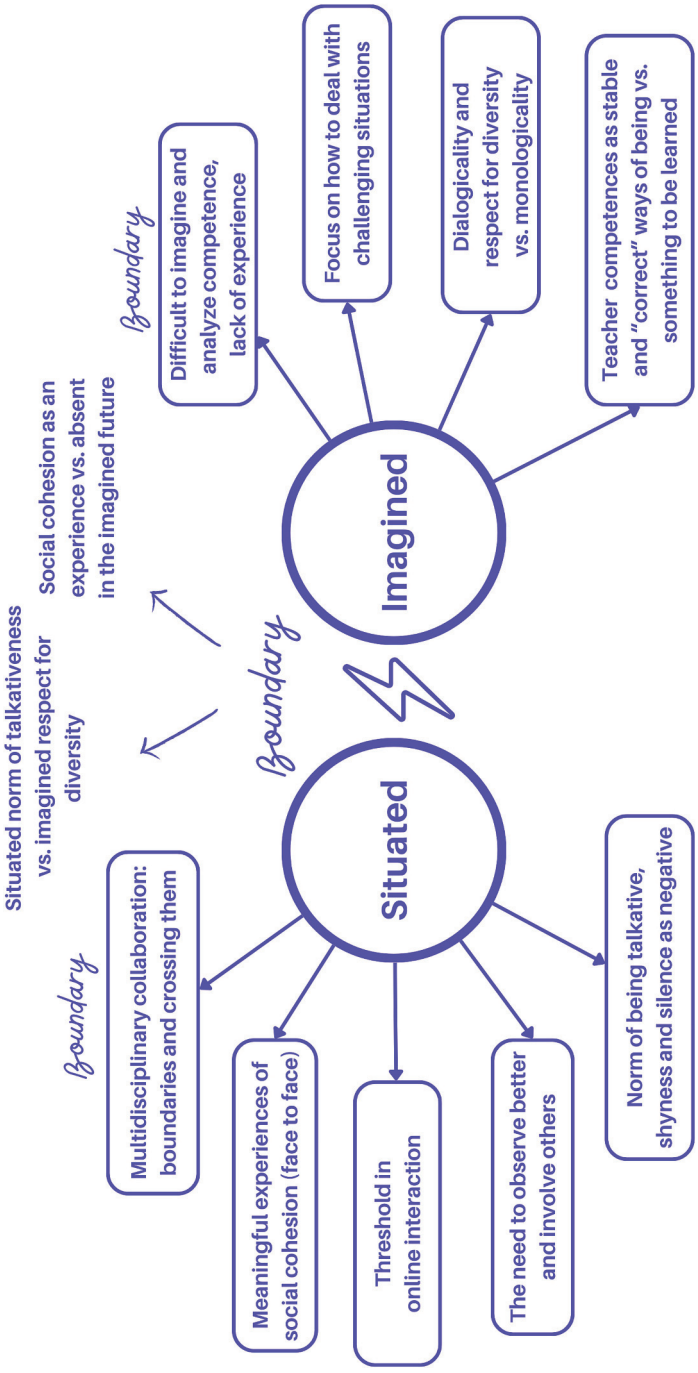

Fig. 1. Situated and imagined views of socioemotional and dialogical dimensions of becoming and being a teacher.

might be happening at the boundaries, namely disciplinary boundaries and the boundary between being a student teacher and being a future teacher. We identified some tensions, specifically between the situated (RQ1) and imagined (RQ2) views, and these are pictured in Fig. 1 as arising from the boundary. Themes are in many ways intertwined, and we report some of them together (e.g., "Threshold in online interaction – the need to observe better and involve others").

5.1. Multidisciplinary collaboration – identifying boundaries and the uniqueness of educational science

The PSTs in our study majored in various disciplinary subjects. They studied education together in multidisciplinary groups in the Department of Teacher Education. The PSTs identified boundaries between their disciplines (e.g., history or chemistry) and educational sciences. Two students described educational sciences as being "*such a different world.*" The uniqueness of education was manifested through open-ended reflection, deep discussions, social interaction, and interactive teaching. Ella compared how different the tasks are: in chemistry, tasks are straightforward and "*you are told where to put a period,*" whereas in educational sciences "*they don't really tell you what they want, they are, like, it can be anything* [laughter]." She regarded this openness as challenging since "*we are not hundred percent sure about what we are doing*." She also thought that in chemistry there was "*no need for a kind of interaction situation*" – a conception that one would like to challenge in teacher education.

In general, the PSTs appreciated educational sciences for the high-quality collaborative discussions and the freedom to express and reflect on oneself. Vera, majoring in physics, talked about stopping to think about oneself:

> "It's always nice to come to these [educational science] classes when you know that it's **such a different world** from the other one [laughter], the other one is so theory-driven and you just work hard and keep going forward, but here you can **stop and really think** about, like, what I'm thinking and […] what kind of person I am […] you can stop and think about yourself too."

Here, Vera identified disciplinary boundaries dialogically by *othering* (Akkerman & Bakker, 2011), showing and comparing them in the light of the other practice.

The PSTs viewed the teacher educator as modeling high-quality teaching. This, too, was demarcated by a boundary – comparing teacher education practices to their discipline's teachers and teaching practices. Oliver, for example, depicted history teaching as falling easily into "*faceless lectures*" where distant lecturers read jargon from packed slides, while the teacher educator modeled higher-quality teaching. The PSTs seemed to share the view that, in their discipline, there were more monologic teaching practices, compared to educational sciences. Mia, a student of Finnish language and literature, explicated that it felt important to see the teacher educator teaching:

> "I think it's quite important to have these teacher education courses in the **face-to-face** mode, so that there is also that kind of, uh, **I don't know if this sounds funny**, but you also kind of **see the teacher** [laughter] there, mmm, well **teaching** and like telling us and discussing with us."

In this way, as well as through their body language, teacher educators teach the PSTs how to engage in the social practices of teaching (Godhe & Wennås Brante, 2022). The PSTs considered that online teaching restricted this aspect (see section 5.3). However, according to Sofia, "*you can tell we've been here* [laughter] *at the Department of Teacher Education, because it's probably the highest quality online teaching I've had.*"

The PSTs also recognized boundaries between various school subjects. Vera talked about the different degrees of free debate:

> "In language arts, I feel that we had much more free discussion in, for example, upper secondary, so it is perhaps more emphasized there, but then again, I feel that these subjects that I study [physics, chemistry, mathematics] […] **there's not so much room for** the kind of, like, **free thinking** [amused], so these subjects are pretty much **stuck in their routines.**"

After a follow-up question, Vera explained that she liked the theorical nature of physics and being able to "*browse through a collection of formulas and find answers there* [laughter]." She continued that she liked having educational studies "*separately*"– which allowed for more openness, self-expression, and personality – and "*then the other studies* [physics] *are in the background.*" With this wording, Vera clearly demarcated the boundary. This process of identification could be called not only othering, but also *legitimating coexistence* (Akkerman & Bakker, 2011), since Vera appreciated being part of both worlds.

In the above examples, the boundary was expressed by verbal markers (Akkerman & Bakker, 2011): comparing the "*different worlds*" and clearly indicating the "*separate*" nature of the disciplines. Other words used were "*alteration/variation*" and "*counterbalance.*" Furthermore, the PSTs understood the situated nature of boundaries in spatial and temporal terms (Akkerman & Bakker, 2011; Kerosuo, 2004). Sara, majoring in mathematics, talked about developing teacher training so that classes would not be held only on Mondays. She felt that she forgot things in between and that there was a sense of temporal separation:

> "The week starts so that I have educational sciences [laughter] and then I think about them that day and then I have **everything else** the whole week, so then on Sunday I'm like, well, I have educational sciences again tomorrow [laughter], then I think that I have like **two days a week when I just think about them**, so I don't know, maybe I should just **make time** for the other [subject]."

In addition to temporal markers, spaces were also relevant. Ella gave voice to insecurities concerning the evolving teacher identity and tensions related to being primarily a subject matter expert (see Peterman, 2017). She highly appreciated self-reflection and the inspiring and awakening studies in teacher education, but felt that she didn't know what was expected from her, which brought forth insecurity. She sensed that she didn't "*yet belong anywhere*":

> "I just have a feeling that since I'm like a chemist [laughter], **I can't go there**, I don't even, like, know what I'm studying yet and what's expected of me and whether I am a subject teacher, **can I call myself a subject teacher?** […] I would maybe need a bit like, something that would really combine the fact that subject teachers study something else [their major] and that everyone is welcome, so that even though you mainly study chemistry, but you are also a teacher, so come here, **come here, you belong here.**"

Ella referred to not knowing whether she was welcome at all events targeted at PSTs, such as an employment-related event simultaneously organized at the interview premises. The premises also house the Department of Teacher Education, and Ella continued to describe how "*even coming here today was like, I can't go to* [building name], *I don't know why.*" The interviewer then reassured her that she was very welcome, to which Ella said that she would try to "*make this a kind of a second home,*" instead of only the buildings where her major's department is located. In this way, a larger boundary (belonging to educational sciences and to the group of prospective teachers) was also manifested spatially.

5.2. Crossing boundaries in multidisciplinary collaboration, afforded by meaningful experiences of social cohesion

According to Akkerman and Bakker (2011), learning – as viewed in the broad sense, including identity development and change of practice – at the boundaries can happen through various mechanisms: identification, coordination, reflection, and transformation. To really learn to dialogically collaborate across disciplines and to develop boundary-crossing competences (Fortuin et al., 2023), PSTs need to not only identify boundaries, but also to reflect on them and transform practices. This seems to have happened in our study: the PSTs described the processes of grasping the differences between practices and thus developing new understanding about their own and others' practices, in other words, learning through reflection (Akkerman & Bakker, 2011).

Some evidence of transformation was also present. Transformation leads to changes in practices, possibly even creating new, in-between practices (Akkerman & Bakker, 2011). Mia described how it was different and interesting, a kind of counterbalance, to be able to listen to students from other disciplines and their opinions, and to "*sort of unite our knowledge and skills.*" Similarly, Ella reported finding a common path:

> "They were really great discussions and then the days stretched long […] if someone disagreed, it was stated immediately, and then we discussed it and found solutions […] everyone is so different, especially in our group, we were like **cut from different cloth**, **but** somehow, **we found a common path.**"

It is only when sociocultural differences – here, differences between disciplinary practices – lead to some kind of disruption that negotiation of meaning and transformation become possible (Akkerman & Bakker, 2011). This kind of disruption and transformation seems to have happened, at least according to some PSTs. Moreover, in our previous study (Lehtinen et al., 2023), we used video observations and discovered that these PSTs engaged in complex processes of negotiation of meaning in their collaborative learning discussions. In their meaning-making, PSTs compared disciplinary differences, which were also encouraged in instructional design. Thus, they showed the ability to collaborate across disciplines, and learned dialogically about the unique nature of education. This, however, did not mean "a fusion of the intersecting social worlds or a dissolving of the boundary" (Akkerman & Bakker, 2011, p. 152). Instead, the uniqueness of each discipline was preserved – a dialogical respect for diversity (Akkerman & Bakker, 2011) that we hope will continue in their future professional collaborations.

Nevertheless, this positive view of dialogical boundary crossing was challenged by another voice: that of Oona, who experienced exclusion and felt that she learned best on her own. This experience was linked to other themes, namely "Threshold in online interaction" and "Norm of being talkative, shyness and silence as negative." Oona, majoring in languages, described her orientation to learning: "*the kind of individual assignments that are done and returned, they are probably the easiest and I feel like I learn more from them.*" She also talked about her experiences in collaborative learning:

> "If there are four of us there, then it's **hard for everyone to be heard** […] there are three people who know each other, and then there is one who is a so-called **outsider** […] I'm probably, like, **quieter** anyway, so then I'm the one who just follows there."

This can be seen from various perspectives – on the one hand, collaborative mindsets and dispositions are quite stable and difficult to transform in teacher education (Valtonen et al., 2021), on the other, the social norm of talkativeness is problematic. We will come back to this later (section 5.4).

Overall, what afforded high quality collaborative learning and dialogical boundary crossing seemed to be the meaningful experiences of social cohesion created in face-to-face teaching prior to the COVID restrictions. The opportunity to get to know each other in face-to-face teaching was essential, in the PSTs' experience. Many students mentioned the role of icebreaker games and getting-to-know-you-games. Knowing each other made it possible, for example, to express disagreements because the atmosphere was supportive and "*you had already talked about personal things, like each other's family backgrounds.*" Since the online environment restricted social interaction, it was important to be "*as natural as possible,*" and according to Oliver, this could be manifested in "*shooting the breeze,*" and even "*letting dirty words slip.*" Valuing off-task interaction was one aspect of social cohesion, as described by Ella:

> "Now that you have started to **get to know people** a bit, the conversations are really relaxed, and then you notice that sometimes you can talk about something else, a bit, like, **off-topic**, other than just the issue at hand, so there have been **really good conversations.**"

Off-task discussions can be seen as essential for intersubjectivity, which builds relationships between people (e.g., Jones, Volet,

Pasternak, & Heinimäki, 2022). Experience-oriented talk can also help build engagement, motivation, and trust (Ke, Chávez, Causarano, & Causarano, 2011). However, in our previous analysis of the same PSTs' online collaborative learning (Lehtinen et al., 2023), we found that the PSTs frequently shared their personal experiences while addressing the task, whereas there was no off-task sharing of personal life. It may be that in their other collaborative learning situations, off-task interaction was more present.

5.3. Threshold in online interaction – the need to observe better and involve others

During online teaching during the COVID restrictions, there was a "*threshold*" or "*invisible wall*" that hindered collaboration because of a lack of "*genuine human connection.*" The word "threshold" (*kynnys* in Finnish) was used by eight PSTs. The experienced threshold made it difficult to talk, invite others to participate, and ask for help. Also, difficulties related to uneven participation and division of labor were reported. Having web-cameras on helped in creating a feeling of presence (see also Lehtinen et al., 2023), but what was still lacking was the other person's "*entire essence,*" "*energies,*" and body language. Similarly, Kasperski and Hemi (2022) found that PSTs perceived the complexity of online interaction as coming from the decrease of nonverbal expressions. In our study, general "*essence*" was highlighted. Sara talked about how overlapping talk led to shared laughter, creating a funny moment that resembled a face-to-face situation and brought about "*genuine human connection*" and the joy of chatting with people, not bots. Overall, it was challenging for PSTs to describe the issues related to physical proximity – they mostly reported a sense of difficulty, stating that it was difficult to analyze.

One facet of the threshold was getting routinized into being in remote mode, which resulted in growing social anxiety. Various PSTs described how it became difficult to be "*among people,*" "*surrounded by people,*" or "*in front of people.*" Niko, majoring in languages, said:

> "You may have forgotten some things about what it's like to have a face-to-face conversation […] in my case, I've never really been the type of person who would be, like, nervous about **talking in front of people** [....] but when we had the presentation, I was nervous about it […] it feels a bit strange even to myself that I've **never had any problems before and then all of a sudden now** when I come back I feel a bit different."

He also stated that, as a prospective teacher, this was an important aspect since one must be able to "*teach or present or lecture and such*" and be comfortable in front of people. He thought that getting used to online settings could cause problems for future teachers. Kasperski and Hemi (2022) also found that PSTs felt psychologically safer in online settings, afforded by the distance and protective screen. Teacher educators have described how, when teaching online, they no longer recognize their own teacher bodies and find it difficult to adequately convey what it is like to be a teacher (Godhe & Wennås Brante, 2022). This aspect could be viewed as one boundary, namely between online and face-to-face practices.

On only some occasions did the experienced threshold make PSTs emphasize the ability to involve others (e.g., remembering to ask others) – an important teacher capacity. This aligns with our previous results about their collaborative learning (Lehtinen et al., 2023), as they hardly ever encouraged each other's participation explicitly (e.g., by saying "how about the rest of you?"). They did, however, mention that one needs to be able to "*observe better*" and "*read between the lines*" in online settings and to "*infer from people's behavior*" whether someone is, for example, shy. Some talked about how easy it was to forget someone or how someone may be sidelined. More courage to involve others could have changed Oona's feelings of exclusion or the experiences of unequal division of labor.

Many PSTs noted that it was difficult to specify or analyze the features of socioemotional competence in online settings, or that it was inseparable from other contexts – as always present in interaction. As Nea stated:

> "That's a bit of a tricky question because, in a way, social and emotional skills are a **terribly, sort of, ordinary thing** on some level, so that if you don't pay attention to them, **you almost don't notice them**, but on the other hand, if they were missing, it would be terrible, but, well, would I be able to sort of name something, some individual thing."

Thus, it seems that it was difficult to analyze socioemotional competence as situated practice, similar to the findings of Aspelin and Jonsson (2019).

Related to the theme "Threshold in online interaction" and social anxiety, several students talked about fatigue, exhaustion, or "*having zero energy.*" This was partly because they were first year students and there were initially many social events (before the COVID restrictions), and the "*social battery went to zero.*" Sofia also mentioned "*COVID exhaustion*" and "*holistic stress related to COVID*" since one couldn't go anywhere and there was a fear of getting infected. However, she described how, after returning to face-to-face teaching, it felt exhausting to go to the university without the routine.

5.4. Imagined future – tensions at the boundary between being a student and being a teacher

In this section, we draw together the complexity of imagining the future profession (theme "Difficult to imagine and analyze competence, lack of experience"), marking the boundary between being a student and being a teacher through challenges (theme "Focus on how to deal with challenging situations"), as well as tensions arising from the boundary ("Social cohesion as an experience vs. absent in the imagined future" and "Situated norm of talkativeness vs. imagined respect for diversity").

While it was somewhat difficult to analyze competence as situated practice, many PSTs also found it difficult to envision socioemotional competence in their future work and to indicate how they would like to develop their competences during teacher education. Some PSTs explained that this was due to their lack of experience as teachers. Similarly, Laletas and Reupert (2016) found that secondary PSTs perceived inexperience and inadequate training as limiting their ability to provide care during practicums.

The boundary between being a novice and being an expert – between peripheral and full participation (Lave & Wenger, 1991) in the

community of teachers – was often demarcated by imagining challenging situations. Ida, a prospective English teacher, talked about problem situations including intense emotions:

> "**I can't quite think of it** [laughter], because I have **no experience** of that, so I can't say terribly well, but maybe, in a way, some kind of irritation or something like that, things related to that, because for me, it might be a bit scary, or I find it threatening […] maybe, like, to imagine a situation where a **child starts to rage** and gets angry […] I'm not quite sure how I might act in that situation, so at least I would sort of, or precisely, need to go through those kinds of things […] those kinds of **problem situations.**"

Many students emphasized such situations of conflict or unexpected events. Laura, majoring in educational technology, said that teachers face a lot of situations that one doesn't usually encounter in everyday life, and "*normal people don't, like, get involved in an argument, but a teacher has to.*" Oliver said that he would like to have a "*difficult situations course.*" The imagined examples often involved strong or negative emotions, and one student mentioned emotion regulation as an important part of teacher competences due to situations involving such emotions. The imagined situations involved not only pupils, but also – to a small extent – parents. Situations with colleagues were not brought up.

Tensions and conflicts, even imagined, may mark the boundary (Akkerman & Bakker, 2011) – in this case the boundary between what is part of me and what is not (yet) part of me. According to Aspelin and Jonsson (2019), one of the significant purposes of teacher education is to prepare PSTs for challenging and unpredictable relationships and situations.

Apart from the tensions and challenges described by the PSTs, we recognized a tension in that PSTs emphasized the role of social cohesion in the situated context but did not imagine it as part of their future role. Some PSTs talked about "*listening equally to everyone*" and "*involving everyone*" (see also section 5.5), but group-level cohesion and related issues were almost absent. Emma, a prospective history teacher, stated that she would like to learn to understand group dynamics better and to thus be able to act "*somehow in a good way.*" Sara brought up the ability to "*read bullying situations*" and to interpret them correctly and to avoid misunderstandings. However, ways to create safe spaces were not mentioned.

The PSTs held a normative conception of prospective teachers being talkative and viewed shyness and being silent as something to do away with. Student teachers were seen as "*probably the chatty types by default.*" Sofia differentiated between her discipline's (English) students and student teachers:

> "In the major studies, there are **those who don't dare to speak**, but when everyone is a student teacher, then they **speak more easily** there and participate."

In addition to this, collaborative learning, particularly in the online setting, was framed by the idea that "*everyone should just talk.*" Lisa talked about a good and successful small group and contrasted it with other groups: "*sometimes there is such a group where others are quieter and maybe not so much necessarily involved in the discussion.*" Similarly, other students spoke negatively about silence. Various students described themselves as shy or introverted. For instance, Mia said that she would need to develop courage or initiative because she is shy and likes to be *"a bystander.*" Ida, although describing herself as shy, said that "*maybe our group worked precisely because, I think, no one there was very shy.*"

On the one hand, it is good that introverted future teachers develop their "*courage and initiative.*" On the other, a normative idea of participation through talkativeness is problematic. This "tyranny of participation" (Gourlay, 2015) can mean a lack of understanding of people's diversity, even to the extent that non-privileged and less powerful participants can be silenced and intimidated by learners who are more confident and have a higher status (Lambert, 2019). It may reflect a "particular Western, post-enlightenment fantasy of the 'ideal' student" (Gourlay, 2015, p. 405). Complete disengagement from collaboration and educational activities is obviously problematic (see Gourlay, 2015) for several reasons, such as not being able to hear different voices and opinions or from the perspective of belonging and social cohesion. However, the norm of talkativeness may lead to undervaluing quiet practices, such as silent reflection and the collaborative activity of listening (Gourlay, 2015; see also McNaughton, Hamlin, McCarthy, Head-Reeves, & Schreiner, 2008; Remedios, Clarke, & Hawthorne, 2012). We found that there was an imbalance, with students emphasizing that everyone should speak up, rather than noting that one needs to be able to ask questions and involve others.

Moreover, there was a contrast between this situated norm of "everyone should just talk" and the imagined respect for diversity. Many students talked about considering that every pupil is different and treating and respecting everyone equally (see section 5.5). This, however, conflicts with the normative views that they set for themselves and their peers. In line with this, Moate (2023) found that, in their situated reflection, PSTs demonstrated a nuanced understanding of the themes (insideness and outsideness), but when imagining their future as teachers, their reflections lacked the previous multidimensionality. Thus, PSTs tend to hold idealistic notions of dialogically involving others (Moate, 2023), and this also applies to caring (Laletas & Reupert, 2016).

5.5. Imagined future – dialogical vs. monological voices

In this section, we consider various dialogical and monological voices that PSTs expressed regarding their future under the themes of "Dialogicality and respect for diversity vs. monologicality" and "Teacher competences as stable and 'correct' ways of being vs. something to be learned." The PSTs used the words "dialogue" and "monologue" in various associations during the interviews, for example, when talking about how the teaching practices in their major appeared more monologic than in educational sciences (see section 5.1). They did not, however, mention these words while imagining their futures.

While imagining, many PSTs foregrounded the need to consider diversity and individual differences. Sofia talked about being open and not labeling:

> Maybe we need the kind of **openness to accept that everyone is different**, every kid, and they have different experiences, at home, in their free time, just about anything can happen that we don't know about, maybe kind of, **not to label**, **to let them themselves**, hmm […] not to assume anything, and then maybe, as an adult or a teacher, to be someone who they can come talk to, and to **take everyone into account**.

This reflects beautifully a dialogical orientation to differences (Arvaja & Hämäläinen, 2021). In a similar vein, PSTs perceived listening to and involving everyone as essential when it comes to socioemotional competences. This included "*participatory interaction,*" treating and respecting everyone equally, giving everyone the opportunity to be heard, and "*continuous activation,*" metaphorically "*scooping them* [pupils] *along all the time*" even though "*you are in the teaching mode.*" However, this ideal view of differences and of involving everyone contradicts the situated norm of talkativeness, as we have proposed in the previous section.

While the PSTs' conceptions, perhaps idealized, reflected mostly a vision of a dialogical teacher, there were few more monological voices. Oliver described how he thought that teachers' authority is automatic:

> "Oliver: […] A certain kind of **leadership, authority is automatic**, I do not, I do not doubt it at all, but then how you, sort of, **create** it and how you **maintain** it so that you are listened to, and they want to be in contact with you, so that must be a kind of **conscious, active, continuous activity.**
>
> Researcher: […] Do you have an idea where that authority or that desire to be with you or with the teacher comes from?
>
> Oliver: […] Take the **stereotypical difficult teenager** who can't be told what to do, but even they have it, we people have it, when someone is **older and wiser**, so you anyway somehow see it, like, well okay, he's now **the one in charge** […] like, okay, that's the teacher, I'm a student, even if it annoys me, that's still the teacher, not an uncle, that's the teacher, and then how you, kind of, **prove that you are the teacher** […]."

Here, the authoritative teacher position was somewhat taken for granted. Of course, Oliver simultaneously expressed the idea of creating and maintaining a relationship with the pupils. Nevertheless, the idea of an automatic authority comes close to the monological stance of reducing the other to the status of an object (Rule, 2011). It has been shown that a healthy classroom climate, characterized by fewer conflicts and disruptive behavior, has to do with the teacher's social and emotional competences (Jennings & Greenberg, 2009), not authoritative leadership as such. A monological orientation may lead to aggressive responses or relying extensively on punishments when addressing pupils' behavioral issues, which is not only ineffective (see Greene, 2018; Jennings & Greenberg, 2009) but often also unethical. Going beyond this is not the responsibility of individual student teachers, but of teacher education programs, which may still lack sufficient explicit training in socioemotional competences (Jennings & Greenberg, 2009).

Related to developing competences, we found that students' perceptions of teacher competences moved along a continuum from normative and "right" to a more flexible conception. Many of them talked about learning how one "*should*" act in difficult situations and what would be the "*correct*" or "*right*" ways of interpreting or reacting to challenges. Sara wanted to "*find the **right** way to approach the pupils' despair*" in mathematics. At the other end of the spectrum was knowing how to act "*professionally*" or "*on the basis of training, of all the knowledge and skills that you have accumulated.*" Ella voiced both ends of the continuum:

> "I don't know […] **how a teacher should be there**, and to have the social and emotional competence and so on […] I don't know at all what I would need or **how I should be** and then I, uh, would **need to learn how to, like, be for them** […] I feel like I just know the ways of the two good teachers and they're pretty much the same […] but then again, I don't even remember what kind of ways other teachers have had, so then it would be nice to **see the other approach** to it, **how you can be when it comes to skills**."

There seemed to be normative, authoritative voices regarding "how to be" as a teacher. Simultaneously, there was the idea of competences as something to be learned, to learn to be "for them" in a notably open way: seeing and learning other ways and approaches. A similar idea of learning "to be," to engage in the social practice of teaching, was emphasized by Godhe and Wennås Brante (2022).

Furthermore, some descriptions reflected dominantly stable teacher characteristics. Ella talked about her "*teacher idols*" being "*wonderful, natural, the kind of sunny people,*" whereas she felt she was sometimes "*a cursing sailor.*" Oliver mentioned the influence of "*personal characteristics,*" such as being "*overly self-important*" or "*too strict*" and "*overly lax*" or "*too quiet,*" which he considered as being the "*bad extremities.*" However, both Ella and Oliver also talked about competences as something to be learned, highlighting "*what I want to grow up to be*" (Ella). While most teachers believe social and emotional competences to be teachable (Schonert-Reichl, Hanson-Peterson, & Hymel, 2015), there is still a risk of static categorizations and social representations of the teacher (Arvaja et al., 2022). To avoid static and authoritative framings, PSTs need critical dialogue and reflection (Arvaja et al., 2022), as well as the overt teaching of competences. In this process, the dialogical idea of constant becoming and the unfinalizability of being a teacher (see Rule, 2011) can be centered.

6. Conclusions and implications

In this study, we examined PSTs' situated and imagined views of socioemotional and dialogical dimensions of becoming and being a teacher. In the situated context, we highlighted the role of the multidisciplinary collaboration in teacher education, the later stages of the COVID pandemic, and online teaching. Through reflexive thematic analysis, we found that in their **situated views** PSTs (1)

identified disciplinary boundaries and the uniqueness of educational sciences in multidisciplinary collaboration, (2) crossed disciplinary boundaries with the help of meaningful experiences of social cohesion, (3) perceived a threshold in interaction while studying and working collaboratively online, meaning that it was difficult to participate and to invite others to participate and it became difficult to "*be in front of people,*" and (4) held a normative conception of being talkative and perceived being shy or silent as negative. On only some occasions did the experienced threshold cause PSTs to emphasize the need to involve others. Several PSTs noted that it was difficult to specify or analyze facets of socioemotional competence in online settings. It seemed that it was somewhat challenging to analyze socioemotional competence as situated practice (see Aspelin & Jonsson, 2019). The students were in their first academic year; thus, it is the task of further education to provide students with appropriate professional language (Aspelin & Jonsson, 2019) to analyze competence in different professional situations.

Regarding the **imagined future**, we found that PSTs (1) found it difficult to imagine and analyze competence, often due to lack of experience, (2) marked the boundary between being a student and being a teacher through situations of challenging interaction, (3) expressed both dialogical and monological voices regarding a teacher's profession and authority, (4) held perceptions of teacher competences that moved along a continuum from normative and "right" to a more flexible conception. We recognized three kinds of **boundaries** (Akkerman & Bakker, 2011): boundaries between (1) disciplines, (2) online and face-to-face practices, and (3) being a student and being a teacher, between what is part of me and what is not (yet) part of me (Akkerman & Bakker, 2011). At the boundary between situated and imagined views (see Fig. 1), there were **tensions** in that PSTs held a situated norm of talkativeness, while largely emphasizing respect for diversity in their imagined profession, and in that PSTs valued social cohesion as a situated experience in teacher education, but group-level cohesion or related issues were peripheral in the imagined future. Perhaps guided reflection between the situated and imagined views could further bridge these contrasting views (see also Moate, 2023).

In terms of **crossing disciplinary boundaries**, we believe that the learning mechanisms that PSTs engaged in were identifying boundaries, reflecting on them, and possibly even transforming practices (Akkerman & Bakker, 2011). However, as Akkerman and Bakker (2011) put it, "it is one thing to create something hybrid at the boundary but quite another to embed it in practice so that it has real consequences" (p. 148). This remains to be seen further in PSTs' studies and in their working life. All in all, it seemed that boundary crossing enabled reflective identity work (Akkerman & Bakker, 2011; Williams et al., 2007).

Our findings offer various implications for teacher education and for professional development more generally:

- making explicit the disciplinary boundaries and boundaries between being a student and being an expert, and collaboratively reflecting on them,
- using situated analyses of professional competences (e.g., socioemotional competence) together with imagined accounts of them – thus engaging in critical dialogue and reflection of possible differences and tensions between the situated and the imagined,
- ensuring enough cohesive, safe spaces and time for meaningful, collaborative boundary crossing and identity work,
- emphasizing that professional competences, although built on one's personality and personal strengths, are something to be learned, rather than seeing them as unilateral "right ways" of being – hence, highlighting the constant becoming as professionals,
- tapping into social norms and beliefs, such as the norm of talkativeness, through written or collaborative reflection,
- teaching various ways of active listening and engaging others (e.g., synthetizing previous discussion, asking for clarifications, or inviting quiet participants to participate).

Although we looked at PSTs' learning from a situated learning perspective and considered the boundary between being a novice and being an expert, we also want to draw attention to the unique perspectives and subjectivity that "newcomers" can bring to professional communities. Situated learning theory has been criticized for the idea of socializing novice members into existing practices and thus reproducing social and pedagogical practices (Cherrington, 2017). Biesta (2013) argued, on the basis of Dewey's ideas, that there is a difference between educative and noneducative participation: "participation in which only one party learns (by adapting to the other party), and participation that transforms the outlook of all who take part in it and that brings about a shared outlook" (p. 33). According to Biesta, this is the difference between Dewey's ideas of participation and those of situated learning theory. Similarly, we believe that new teachers bring important perspectives and practices to teacher communities (see also Darling-Hammond & Hyler, 2020), which can change the outlook for all. Among such may be the personally lived "threshold" in interaction during the pandemic, from the perspective of a student.

This study is not without limitations. First, the participants were a relatively small group of PSTs. However, our aim was not to generalize our results but to provide an in-depth account of the phenomena. Second, our experiences as teacher educators in the studied Department of Teacher Education affect our interpretations. However, none of us taught the participants and we used investigator triangulation. Third, although we identified some tensions or potentially problematic parts of PSTs' beliefs that require critical reflection, we do not wish to criticize PSTs' belief systems as such. Their belief systems are evolving, which means that our analysis focused on emerging thinking rather than well-grounded and tested ideas (McGraw et al., 2023). Also, PSTs' abilities to articulate their beliefs, or our capacities to interpret them, may be limited (McGraw et al., 2023). Fourth, we only collected self-report data at one moment, so we were not able to detect possible changes in PSTs' perceptions other than those they described themselves at that moment.

Future studies could explicitly target the social norms of talkativeness among PSTs and address various facets of respecting diversity, both in the situated context and in the imagined future. Longitudinal study designs could be used to explore how secondary PSTs cross disciplinary boundaries and how they perceive the boundary between being a student and being an expert in various phases of their studies. Moreover, the boundary between online and face-to-face practices could be further analyzed from the perspective of socioemotional competence in becoming a teacher. To conclude, we believe that our findings can contribute to addressing

socioemotional competence and dialogicality in teacher education amid crises and to further theorizing the boundary between the situated and the imagined.

CRediT authorship contribution statement

Auli Lehtinen: Writing – original draft, Visualization, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Emma Kostiainen:** Writing – review & editing, Validation, Supervision. **Piia Näykki:** Writing – review & editing, Validation, Supervision.

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Declaration of competing interest

None.

Data availability

The authors do not have permission to share data.

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