frontiers in Education

TYPE Original Research
PUBLISHED 31 March 2026
DOI 10.3389/feduc.2026.1789590

OPEN ACCESS

EDITED BY
Martina Homt,
University of Paderborn, Germany

REVIEWED BY
Judith Schellenbach-Zell,
University of Wuppertal, Germany
Falk Scheidig,
Ruhr University Bochum, Germany

*CORRESPONDENCE
Katharina Neuber
katharina.neuber@leuphana.de

RECEIVED 16 January 2026
REVISED 27 February 2026
ACCEPTED 06 March 2026
PUBLISHED 31 March 2026

CITATION
Neuber K and Kleinknecht M (2026) When theory becomes practice – potentials and constraints of simulation-based core practice trainings in teacher education.
Front. Educ. 11:1789590.
doi: 10.3389/feduc.2026.1789590

When theory becomes practice – potentials and constraints of simulation-based core practice trainings in teacher education

Katharina Neuber* and Marc Kleinknecht

Institute of Educational Sciences, Teacher Education and School Development, Leuphana University Lüneburg, Lüneburg, Germany

Background: Simulation-based learning is increasingly becoming a subject of educational research, attributed with the potential to combine theory and practice. This method shifts the focus from theoretical knowledge to performing profession-specific core practices which are theoretically sound and at the same time focus on the requirements of teaching. Although studies provide valuable insights into how simulation-based settings at universities should ideally be designed to teach core practices, the question of how simulation-based settings are experienced from the perspective of pre-service teachers need to be further investigated. The present study focused on pre-service teachers' emotional and cognitive processes and acceptance during a simulation-based core practice training (role-plays) in educational sciences in teacher education.

Methods: Using a cross-sectional design, we analyzed 77 feedback responses from German bachelor's degree students. Emotional processes were assessed using the teacher emotions scales. The acceptance scale comprised eight items on preparation for the role-plays and perceived learning effect. The feedback form also included an immersion scale and single item for assessing germane load.

Results: Findings indicate a moderate level of enjoyment and germane load, a high degree of immersion and low level of negative emotions such as anxiety and anger. Simulation-based training in core practices was rated positively for acceptance.

Conclusion: Participants enjoy simulating core practices of the teaching profession and consider the simulation-based learning environment to be highly relevant in practical terms. Our study thus provides initial empirical support for integrating simulation-based learning formats into teacher education at an early stage in order to bridge the gap between theory and practice and reinforce the idea that educational theory can be a practical tool.

KEYWORDS

acceptance, core practices, cross-sectional study, emotions, practice-based teacher education, role-plays, simulation-based learning

1 Introduction

> "We should be aware of the value of theory […] there is nothing as practical as a good theory." (Lewin, 1943, p. 118)

This dictum sums up a key challenge in teacher training: the relationship between theory and practice. University teacher training is often criticized as being too theory-heavy, too far removed from practice, and not very effective in terms of practical application (e.g., Bernholt et al., 2023). This contrasts with the expectation that students should be exposed to concrete teaching practice as early as possible. The pedagogical activities in the teaching profession are grounded in interdisciplinary, profession-related theories taught within the educational sciences in university teacher training. The ongoing criticism of teacher training programs poses a challenge to the educational sciences to link their theoretical contributions more closely to the micro-strategies of pedagogical action.

The core practice approach outlines a practice-based way of professionalization that is also gaining traction in Europe (Grossman and Fraefel, 2024). Based on the idea that teacher training should focus on the acquisition of practices typical of the teaching profession early during study, core practices of the teaching profession are defined, and didactic settings are proposed for their acquisition (McDonald et al., 2013). Core practices are not understood as a mere attempt to increase practical experience, but rather as a tool for student learning and professional development. This is linked to the assumption that competence is not developed solely through the acquisition of theoretical knowledge or analytical skills, but through repeated, theory-based engagement with core practices (Grossman et al., 2009). In the core practice approach, professional action becomes therefore the central object of individual learning. Initial studies provide important insights into how learning settings at the university should ideally be designed for conveying core practices (e.g., Nückles and Kleinknecht, 2023). Approximations of practice, such as role-plays or digital simulations, play a central role in this context, as they provide a protected learning space for testing and reflecting on one's own actions (Grossman et al., 2009). Simulation-based learning environments offer pre-service teachers the opportunity to experience complex teaching situations in a controlled environment, to rehearse different courses of action, and to receive immediate feedback – elements often lacking in traditional university learning in Germany.

In research on core practices, previous studies have focused in particular on the development of students' skills and the design features of simulation-based learning environments. In a recent review, Cohen et al. (2025) concludes that approximations of practice can support short-term changes in pre-service teachers' professional knowledge, beliefs and self-assessed competencies regarding various aspects of teaching. However, the quality of the learning process and the subjective evaluation by participants are also crucial for the sustainable integration of simulation-based learning environments into teacher training. Including the perspective of students participating in simulation-based learning settings can be particularly valuable in order to examine the complexity of the learning experiences during approximations of practice in more detail – a perspective that has hardly been considered in previous research on core practices (Matsumoto-Royo and Ramírez-Montoya, 2021).

In this article, we present initial results of our study on pre-service teachers' acceptance as well as emotional and cognitive processes during a simulation-based learning setting in form of role-plays which are implemented in educational sciences in teacher education to promote core practices. We assume that emotions can influence not only perceived learning outcomes in simulation-based learning environments, but also the acceptance of such settings for one's own profession (LeBlanc and Posner, 2022). The article concludes with a discussion of the potential for integrating the core practice approach into teacher training. Based on our findings, we seek to clarify the conditions under which simulation-based learning settings can contribute to a practice-based teacher training at universities.

2 Theoretical background

2.1 Structural characteristics and competence orientation in teacher training in Germany

Teacher training in Germany is characterized by a historically developed structure that separates theory and practice institutionally, temporally, and conceptually. A central feature of German teacher training is the two-phase model, which divides training into a first phase at university and a second phase of practical school experience. Debates on the structure of teacher training are dominated by a competence-oriented approach. The focus is on acquiring professional competencies that enable pre-service teachers to successfully meet the demands of the teaching profession. Based on the assumption that theoretical knowledge is a prerequisite for professional practice (Baumert and Kunter, 2006), teacher training at university emphasizes the teaching of theoretical foundations. The second phase of teacher training, which takes place in schools, focuses on practical experience and theory-based reflection.

The temporal and institutional separation is further reinforced within the first phase at university by a differentiation between subject-specific sciences, subject didactics, and educational sciences. Within this structure, educational sciences play a special role. They form the framework in which interdisciplinary, profession-related concepts and models (e.g., pedagogical-psychological models of motivation or development, models of school and classroom development, fundamentals of pedagogical diagnostics) are taught, which in turn form the basis for teachers' pedagogical actions. This structure follows the logic of division of labor that addresses different forms of knowledge, but can also lead to fragmentation. The division into knowledge domains, a lack of coordination between courses in terms of content, and limited links between teacher training phases sometimes make it difficult to integrate professional knowledge. In literature, this problem is described as a double discontinuity (Hellmann, 2019): on the one hand, there are gaps between scientific theory learned at university and school practice, and on the other hand, between different areas of knowledge within the university. The result can be unconnected

bodies of knowledge that students neither systematically integrate nor combine in practical situations. Against this backdrop, coherence proves to be an essential quality dimension of teacher education (Cramer, 2025; Hellmann, 2019). It describes a meaningful, systematic linking of structures, content, institutions and phases of teacher training. The aim is to design learning opportunities in such a way that students experience different parts of their studies – courses, practical phases, program elements – as structurally and contextually coherent and can develop them into a networked knowledge structure.

A central discourse within the debate on coherence concerns the relationship between theory and practice (Cramer, 2025), which is one of the most discussed topics in German teacher training (Gröschner, 2019). Theoretical knowledge is considered a prerequisite for professional action (Baumert and Kunter, 2006), as teaching is characterized by complexity, uncertainty, and situational demands. Theory enables pre-service teachers to interpret educational situations in the light of scientific findings, develop alternative courses of action, and critically question their own actions. However, the structural characteristics of German teacher training have a significant impact on how theory is perceived by students. In this context, Hellmann (2019) emphasizes the importance of horizontal coherence, which can be achieved, for example, by systematically linking university requirements with the expectations placed on pre-service teachers during their practical field experiences. By enabling students to systematically link theoretical knowledge with elements of practice or relate them to each other, a sense of individual coherence is created, which can significantly support the individual professionalization (Cramer, 2025). Similarly, Brouwer and Korthagen (2005) demonstrate that students who repeatedly alternated between university learning and practical field experiences perceived an increase in competence, through more intensive use of theoretical content and deeper reflection on their teaching activities.

In recent models, teacher's competence is defined as a continuum realized in the interplay of individual dispositions, situation-specific competencies and professional action/performance (Blömeke et al., 2015). Accordingly, many courses in university teacher education are geared toward enabling pre-service teachers to analyze, diagnose, and reflect on teaching situations, for example through text- and video-based learning arrangements (e.g., Weber et al., 2023). While teacher training at the university is predominantly characterized by analytical processes and the development of theoretical knowledge, professional action is often understood as the result of practical experience, particularly during the second phase of teacher training in schools. Even though major reforms have been introduced, such as the introduction of extended practical phases in bachelor's and master's university studies, pre-service teachers still express a desire for more practical experience (Makrinus, 2013; VBE, 2025). Furthermore, teacher training programs in educational sciences are often criticized for the lack of connection between theory and practice and the absence of a systematic approach to developing and reflecting on professional action (Bernholt et al., 2023; Fecke, 2024). This criticism suggests that the requirements of school practice do not consistently serve as references for the acquisition of theoretical knowledge (Müller and Kleinknecht, 2025). Accordingly, students may perceive theory as secondary to practice, as abstract, normative, or detached from the concrete requirements of school life.

Against this backdrop, a key challenge is to create learning opportunities in which pre-service teachers not only analyze lessons, but also engage in practices, receive feedback, and further develop their actions on a theoretical basis. This is not a matter of "more practice," but rather of designing learning opportunities in which pre-service teachers can systematically link and relate theoretical knowledge with elements of practice. This is where the core practices approach comes in. By identifying recurring, professionally relevant patterns of action and implementing them as theory-guided, structured units, it offers a promising approach to enhance coherence with the aim of optimized professionalization.

2.2 Core practices as theory-driven condensations of practice

In the Anglo-American discourse, the approach of *practice-based teacher education* (Ball and Cohen, 1999) is well established). *Practice-based teacher education* can be understood as the transformation of theoretical concepts into so-called *core practices*, in which typical and frequently occurring challenges in the teaching profession provide the starting point for theoretically grounded analysis and further development of professional practice (Charalambous and Delaney, 2020; Grossman et al., 2009; Matsumoto-Royo and Ramírez-Montoya, 2021). Professional practice is characterized by complexity, contingency, and situational decision-making, and requires integrating different forms of knowledge in specific interaction situations. Core practices (often discussed as *high-leverage practices*, cf. TeachingWorks, 2025) address precisely this integration process: they represent fundamental patterns of action that teachers successfully apply in a variety of subjects, school types, and contexts and which, when implemented appropriately, prove to be conducive to student learning (McDonald et al., 2013).

In the core practice approach, professional action does not arise from replication of practice, but rather from the transformation of conceptual knowledge into representations of action. Fraefel (2026) describes core practices in this sense as a link between theoretical knowledge and professional action. They are anchored in typical challenges of the teaching profession and are at the same time based on theoretical and empirical knowledge. The core practice approach thus positions itself explicitly between theory and practice, without propagating a simplified practice orientation or a transfer of theory into practice.

Unlike models of teacher training that primarily view professional practice as a place where theoretical knowledge is applied, the core practice approach makes practice itself the starting point for learning (Müller and Kleinknecht, 2025). Integrating the core practice approach into teacher training creates opportunities for guided practice, feedback, and reflection. Elements that are crucial for learning and competence development. Core practices reveal which theoretical assumptions come into play in specific pedagogical interactions (e.g., in feedback situations or in classroom management processes). They can thus contribute to coherence at the level of individual

learning processes (Cramer, 2025), as they offer students points of reference for relating theoretical concepts with typical situations in school practice.

By linking (or relating) theoretical knowledge with professional action, core practices offer great potential not only for individual learning, but also for shaping collaboration between the actors, institutions, and phases of teacher education (Bernholt et al., 2023). According to Schellenbach-Zell and Hartmann (2022), core practices can be considered as "boundary objects" that exist in the various systems of teacher training (e.g., educational sciences, subject didactics, school practice), can be recognized and interpreted there, and thus build a bridge between the systems (cf. Grossman and Pupik Dean, 2019). Core practices therefore provide an opportunity for productive discourse between the actors and institutions in teacher education, for example about the subject specificity of core practices. Even the simple discussion of ideas about these fundamental concepts for the design of teacher training programs can promote the coherence of teacher training (institutional coherence, cf. Cramer, 2025).

Following the core practice approach, theories on teaching and learning processes, feedback, or classroom management model the underlying structures of pedagogical interaction. They provide concepts, assumptions, and explanatory models that teachers can use to understand, justify, and specifically develop their actions. For example, the professional action *providing feedback* can only be understood as a core practice through theoretical concepts. Teachers' feedback to students is considered an essential component for the learning process and an integral part of constructive (cognitive) support in the classroom (e.g., Kunter and Voss, 2013). Accordingly, teachers must make strategic decisions about the frequency, method, and content of the feedback (TeachingWorks, 2025). Feedback theories differentiate between content-related, process-related, and self-regulatory feedback, which has an informative function, highlights errors in current behavior and provides specific information that promotes learning with the aim of reducing the discrepancy between current performance and the desired learning goal (Hattie and Timperley, 2007). These theoretical distinctions make it possible not only to give effective feedback, but also to shape it in a qualitative way.

The same applies for the core practice *building respectful relationships* (TeachingWorks, 2025). A respectful student-teacher relationship results in a teacher's behavior characterized by a high degree of cooperation and emotional closeness, while at the same time guiding behavior in the interests of smooth classroom management. Conceptual models of teacher leadership (Wubbels et al., 1993) and teaching quality in the context of classroom management and emotional support (Pianta and Hamre, 2009) describe interaction logics that become visible in specific micro-actions: in setting rules, in responding to disruptions, in the responsible use of power, and in showing care and appreciation. Specific micro-strategies for building respectful relationships include, for example, teachers being patient, addressing learners by name, or actively approaching learners when something is wrong.

One of the daily challenges for teachers is to organize and structure lessons through efficient classroom management so that available teaching time is used effectively for student learning (Seidel and Shavelson, 2007). On this basis, *managing transitions* between two teaching activities or phases is an important feature of effective classroom management and thus as an important core practice (Yilmaz and Kleickmann, 2018). According to Weber et al. (2022, p. 105), effective transition management is based on "a prepared learning environment with established rules and routines that minimizes disruptions preventively and thus ensures a smooth and seamless transition between teaching phases." To achieve this, teachers can provide clear instructions and explanations (e.g., regarding work assignments), use acoustic or visual signals, and create a well-prepared learning environment with all necessary materials available.

Against this backdrop, core practices should not be understood as practices that arise from intuition or experience, but rather as the translation of theoretical concepts in situated patterns of action. The core practices approach thus addresses a central issue in teacher training: the complexity of practice is often overwhelming for novices and difficult to access without analytical approaches. By deriving core practices from theoretical models, they fulfill a bridging function: they reduce complexity without trivializing practice and structure perception by directing attention to relevant micro-strategies. Theory acts as a *lens* for professional action, providing the concepts needed to recognize what is happening in an interaction, why it is happening, and what alternatives are available.

2.3 Simulation-based learning in teacher education

A key assumption of the core practice approach is that these can be consciously initiated and systematically developed (Charalambous and Delaney, 2020; Forzani, 2014). For this purpose, *practice-based teacher education* relies on a specific didactic of learning, rehearsing under controlled conditions, and practicing core practices in real settings during university studies, centered on decomposition, representation, and approximation of practice (Grossman et al., 2009). When implemented as learning cycles of practice, these pedagogical principles create sequenced opportunities for novices to analyze, rehearse, enact, and reflect on core practices (Matsumoto-Royo and Ramírez-Montoya, 2021). McDonald et al. (2013) conceptualize this *learning cycle* in four phases: (1) explaining and modeling professional practice, (2) preparing for and rehearsing it, (3) enacting it with students in the classroom, and (4) analyzing the enactment to guide further development. For example, teacher training uses learning formats that combine theoretical content, practical exercises in simulated (e.g., video-based) scenarios, and feedback on teaching (Meier et al., 2023). Empirical findings highlight the importance of completing all phases of the learning cycle, particularly the phase of enacting and practicing action strategies for the core practice in a protected, pre-structured setting, which appears crucial for the successful acquisition of core practices (Kleinknecht et al., 2022).

Consequently, *approximations* of practice are a central component for acquiring core practices (Cohen et al., 2025; Grossman et al., 2009; Sapkota and Max, 2023). The simulation-based learning approach provides an overarching framework that aims to build key professional competencies – such as diagnosis,

communication, and problem-solving – in realistic yet controlled learning environments using authentic scenarios (Chernikova et al., 2020). These are usually scenarios with reduced complexity in which pre-service teachers plan and carry out specific, short teaching situations (e.g., reading exercises) with small groups of students. This allows pre-service teachers to focus attention on specific aspects of teaching and rehearse core practices without the pressure of high expectations and responsibilities (Matsumoto-Royo and Ramírez-Montoya, 2021). Approximations of practice during simulation-based learning can take various types (e.g., role-plays, rehearsals or simulation) and vary in their degree of authenticity depending on the location (university or school), participants (peers or students), and level of support (scaffolding) from teacher educators (Cohen et al., 2025). Role-plays are a specific form of simulation-based learning (Clapper, 2010), especially in professions where communication and social interaction are at the core of the work (Chernikova et al., 2020; Meier et al., 2023). They simulate typical – sometimes challenging – situations of interpersonal interactions from a teacher's everyday working life (e.g., parent-teacher conferences, conflict resolution, student interactions). Unlike rehearsals, in which teacher educators actively participate, or simulations, which are often taught digitally and require the involvement of actors, students can perform role-plays with people they know, e.g., peers (Cohen et al., 2025). For this reason, role-plays can be easily used in teacher training.

However, the effectiveness of simulation-based learning depends on specific factors related to the context, participants, and simulation design (Chernikova et al., 2020; Ulrich and Meyer, 2025). Approximations are considered effective for learning when they are conducted in a university context with students who have a high level of prior knowledge, when they take place in authentic settings, and when they are supported by teacher educators and include reflection phases. Simulation-based learning should therefore not be understood as merely "trying out" practices but only develop its potentials if practices are explicitly linked to theoretical concepts.

2.4 Emotional and cognitive processes during learning

For the sustainable implementation of learning arrangements in teacher training, it is crucial to understand how students perceive and experience this learning situation, both emotionally and cognitively. In educational research, acceptance is considered a key condition for effective learning (e.g., Lipowsky, 2010) as well as prerequisite for curricular implementation. Only when learners accept a learning setting do they invest cognitive effort, show persistence, and use more in-depth learning strategies. Acceptance of learning environments can be measured empirically, for example, based on satisfaction with support, personal motivation, perceived learning outcomes and usefulness (Carstensen et al., 2019). Models such as the Control-Value Theory of Achievement Emotions (Pekrun, 2006) emphasize that learning processes are significantly influenced by the interplay of perceived control, value attribution, and emotional experience. According to this, acceptance arises when high value, sufficient control and positive emotions are perceived.

Emotions describe a person's affects and can be seen as a complex reaction to the assessment of a situation. They are classified according to various characteristics (Moors et al., 2013) – such as their stability (state vs. trate), valence (positive vs. negative), intensity and level of activation (arousal). Relevant emotions in learning scenarios are, for example, fear, anger, joy or shame (Kuhbandner and Frenzel, 2019). Emotions are considered important gateways for cognitive processes, motivational orientations and intentions to act. For example, positive emotions can facilitate learning processes since we are able to perceive and process more stimuli when we experience positive emotions, which promotes mental flexibility, creativity, and problem-solving skills (Fredrickson, 2001; Frenzel et al., 2009). However, negative emotions such as anxiety and anger – occurring particularly when learning activities are evaluated negatively or little control is experienced (Pekrun, 2006) – can be assumed to have an inhibitory effect on learning, as cognitive resources are required to cope with them. Role-plays frequently involve unpredictable interaction, performance evaluation, and potential failure experiences, making negative emotions such as anxiety and anger theoretically plausible.

Emotional experiences during learning settings have significant effects on what participants remember from these events, their judgments, as well as their motivation to engage in learning behaviors (LeBlanc and Posner, 2022; Scherer, 2000). As a focused and pleasant learning experience can be facilitated not only by enjoyment itself, but also by a sense of *immersion* (Chang et al., 2018), pre-service teachers should also experience a feeling of immersion in teacher training programs, such as simulation-based learning. Research on video-based learning has shown that enjoyment is positively correlated with immersion, whereas negative emotions such as anger can reduce *immersion* (Weber et al., 2023). At the same time, *cognitive load* plays a regulatory role for learning (Sweller, 2010). A certain amount of cognitive load is necessary to reflect authentic requirements, but overload can impair learning processes. In simulation-based learning settings, there is a high risk of either underchallenging learners (e.g., through overly simplified scenarios) or overloading them (due to high complexity). Therefore, cognitive load acts as a quality indicator of instructional design in this context. It is assumed that cognitive load related to learning (*germane load*) refers to the cognitive resources invested in processing and structuring the learning content. The complexity of the content as well as the learning environment are particularly decisive factors in this regard. If pre-service teachers lack prior knowledge and experience, they may experience increased *germane load* when they must solve a problematic situation in the learning setting. Preparing the learning environment with clear instructions and support (e.g., role descriptions and feedback) can therefore help reduce germane load, allowing pre-service teachers to use sufficient cognitive resources and reach their zone of proximal development (Vygotsky, 1978).

Research in the field of simulation-based learning has shown that classroom simulations can evoke positive feelings of involvement and motivation, but also negative emotions such as fear, anxiety, insecurity and stress (Kunze et al., 2016; Stavroulia et al., 2016). The most common barriers include fear of evaluation, social observation, unfamiliarity with the setting, and

a lack of perceived authenticity (Bautista and Boone, 2015; Stavroulia et al., 2016; Theelen et al., 2019) which in turn can lead to a low sense of immersion. Overall, however, the picture is positive, with approximations such as role-plays being perceived as conducive to learning (Kunze et al., 2016; Meier et al., 2023; Schuldt et al., 2023). Studies on computer-based simulations also hint at positive perceptions: pre-service teachers often find learning during simulations enjoyable and motivating, report engagement and psychological involvement, and feel well prepared for their work in real classroom (e.g., Bautista and Boone, 2015; Fecke, 2024; Theelen et al., 2019). However, simulations might also be rejected as a learning opportunity, for example, if the simulated scenarios do not align with one's professional beliefs or previous experiences, or if they do not reflect the reality of the teaching profession (Fecke, 2024).

By focusing on core practices, simulation-based learning does not simply reenact everyday actions but addresses specific practical challenges that are also theoretically sound. To our knowledge, there has been no research to date on how pre-service teachers perceive the learning potential of a simulated learning environment for core practices. This is precisely where our study comes in.

3 Present study

Teacher training in Germany comprises various elements such as institutions, stakeholders, phases, or subjects, which are considered to have little connection with one another (Cramer, 2025). In particular, there are repeated references to a supposed gap between theory and practice (e.g., Bernholt et al., 2023; Fecke, 2024). Despite its potential to bridge the gap between theory and practice, simulation-based learning on core practices has hardly been established in university teacher education. Similarly, the question of how pre-service teachers experience simulation-based settings on core practices requires further investigation. Our study investigates pre-service teachers' *emotional* (emotions, immersion) and *cognitive processes* (germane load) during simulation-based training on core practices and their *acceptance* of the training, particularly reflected in perceived usefulness and learning outcomes. We focus on the following research questions:

RQ 1: Which emotions and levels of immersion and germane load do pre-service teachers report directly after conducting role-plays on core practices?

Empirical studies show that simulation-based learning is experienced in different ways. It has been reported that classroom simulations evoke feelings of involvement and motivation, but also negative emotions such as anxiety and stress (e.g., Stavroulia et al., 2016). However, since role-plays are often perceived as conducive to learning (Kunze et al., 2016; Meier et al., 2023; Schuldt et al., 2023), we also expect that our simulation-based core practice training will be associated with *enjoyment* and a sense of *immersion*. Given the structured learning environment, we expect the pre-service teachers' germane load during the role-plays to be moderate overall. However, since role-plays are only used to a limited extent in teacher training (Meier et al., 2023), some pre-service teachers may be exposed to higher level of mental effort due to a lack of prior experience and knowledge – we therefore assume that there will be variance in *germane load*.

RQ 2: How do pre-service teachers accept our core practice training in terms of the self-assessed learning effects and usefulness for their profession?

We expect our training to be well accepted, as research in the field of computer-based simulations indicates an overall positive perception. In studies with role-plays in teacher education, participants rated those as useful because they reflect the complexity of the profession and the authentic demands of teaching, such as difficulties in conducting conversations, conflicts, and teaching scenarios (Meier et al., 2023; Schuldt et al., 2023). We assume that the emotions experienced during the role-plays are relevant to pre-service teachers' judgements of simulation-based training (LeBlanc and Posner, 2022). If, on the one hand, positive emotions such as enjoyment and immersion are evoked during the role-plays, the training format could be perceived as more useful for one's own practice, which in turn can support deeper information processing and reflective engagement with professional requirements. If, on the other hand, pre-service teachers experience negative emotions, low immersion, and high germane load during the role-play, this may correlate with low acceptance, which in turn could limit the potential learning effects.

4 Methods

This paper presents empirical data of research that sought to examine the pre-service teachers' emotional and cognitive processes during a simulation-based core practice training in educational sciences in teacher education and their acceptance of role-plays. The data was collected in the spring semester from April to July 2025 in the bachelor's program in teacher education at a German University. In the education sciences module *Didactics & Methodology*, pre-service teachers were trained in core practices through simulation-based learning in form of role-plays. The research questions were evaluated using written questionnaires, which the pre-service teachers completed directly after each role-play session.

4.1 Setting

Strategies of classroom management, effective feedback, and respectful student-teacher relationships are considered prerequisites for successful teaching and learning (Hattie, 2009). Against this backdrop, our training focusses on the core practices 1. *Building respectful relationships*, 2. *Providing feedback*, and 3. *Managing transitions*. Our training draws on existing training programs for acquiring core practices and is conceptualized as follows: Based on the *Learning Cycle* (McDonald et al., 2013), each core practice is first presented in the initial modeling phase as part of the lecture and then modeled using teaching videos from other teachers. The second phase serves as a bridge between theoretical discussion and practical implementation and involves role-plays on the respective core practices. In this simulated, controlled environment, pre-service teachers interact with peers, which enables a reductionist didactic approach to the complex reality of the classroom.

For all three core practices, the pre-service teachers worked in pairs to prepare a 5-minute simulation for the core practice. The pairs were assigned the following tasks:

1. *Building respectful relationships*: You simulate a classroom discussion with a student and demonstrate guiding behavior by, for example, setting rules or pointing out consequences for misbehavior./You simulate a classroom discussion or formulate feedback for a student, demonstrating emotional closeness by, for example, showing interest or acknowledging behavior.
2. *Providing feedback*: You have planned a specific feedback situation and can simulate it. The feedback situation takes place during a phase of independent task completion.
3. *Managing transitions*: You can simulate a phase transition at which you assign the work order and explain the objectives and the process, for example.

When preparing role-play on the core practice *building respectful relationships*, pre-service teachers could refer to written case vignettes that address interaction barriers in the classroom. In addition, they were free to choose the focus of their simulation and could rehearse either guiding behavior or emotional closeness. In the second and third role-plays, however, no written case vignettes were provided. When conducting the role-plays, two tandems come together. One person takes on the role of the teacher, and two people simulate the roles of students in school. The fourth person takes on an observing role and provides feedback. Since our training focuses on three core practices – *building respectful relationships, providing feedback,* and *managing transitions* – the pre-service teachers had three opportunities during the semester to participate in a role-play and systematically rehearse each core practice.

4.2 Participants and study design

The study participants were bachelor's degree students from a German university in their fourth semester of teacher education. All pre-service teachers were studying to become primary or secondary school teachers and attended a lecture on *Didactics & Methodology* as well as an accompanying seminar in which the university teachers provided theoretical input about core practices in the context of classroom management, feedback and student-teacher relationships. The pre-service teachers were required to participate in simulations in form of role-plays.

To examine the emotional and cognitive experiences and acceptance of our simulation-based training on core practices, the participants were surveyed in a cross-sectional study. The survey was conducted online using *LimeSurvey*. Participation in the survey was voluntary and was aimed exclusively at pre-service teachers who took part in the role-plays. *Building respectful relationships* was the first core practice to be simulated in the accompanying seminar. A total of 32 students took part in this and gave feedback afterwards. After the second role-play on *providing feedback*, 20 students provided feedback, and after the third role-play on *managing transitions*, feedback was provided by 25 students. In conclusion, a total of $N = 77$ feedback responses were evaluated.

4.3 Questionnaires

The teacher emotions scales (Frenzel et al., 2016) were used to measure pre-service teachers' emotional processes during the role-plays, with the items being adapted to the seminar context. Three scales were formed by calculating the mean values. The items capture *enjoyment* as a positive emotion as well as negative emotions such as *anxiety* and *anger*. To evaluate the degree of *immersion* evoked by the core practice simulations, seven items by Seidel et al. (2011; cf. Weber et al., 2023) were applied. *Immersion* can be considered as the degree to which teachers are involved in role-play. *Germane load* was measured using a rating scale assessing the pre-service teachers' mental effort (Paas and van Merrienboer, 1993). To this end, pre-service teachers reported their perceived level of invested mental effort during the role-plays on a nine-point symmetrical scale.

Acceptance of the core practice training was assessed using a feedback form after each role-play. In accordance with a broad understanding of the construct, we define acceptance as satisfaction with the preparation for and implementation of role-plays, aspects of motivation (e.g., interesting content) as well as perceived learning outcomes and usefulness (cf. Carstensen et al., 2019). The scale comprised eight items rated on a scale from 1 (strongly disagree) to 4 (strongly agree). Table 1 shows example items and scales' Cronbach's alpha for the three sessions on core practices.

4.4 Data analysis

The results of the data analysis are presented descriptively. For this purpose, raw mean values and standard deviations are given for the scales, based on all 77 feedback responses. Estimated

TABLE 1 Item examples and cronbach's alpha.

Scale	Example items	*N*	Rating	Alpha
Enjoyment	I was joyful while conducting the action simulation	4	1 = not at all to 4 = very much	.74–.90
Anxiety	I was tense and nervous while conducting the action simulation	4	1 = not at all to 4 = very much	.75–.85
Anger	I was annoyed while conducting the action simulation	4	1 = not at all to 4 = very much	.61–.93
Immersion	I was mentally involved in the action simulation.	7	1 = never to 4 = all the time	.80–.89
Germane Load	How much mental effort did you put into the action simulation?	1	1 = very low to 9 = very high	–
Acceptance	I learned something new today.	8	1 = strongly disagree to 4 = strongly agree	.84–.91

marginal means and standard errors from linear mixed models are presented for comparisons between the three sessions. Correlations between the scales were examined using bivariate correlation analyses.

Some participants provided feedback on more than one core practice session. To adequately account for the interdependence of the measurements, linear mixed models were used to examine differences in feedback across the three core practice sessions, with the role-play session as a fixed effect and the person as a random intercept. Repeated effects were not of interest as only a small number of people provided feedback across all three sessions ($n = 9$). All analyses were computed using the Statistical Package for the Social Sciences (SPSS; IBM Corp., 2016). The alpha level was set at $p < .05$ for all the statistical analyses.

To describe the structure of the feedback instrument, descriptive values and intercorrelations between the scales were calculated based on all available feedbacks ($N = 77$ feedback responses, see Table 2). We found that *emotions* and *immersion* (emotional processes) are significantly intercorrelated and that *germane load* (cognitive processes) correlates negatively with *enjoyment* and positively with *anxiety*. *Acceptance* shows positive significant correlations with *enjoyment* and *immersion* and negative correlations with *anxiety* and *anger*.

5 Results

5.1 Emotional and cognitive processes

The evaluation of the questionnaire data following the role-play during the core practice sessions shows that the pre-service teachers experienced a moderate level of *enjoyment* and a high level of *immersion*. In contrast, negative emotions such as *anxiety* and *anger* were low (see Table 2). The statistical comparison of the core practice sessions revealed no significant differences in emotions or immersion, suggesting that emotional processes remained consistent regardless of the simulation focus (see Table 3). Furthermore, the mental effort required during the role-plays (*germane load*) was moderate throughout. There was a slight increase from the first simulation on relationships to the second simulation on feedback to the third simulation on transitions, but this was not statistically significant (see Table 3).

5.2 Acceptance

The descriptive analysis of feedback collected after each role-play (approx. $N = 20$–30 per session) indicates a positive evaluation of the simulation-based training (see Table 2 for participants' ratings on the four-point scale *acceptance*). The

TABLE 2 Means, standard deviations and intercorrelations between the scales.

Scale	*N*	Min	Max	*M*	*SD*	(1)	(2)	(3)	(4)	(5)	(6)
Enjoyment (1)	77	1	4	2.53	0.62	1					
Anxiety (2)	77	1	3.5	2.15	0.69	−.592**	1				
Anger (3)	75	1	3.75	1.39	0.51	−.415**	.467**	1			
Immersion (4)	76	1.57	4	3.13	0.52	.616**	−.449**	−.576**	1		
Germane load (5)	76	1	9	4.45	1.80	−.271*	.297**	.218	−.098	1	
Acceptance (6)	75	1.38	4	3.19	0.51	.350**	−.239*	−.361**	.572**	.005	1

Spearman-Rho-Correlation-Coefficients, analysis based on 77 feedback responses.
*$p < .05$.
**$p < .01$.

TABLE 3 Scale statistics and group comparison statistic (linear mixed model).

Scale	Building respectful relationships ($n = 32$)		Providing Feedback ($n = 20$)		Managing transitions ($n = 25$)		Test statistics
	EMM	SE	EMM	SE	EMM	SE	
Enjoyment[a]	2.48	0.10	2.63	0.13	2.55	0.12	$F(2, 39{,}68) < 1$, $p = .545$
Anxiety[a]	2.30	0.12	1.95	0.14	2.09	0.13	$F(2, 44{,}01) = 2.604$, $p = .085$
Anger[a]	1.38	0.09	1.40	0.11	1.48	0.10	$F(2, 28{,}14) < 1$, $p = .569$
Immersion[a]	3.12	0.09	3.12	0.10	3.05	0.10	$F(2, 33{,}64) < 1$, $p = .697$
Germane load[b]	4.24	0.32	4.50	0.41	4.66	0.37	$F(2, 56{,}48) < 1$, $p = .672$
Acceptance[a]	3.12	0.08	3.21	0.09	3.25	0.09	$F(2, 32{,}14) = 1.557$, $p = .226$

[a]Scale from 1 to 4;
[b]Scale from 1 to 9.

statistical comparison between the sessions revealed no significant differences (see Table 3), suggesting consistent acceptance of the role-plays across the core practices topics.

In particular, the participants rated the content on the specific core practices as interesting and found the seminar sessions to be valuable insights into the challenges of their profession (see Table 4). In line, the perceived learning effect was rated as high and the pre-service teachers felt motivated during the role-plays. For the final simulation (managing transitions), there is a slightly more positive assessment of the support provided by the university teachers (e.g., assistance with script writing for the simulation, feedback on the implementation of actions) experienced during the preparation and implementation of the role-play. Furthermore, the structure of the seminar session was rated slightly more positive than at the beginning of the seminar.

6 Discussion

The core practice approach offers the potential to systematically combine theory and practice and to make theories tangible through appropriate didactic formats. In approximations such as role-plays on core practices, pre-service teachers can not only gain practical experience, but also apply theories on feedback, classroom management, or building relationships.

In research on core practices, previous studies have focused on the development of students' skills and the design of practice-based learning environments (Cohen et al., 2025). However, the quality of the learning process and the evaluation by participants are also crucial for the sustainable integration of simulation-based learning environments into teacher training. The aim of this article was to empirically investigate a simulation-based learning format for the development of core practices from the perspective of pre-service teachers in terms of acceptance, emotional (emotions and immersion) and cognitive (germane load) processes. We know from international research on (digital) classroom simulations that these can evoke feelings of involvement and motivation, but also negative emotions such as fear, anxiety, insecurity and stress (Stavroulia et al., 2016; Theelen et al., 2019). The evaluation of our data shows that the pre-service teachers experienced a moderate level of *enjoyment* and as well as a high degree of *immersion* during the role-plays, while negative emotions such as *anxiety* and *anger* were only weakly pronounced. The predominance of positive emotions among participants reinforces the assumption that approximations of practice are a low-risk opportunity to acquire professional skills in authentic scenarios (Chernikova et al., 2020). At the same time, our findings of correlation analyses are consistent with the assumption that a positive emotional experience of a learning opportunity can also be associated with acceptance, particularly reflected in perceived usefulness and learning outcomes (Frenzel et al., 2009; LeBlanc and Posner, 2022). As part of a further analysis, which is currently still in progress, we investigate the relevance of emotions for acceptance in the context of linear regression analyses. Initial findings show that *enjoyment* positively predicts *acceptance*, while anger and fear have no effect. Furthermore, our findings reveal that enjoyment during the simulation promotes a sense of

TABLE 4 Item-specific statistics (acceptance).

Items[a]	Building respectful relationships (n = 32)		Providing Feedback (n = 20)		Managing transitions (n = 25)	
	EMM	SE	EMM	SE	EMM	SE
I was well prepared for the simulation.	2.65	0.12	3.05	0.15	3.07	0.14
I felt adequately supported during the simulation's preparation and implementation.	2.86	0.12	3.03	0.14	3.16	0.13
I found the simulations motivating.	2.85	0.14	2.78	0.18	2.63	0.16
I am aware of the intention behind the simulations.	3.59	0.10	3.44	0.12	3.60	0.11
After today's session, I feel that this event has provided me with important insights for my career.	3.27	0.13	3.23	0.16	3.27	0.14
The structure of today's session was very clear.	3.28	0.12	3.40	0.14	3.52	0.13
I found the content on core practices interesting.	3.27	0.11	3.38	0.14	3.55	0.13
I learned something new today.	3.22	0.12	3.24	0.16	3.25	0.14

[a]Scale from 1 "does not apply at all" to 4 "applies completely".

immersion in the learning environment (Weber et al., 2023), which, in turn, is crucial for pre-service teachers' acceptance.

Furthermore, our data indicates moderate mental effort during the role-plays, with the lowest level of *germane load* occurring in the first simulation on the core practice *building respectful relationship*. This result can be explained by the fact that the pre-service teachers had specific role requirements for the first role-play and were able to use case vignettes as a guide. Clear instructions and supporting materials may have helped them to devote sufficient cognitive resources to the simulation (Vygotsky, 1978). However, the high standard deviation illustrates individual differences in the perception of *germane load*, as not everyone reacts to simulation-based learning in the same way, and some participants experienced the role-plays more challenging than others. In our training, we provided case vignettes for the role-plays but no specific role descriptions (including suggested behaviors or wording). For students with less prior knowledge or little experience with role-plays this may have been insufficient support. This result underscores the literature's call for simulation-based learning to be tailored to individual needs, for example through customized scenarios or graded levels of difficulty (e.g., Fecke, 2024).

Given the mental effort required, it was interesting to find out how well prepared the pre-service teachers felt for the role-plays. The item "I was well prepared for the simulation" received the highest rating in connection with the simulation on the core practice of *managing transitions*, and the lowest rating in the context of the core practice of *building respectful relationships*. This can be explained by the fact that classroom management is a key focus of the bachelor's degree program, and managing transitions was also a focus of the pre-service teachers' reflection during their first practical field experiences, for example. In this respect, it can be assumed that the participants already had prior knowledge of classroom management through their own observations and repeated practice of strategies in other contexts, which made them more confident and found the preparation and implementation of the role play easier (Bautista and Boone, 2015). It is possible that they find theories of classroom management even more practical through frequent repetition and application in different contexts and can therefore establish the link between theory and practice in a more targeted manner during their role-play. In contrast, the theory underlying the core practice *building respectful relationships* could be more demanding and complex. Building relationships might be more difficult than managing phase transitions, and pre-service teachers also might have less prior knowledge of the subject matter.

When evaluating the support provided by the instructors during the preparation and implementation of the role-play, it was found that this was rated slightly more positively in the third session (*managing transitions*) than at the beginning of our training. Similarly, the structure of the seminar session was also rated more positively at the end than at the beginning. This suggests that the university teachers might benefit from ongoing practice, as they might have become more familiar with facilitating role-plays and were able to provide more specific support. Overall, in line with empirical studies on role-plays in German teacher education (e.g., Kunze et al., 2016; Meier et al., 2023 Schuldt et al., 2023); our data indicates a high level of *acceptance* of our simulation-based training on core practices. In particular, the participants rated the content on the three core practices as interesting and found the training to be useful as it provides a valuable insight into the practical challenges of their profession.

6.1 Practical implications

The present findings provide several important implications for teacher education. The pre-service teachers' enjoyment and high level of acceptance show that role-plays on core practices are a suitable medium for preparing pre-service teachers for the professional requirements – not only from a theoretical point of view, but also from the participants' perspective. The fact that the positive emotional experience in our study was independent of the content focus of the simulation shows that it is not specific topics, but the format itself – role-plays – that is fundamentally accepted. However, individual differences in terms of perceived germane load demonstrate that a "one-size-fits-all" approach of approximations would not be appropriate and that a differentiated design, support, and reflection are required instead. The individual prerequisites of the students (prior knowledge or experience with role-plays) could therefore influence how the given case vignettes for the role-plays are experienced. While a very structured guideline in the form of role descriptions might be helpful for individual students, students with a lot of experience might perceive a very structured scenario as a limitation. Accordingly, simulation-based learning settings are needed in which students receive support when needed (Vygotsky, 1978) and can appropriately contribute their prior knowledge and individual professional experience (Fecke, 2024). In particular, students with more teaching experience may need stronger connections between the theory-based core practice in approximations and their classroom work (Cohen et al., 2025). This should not only promote the acceptance of the simulation-based setting but also facilitate theory-based reflection on the respective practices.

Furthermore, it can make a significant difference whether pre-service teachers who play the role of teachers during the simulation know exactly what scenario to expect in advance or whether they are confronted with an unknown situation (or student behavior). Since everyday school life is also characterized by unpredictable interaction situations and teachers often react spontaneously, an unknown scenario could significantly increase the simulation's authenticity. At the same time, individuals may react emotionally to this uncertainty, e.g., with fear of being observed or of failure due to a lack of prior knowledge or support. Our data confirm that positive emotions are conducive to acceptance of the simulation-based learning environment, whereas fears and uncertainty might limit learning effects. Especially in situations where teachers have time to prepare in their daily routine – for example, in a scheduled one-on-one meeting with a student who repeatedly disrupts class – a role script and structured, guided role instructions for the role-play can be beneficial, as they allow pre-service teachers to rehearse different techniques, and thereby gain confidence in their professional actions. At the same time, it is an important task for university teachers not only to impart the necessary

theoretical knowledge about core practices, but also to prepare pre-service teachers emotionally for simulation-based learning settings and thereby reduce any fears or inhibitions.

By working with role-plays (instead of, for example, VR-supported simulations), we were able to show that even low-threshold forms of approximations are perceived as effective for learning. However, there are many opportunities for further developing simulation-based learning environments. For example, combining online and face-to-face role-plays could enable more targeted training in (non-)verbal communication skills (Kunze et al., 2016). Furthermore, simulations could be used not only as a training format, but also as an examination format to assess the practical skills of pre-service teachers (Meier et al., 2023). When developing and implementing simulation-based learning, it is important to consider not only the perspectives of pre-service teachers but also those of other stakeholders (e.g., university teachers). In our project, we found that despite identical content requirements for the module, not all university teachers provided space and time in their seminars for the role-plays on core practices. This is despite the fact that, as our results clearly show, pre-service teachers are receptive to such formats (cf. Codreanu et al., 2020; Ulrich and Meyer 2025),. Current feedback on our lectures is also positive, and some pre-service teachers report enrolling in the seminar solely because of the role-plays, which they perceive as more practical than traditional courses in educational sciences. This raises the question of what resources university teachers need to strengthen such a practice-oriented approach in their teaching and how their own attitude toward simulation-based learning can be positively influenced.

Overall, we advocate for the early integration of the core practice approach into teacher training, as simulation-based learning settings were rated as valuable and useful for students' own professional development. The value of the core practices approach lies in the fact that it systematically links theoretical contributions with the micro-strategies of pedagogical action. Core practices offer students the opportunity to relate theoretical knowledge to practical elements and thereby experience a sense of coherence in their individual learning process (Cramer, 2025). At the same time, the implementation of approaches such as role-plays in university teacher training means that practical field experience becomes part of a larger framework of practice-based teacher education. Through the early integration of core practices and the accompanying linking of theory and practice, students' own teaching activities in schools might be prepared, reflected upon, and further developed in a more targeted manner (Sapkota and Max, 2023). Core Practices offers great potential for shaping cooperation and discourse between the institutions involved in the practical phases of teacher training, precisely because it conceptually links university knowledge-related content to actions in the teaching profession (Schellenbach-Zell and Hartmann, 2022).

In order to further exploit the potential of simulation-based settings on core practices for increasing coherence in teacher training, curricular and didactic adjustments are desirable (Hellmann, 2019). On the one hand, this includes the selection and curricular anchoring of specific core practices that are based on educational sciences and are also compatible with subject didactics. On the other hand, closer integration of the phases of teacher training is desirable. Core practices can bridge the gap here and not merely be the subject of the first phase of university teacher education but can also be meaningfully integrated into the practical second phase. However, this requires close cooperation between subject didactics, educational sciences, and school practitioners, as well as a common understanding of core practices and their theoretical foundations. The extent to which the core practices approach can strengthen coherence in this way remains an open question.

6.2 Limitations and future research

Our study has several limitations that should be addressed in future research. First, it relied exclusively on self-report measures to capture pre-service teachers' emotional and cognitive processes and acceptance. While self-report measures provide valuable insights into subjective experiences and perceptions, they do not allow direct examination of competencies or performance. In this context, it should also be noted that self-selection may have occurred in our sample. As participants may have been more open or motivated about the role-plays, the self-assessments could be distorted. In addition, we do not have a control group of pre-service teachers without simulations, which severely limits our study. Second, limitations relate to the selection of instruments. For reasons of research economy, cognitive processes were only recorded in terms of germane load. Furthermore, prior knowledge was not recorded in the respective theories, even though it could be important for the application of core practice simulations and acceptance (e.g., Fecke, 2024). Future studies should incorporate external and objective assessments, such as video-based observational studies, physiologically supported measurements or performance testing, to triangulate self-reported data with observable practices.

Based on our data, some questions remain unanswered, such as which aspects of the training simulation triggered which positive or negative emotion as well as germane load. Supplementary qualitative studies could examine the link between emotional experiences, germane load and learning effects in greater detail. Furthermore, the progression of emotions – before, during, and after the role-play – could be investigated systematically. It is important that future research also examine the consequences of simulating core practices, particularly regarding the development of professional skills. It remains unclear how simulating core practices in university teacher education affects the development of one's own competence or, for example, the perceived confidence in dealing with typical practical requirements of the teaching profession. Further studies should examine the effectiveness of simulation-based learning environments in the context of interventions with control groups. Longitudinal studies appear useful for investigating the short- and long-term effects of approximations on professional development and actual teaching behavior in the classroom (cf. Cohen et al., 2025). In addition, effectiveness and acceptance should be examined in more detail based on personal characteristics (e.g., prior knowledge, teaching experiences, professional dispositions). Since the implementation of simulation-based learning depends heavily on the commitment of university lecturers, further studies should also

consider the perspective of teacher educators or other interest groups. More research can help to clarify why, despite the positive assessment of simulation-based learning by students, its use in university teaching is still rare.

Our training approach is also subject to certain limitations. First, the training is time-limited. In only one lecture session (90 Minutes), the pre-service teachers were prepared for practice by engaging in representations and decompositions of the core practice, e.g., by using video examples. In the accompanying seminar (again 90 Minutes), the core practice was simulated in a role-play, and the actions were then reflected on together in the class. Due to the focus on three different core practices, each practice could only be modeled and simulated once. It is quite possible that acquiring core practices requires learning settings that are more focused in terms of content and more time-consuming. In the current semester, we are therefore conducting training that deals exclusively with the core practice *Building respectful relationships*. Various facets of the core practice are systematically modeled and represented using video examples before being repeatedly practiced in role-plays and then reflected on together with peers. Written reflections on the experiences in the role-plays are also part of the students' coursework. We are evaluating the training in terms of pre-service teachers' interpersonal competence and professional beliefs. In subsequent qualitative interviews, the pre-service teachers' experiences during the role-plays will also be examined in more detail. In video-based case studies, pre-service teachers who complete a school internship after the training will be observed in class to examine their actual behavior.

Second, the composition of the group must also be considered. The composition of the group could have influenced not only the implementation of the role-play, but also the feedback, e.g., due to the perceived sympathy for the simulation partners. Finally, the authenticity of the role-plays must also be critically reflected upon. For example, some participants reported that the composition of similar disciplines was crucial for the authenticity. However, our simulation on core practices took place at the university with pre-service teachers playing teachers and their colleagues playing students. This is not comparable to the social and cultural complexity of classrooms, to which teachers must constantly respond in actual teaching situations (Sapkota and Max, 2023). Nevertheless, our study provides evidence that role-plays offer low-threshold access to learning about and rehearsing core practices without feeling immediate pressure to act.

7 Conclusion

There are many theories in educational sciences, and pre-service teachers complain about the lack of practical applicability (e.g., VBE, 2025). Without a connection to practice, theories remain abstract and vague. This also supports situated and constructivist ideas of learning, according to which learning is always linked to social and institutional contexts (Lave and Wenger, 1991). The significance of theories therefore only becomes apparent through their application and reflection in real teaching situations and the learner's integration into communities of practice. Without this situational anchoring, there is a risk of sluggish knowledge that can be reproduced but is of limited use for professional action in everyday school life (Renkl, 1996). The task of educational science should therefore be to make its theories applicable.

In conclusion, the core practice approach has the potential to more strongly focus university courses on the development of professional action without undermining their theoretical foundation. Approximations of practice such as role-plays make it possible to rehearse and reflect on theory-based core practices in a controlled setting. It seems important to design simulation-based learning settings that enable immersion, regulate mental effort, and provide space for reflection informed by theoretical knowledge and prior experience. To this end, it will be crucial to strengthen the commitment to practice-oriented teacher training among university teachers. If educational sciences want to be a place for a practice-based teacher education, we need university teachers who fully support simulation-based learning. This also means moving away from predominantly theory-based teaching at universities and offering pre-service teachers opportunities to rehearse practical skills in simulation-based settings and to further develop theory-based skills, in addition to practical field experiences. To do so, theory always functions as a constitutive element of professional practice. Or, to put it another way: There is nothing as practical as a good theory – especially when it helps to recognize, understand, and further develop the micro-strategies of professional action.

Data availability statement

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

Ethics statement

Ethical approval was not required for the studies involving humans because in accordance with guidelines from the German Research association for Humanities and Social Sciences (https://www.dfg.de/en/research-funding/proposal-funding-process/faq/humanities-social-sciences#263154) ethics approval is recommended but only necessary in case of studies with patients or vulnerable groups (Point I 1. and 2.). Ethical review and approval were waived for this study due to its anonymized data collection and voluntary participation. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KN: Investigation, Visualization, Writing – review & editing, Formal analysis, Writing – original draft, Methodology, Data curation. MK: Conceptualization, Investigation, Writing – review & editing, Project administration, Methodology.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This publication was funded by the Open Access Publication Fund of Leuphana University Lüneburg.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was used in the creation of this manuscript. During the preparation of this work, the authors used ChatGPT (http://www.chat.openai.com; GPT-4o) as well as DeepL (http://www.deepl.com) in order to improve the readability and language of single sentences. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

References

Ball, D. L., and Cohen, D. K. (1999). "Developing practice, developing practitioners: toward a practice-based theory of professional education," in *Teaching as the Learning Profession: Handbook of Policy and Practice*. eds. G. Sykes and L. Darling-Hammond (San Francisco: Jossey Bass), 3–32.

Baumert, J., and Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften. *ZfE*. 9, 469–520. doi: 10.1007/s11618-006-0165-2

Bautista, N. U., and Boone, W. J. (2015). Exploring the impact of TeachMETM lab virtual classroom teaching simulation on early childhood education Majors' self-efficacy beliefs. *J. Sci. Teacher Educ.* 26, 237–262. doi: 10.1007/s10972-014-9418-8

Bernholt, A., Sorge, S., Rönnebeck, S., and Parchmann, I. (2023). Forschungs- und entwicklungsfelder der lehrkräftebildung – diskussion ausgewählter erkenntnisse und weiterführender bedarfe. *Unterrichtswissenschaft* 51 (1), 99–121. doi: 10.1007/s42010-023-00162-5

Blömeke, S., Gustafsson, J. E., and Shavelson, R. J. (2015). Beyond dichotomies: competence viewed as a continuum. *Zeitschrift für Psychologie* 223, 3–13. doi: 10.1027/2151-2604/a000194

Brouwer, N., and Korthagen, F. (2005). Can teacher education make a difference? *Am. Educ. Res. J.* 42 (1), 153–224. doi: 10.3102/00028312042001153

Carstensen, B., Köller, M., and Klusmann, U. (2019). Förderung sozial-emotionaler kompetenz von angehenden lehrkräften: konzeption und evaluation eines trainingsprogramms. *Z. Entwicklungspsychol. Pädagog. Psychol.* 51 (1), 1–15. doi: 10.1026/0049-8637/a000205

Clapper, T. C. (2010). Role play and simulation returning to teaching for understanding. *Educ. Digest* 75 (8), 39–43.

Chang, C. C., Warden, C. A., Liang, C., and Lin, G. Y. (2018). Effects of digital game-based learning on achievement, flow and overall cognitive load. *Aust. J. Educ. Technol.* 34 (4), 155–167. doi: 10.14742/ajet.2961

Charalambous, C. Y., and Delaney, S. (2020). "Mathematics teaching practices and practice-based pedagogies: a critical review of the literature since 2000," in *International Handbook of Mathematics Teacher Education*. Vol. 1, eds. D. Potari and O. Chapman (Leiden: Brill), 355–390.

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., and Fischer, F. (2020). Simulation-based learning in higher education: a meta-analysis. *Rev. Educ. Res.* 90 (4), 499–541. doi: 10.3102/0034654320933544

Codreanu, E., Sommerhoff, D., Huber, S., Ufer, S., and Seidel, T. (2020). Between authenticity and cognitive demand: finding a balance in designing a video-based simulation in the context of mathematics teacher education. *Teach. Teacher Educ.* 95, 103146. doi: 10.1016/j.tate.2020.103146

Cohen, J., Yonas, A. M., and Wilson, K. E. (2025). Approximating teaching: a systematic review of the research. *Rev. Educ. Res.* 1–44. doi: 10.3102/00346543251368383

Cramer, C. (2025). "Kohärenz als einheitsstiftung oder relationierung in der lehrerinnen- und lehrerbildung," in *Handbuch Lehrerinnen-und Lehrerbildung* (2., vollständig überarbeitete und erweiterte Auflage). eds. C. Cramer, J. König, and M. Rothland (Bad Heilbrunn: Julius Klinkhardt), 338–347. doi: 10.35468/hblb2025-043

Fecke, J. (2024). "Rollenspielsimulationen als professionalisierungsmöglichkeit von angehenden lehrkräften," in *Doppelter Praxistransfer in der Lehrkräftebildung für Berufliche Schulen. Von Beruflichen Vorerfahrungen übers Wissenschaftliche Studium in die Schule*. eds. I. Benner and T. Hocker (Münster: Waxmann), 95–124.

Forzani, F. M. (2014). Understanding "core practices" and "practice-based" teacher education: learning from the past. *J. Teach. Educ.* 65 (4), 357–368. doi: 10.1177/0022487114533800

Fraefel, U. (2026). Kernpraktiken: ein schlüsselkonzept der lehrkräftebildung. *Pädagogik* 78 (2), 48–51. doi: 10.3262/PAED2602048

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: the broaden and-build theory of positive emotions. *Am. Psychol.* 56, 218–226. doi: 10.1037/0003-066X.56.3.218

Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., and Sutton, R. E. (2009). Emotional transmission in the class-room: exploring the relationship between teacher and student enjoyment. *J. Educ. Psychol.* 101, 705–716. doi: 10.1037/a0014695

Frenzel, A. C., Pekrun, R., Goetz, T., Daniels, L. M., Durksen, T. L., Becker-Kurz, B., et al. (2016). Measuring teachers' enjoyment, anger, and anxiety: the teacher emotions scales (TES). *Contemp. Educ. Psychol.* 46, 148–163. doi: 10.1016/j.cedpsych.2016.05.003

Gröschner, A. (2019). "Zum verhältnis von "theorie" zu "praxis": anknüpfungen an john dewey sowie perspektiven zur gegenwart und zukunft der praxisbezogenen lehrerausbildung," in *Langzeitpraktika als Lernräume. Historische Bezüge, Konzeptionen und Forschungsbefunde*. eds. J. Košinár, A. Gröschner, and U. Weyland (Münster: Waxmann), 41–51.

Grossman, P., and Fraefel, U. (2024). *Core Practices in Teacher Education: A Global Perspective*. Cambridge, MA: Harvard Education Press.

Grossman, P., and Pupik Dean, C. J. (2019). Negotiating a common language and shared understanding about core practices: the case of discussion. *Teach. Teacher Educ.* 80, 157–166. doi: 10.1016/j.tate.2019.01.009

Grossman, P. A. M., Compton, C., Igra, D., and Williamson, P. W. (2009). Teaching practice: a cross-professional perspective. *Teach. Coll. Rec.* 111 (9), 2055–2100. doi: 10.1177/016146810911100905

Hattie, J., and Timperley, H. (2007). The power of feedback. *Rev. Educ. Res.* 77 (1), 81–112. doi: 10.3102/003465430298487

Hattie, J. (2009). *Visible Learning. A Synthesis of Over 800 Meta-analyses relating to Achievement*. New York, NY: Routledge.

Hellmann, K. (2019). "Kohärenz in der lehrerbildung – theoretische konzeptionalisierung," in *Kohärenz in der Lehrerbildung*. eds. K. Hellmann, J. Kreutz, M. Schwichow, and K. Zaki (Wiesbaden: Springer VS), 9–30.

Kleinknecht, M., Broß, I., Prinz-Weiß, A., and Nückles, M. (2022). Ich kann schüler*innen beim erschließen von fachtexten anleiten. *Ein Training zum Erlernen Einer Kernpraktik, jlb* 3, 74–85. doi: 10.35468/jlb-03-2022-05

Kuhbandner, C., and Frenzel, A. C. (2019). "Emotionen," in *Psychologie für den Lehrberuf*. eds. D. Urhahne, M. Dresel, and F. Fischer (Berlin: Springer), 185–206.

Kunter, M., and Voss, T. (2013). "The model of instructional quality in COACTIV: a multicriteria analysis," in *Cognitive Activation in the Mathematics Classroom and Professional Competence of Teachers – Results from the COACTIV Project*. eds. M. Kunter, J. Baumert, W. Blum, U. Klusmann, S. Krauss, and M. Neubrand (New York, NY: Springer), 97–124.

Kunze, J., Mohr, S., and Ittel, A. (2016). Online-Rollenspiele in der lehrkräfteausbildung. *Beitr. Lehr. Lehr.* 34 (2), 188–195. doi: 10.36950/bzl.34.2.2016.9524

Lave, J., and Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press. doi: 10.1017/CBO9780511815355

LeBlanc, V. R., and Posner, G. D. (2022). Emotions in simulation-based education: friends or foes of learning? *Adv. Simul.* 7, 3. doi: 10.1186/s41077-021-00198-6

Lewin, K. (1943). Psychology and the process of group living. *J. Soc. Psychol S.P.S.S.I. Bull.* 17, 113–131. doi: 10.1080/00224545.1943.9712269

Lipowsky, F. (2010). "Lernen im beruf – empirische befunde zur wirksamkeit von lehrerfortbildung," in *Lehrerinnen und Lehrer Lernen. Konzepte und Befunde zur Lehrerfortbildung*. ed. F. Müller (Münster: Waxmann), 51–70.

Matsumoto-Royo, K., and Ramírez-Montoya, M. S. (2021). Core practices in practice-based teacher education: a systematic literature review of its teaching and assessment process. *Stud. Educ. Eval.* 70, 101047. doi: 10.1016/j.stueduc.2021.101047

Makrinus, L. (2013). *Der Wunsch Nach Mehr Praxis. Zur Bedeutung von Praxisphasen im Lehramtsstudium*. Heidelberg: Springer VS. doi: 10.1007/978-3-658-00395-1

McDonald, M., Kazemi, E., and Kavanagh, S. S. (2013). Core practices and pedagogies of teacher education: a call for a common language and collective activity. *J. Teach. Educ.* 64 (5), 378–386. doi: 10.1177/0022487113493807

Meier, J., Janzen, T., Wotschel, P., and Vogelsang, C. (2023). Rollenspielbasierte simulationen als Übungs- und prüfungsformate im lehramtsstudium. Eine explorative studie zu erfahrungen und einschätzungen aus studierendensicht. *die Hochschullehre* 9, 85–100. doi: 10.3278/HSL2307W

Moors, A., Ellsworth, P. C., Scherer, K. R., and Frijda, N. H. (2013). Appraisal theories of emotion: state of the art and future development. *Emot. Rev.* 5 (2), 119–124. doi: 10.1177/1754073912468165

Müller, K., and Kleinknecht, M. (2025). "Kernpraktiken des unterrichtens als ansatz einer wissenschaftsbasierten und professionsorientierten lehrkräftebildung," in *Bildung Besser Machen. Eine Festschrift für Thorsten Bohl*. eds. M. Syring, N. Beck, B. Kohler, and S. Meissner (Tübingen: Eberhard Karls Universität Tübingen), 343–362.

Nückles, M., and Kleinknecht, M. (2023). "Modeling, explaining, enacting and getting feedback: how can the acquisition of core practices in teacher education be optimally fostered?," in *Core Practices from a Cross-National Perspective*. eds. U. Fraefel, and P. Grossman (Cambridge, MA: Harvard Education Press), 81–101.

Paas, F. G. W. C., and van Merrienboer, J. J. G. (1993). The efficiency of instructional conditions: an approach to combine mental effort and performance measures. *Hum. Factors* 35, 737–743. doi: 10.1177/001872089303500412

Pekrun, R. (2006). The control-value theory of achievement emotions: assumptions, corollaries, and implications for educational research and practice. *Educ. Psychol. Rev.* 18 (4), 315–341. doi: 10.1007/s10648-006-9029-9

Pianta, R. C., and Hamre, B. K. (2009). Conceptualization, measurement, and improvement of classroom processes: standardized observation can leverage capacity. *Educ. Res.* 38 (2), 109–119. doi: 10.3102/0013189X09332374

Renkl, A. (1996). Träges wissen: wenn erlerntes nicht genutzt wird. *Psychol. Rundschau* 47 (2), 78–92.

Sapkota, B., and Max, B. (2023). A conceptual synthesis on approximations of practice in mathematics teacher education. *Res. Math. Educ.* 26, 569–595. doi: 10.1080/14794802.2023.2207088

Schellenbach-Zell, J., and Hartmann, U. (2022). Core practices als boundary objects im praxissemester. *J. LehrerInnenbild.* 22 (3), 110–119. doi: 10.35468/jlb-03-2022-08

Scherer, K. R. (2000). "Psychological models of emotion," in *The Neuropsychology of Emotion*. ed. J. C. Borod (New York, NY: Oxford University Press), 137–162.

Seidel, T., and Shavelson, R. J. (2007). Teaching effectiveness research in the past decade. The role of theory and research design in disentangling meta-analysis results. *Rev. Educ. Res.* 77 (4), 454–499. doi: 10.3102/0034654307310317

Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M., and Schwindt, K. (2011). Teacher learning from analysis of videotaped classroom situations: does it make a difference whether teachers observe their own teaching or that of others? *Teach. Teacher Educ.* 27 (2), 259–267. doi: 10.1016/j.tate.2010.08.009

Stavroulia, K. E., Makri-Botsari, E., Psycharis, S., and Kekkeris, G. (2016). Emotional experiences in simulated classroom training environments. *Int. J. Inf. Learn. Technol.* 33 (3), 172–185. doi: 10.1108/IJILT-10-2015-0030

Schuldt, A., Palm, M., Neumann, P., Böhm-Kasper, O., Demmer, C., and Lütje-Klose, B. (2023). „Jede*r von uns sieht die situation eben unterschiedlich – das ist zwar eine schwierigkeit, aber auch eine bereicherung". rollenspiel für die inklusionssensible lehrer*innenbildung im blended-learning-format. *DiMawe – Die Materialwerkstatt* 5 (4), 70–88. doi: 10.11576/dimawe-6699

Sweller, J. (2010). Element interactivity and intrinsic, extraneous, and germane cognitive load. *Educ. Psychol. Rev.* 22 (2), 123–138. doi: 10.1007/s10648-010-9128-5

TeachingWorks (2025). High leverage practices. https://www.teachingworks.org/highleverage-practices/ (Accessed December 15, 2025).

Theelen, H., van den Beemt, A., and den Brok, P. (2019). Classroom simulations in teacher education to support preservice teachers' interpersonal competence: a systematic literature review. *Comput. Educ.* 129, 14–26. doi: 10.1016/j.compedu.2018.10.015

Ulrich, I., and Meyer, N. (2025). Simulation in der hochschullehre: eine pilotstudie zur umsetzung und wirkung im dualen studium. *Z. Hochschulentwickl.* 20 (1), 109–132. doi: 10.21240/zfhe/20-1/06

VBE (2025). Zufriedenheit mit dem Lehramtsstudium an PHs in Baden-Württemberg. Ergebnisse einer Befragung unter Lehramtsstudierenden und Lehrkräften im Vorbereitungsdienst an Pädagogischen Hochschulen in Baden-Württemberg. https://www.vbe-bw.de/wp-content/uploads/2025/09/Kurzversion_SINUS-Studie-fuer-den-VBE_Zufriedenheit-mit-dem-Lehramtsstudium_04.09.2025.pdf (Accessed 16.01.2025).

Vygotsky, L. (1978). *Mind in Society. the Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Weber, K. E., Prilop, C. N., and Kleinknecht, M. (2023). Effects of different video- or text-based reflection stimuli on pre-service teachers' emotions, immersion, cognitive load and knowledge-based reasoning. *Stud. Educ. Eval.* 77, 101256. doi: 10.1016/j.stueduc.2023.101256

Weber, K. E., Prilop, C. N., and Kleinknecht, M. (2022). Strukturierte video circles im ersten unterrichtspraktikum. Fokus: übergangsmanagement. *J. LehrerInnenbild.* 22 (4), 102–113. doi: 10.35468/jlb-04-2022-06

Wubbels, T., Créton, H., Levy, J., and Hooymayers, H. (1993). "The model of interpersonal teacher behavior," in *Do you Know What you look Like? Interpersonal Relationships in Education*. eds. T. Wubbels and J. Levy (London: Falmer Press), 13–28.

Yilmaz, A., and Kleickmann, T. (2018). "Förderung von core practices effizienter klassenführung bei lehramtsstudierenden," in *Vernetzung in der Lehrerinnen- und Lehrerbildung. Ansätze, Methoden und Erste Befunde aus dem LeaP-Projekt an der Christian-Albrechts-Universität zu Kiel*. eds. B. Brouër, A. Burda-Zoyke, J. Kilian, and I. Petersen (Münster: Waxmann), 149–160.