



Beyond the research–practice gap: Constructing epistemic relations in teacher education

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ARTICLE INFO

Keywords:

Teacher education
Knowledge relations
Professional knowledge
Research use
Research-based teacher education

Abstract

This article is a conceptual contribution to the research literature on the relations between research and professional practice in teacher education. In many countries, policymakers and practitioners emphasise the need for teacher education to be both research based and professionally relevant. However, limited conceptual attention has been given to the epistemic interrelationships between research-based knowledge and professional practice. We introduce the concept of *epistemic relations* to examine how such interrelationships can be understood. We adopt a social-practice based perspective on knowledge to analytically delineate three aspects of epistemic relations: relations between different knowledge resources, relations between different processes of knowledge generation, and the implications of epistemic relations for student teachers' learning. We conclude by discussing pedagogical implications for teacher education.

1. Introduction: epistemic relations in teacher education

A defining characteristic of teacher education is epistemic pluralism (Hermansen, 2020), which reflects the heterogeneous nature of teachers' knowledge base (Hegarty, 2000; Shulman, 1987). Student teachers are expected to relate to a diversity of knowledge resources throughout their qualification period, including educational theories, subject knowledge, subject didactics, practical skills and knowledge about specific schools and students. This pluralism has further increased in countries that have sought to make their teacher education programmes research based, such as Finland, Portugal, Iceland and Norway (Afdal, 2017; Burn & Mutton, 2015; Cordingley, 2015; Munthe & Rogne, 2015; Winch et al., 2015). More generally, the increased emphasis on the use of research in the teaching profession (British Educational Research Association, 2014; Tatto, 2015) has challenged both researchers and teacher educators to clarify how research can support professional development. A key issue is how research can act as a resource in teacher

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education that is simultaneously close to professional practice but is also capable of developing and transforming it. This brings forth the question of how research-based knowledge can be placed into constructive relationships with professional practice.

Existing research has documented that students frequently struggle to see the relationship between professional practice and research-based knowledge (Canrinus, Bergem, et al., 2017; Grossman et al., 2009). In existing literature, a frequently used metaphor to discuss this relationship is *bridging the gap* (Biesta, 2007; McIntyre, 2005). In her discussion of the relationship between theory and practice, Kvernbekk (2012) has problematised the metaphor of gap bridging because it typically assumes that theory and practice need to be brought in line in a singular kind of relationship, in which the roles of both theory and practice are left undifferentiated or taken for granted. Instead, Kvernbekk challenges us to consider which role abstract knowledge should play in relation to professional practice and how their relationships can be conceptualised and enacted.

In this article, we follow Kvernbekk in her call to conceptually differentiate the type of relations that are constructed between different knowledge resources. In contrast to Kvernbekk, we do not only focus on theoretical knowledge as such. Rather, we draw upon broader conceptualisations of research-based higher education (Healey, 2005; Healey & Jenkins, 2009), which recognise both *processes* and *outputs* of research as important for supporting student learning. Research-related processes include action research, forms of inquiry-based learning, and research skills such as the systematic collection and analysis of data. Outputs include empirical findings, theories, concepts, and models.

In countries with research-based teacher education programs at the master's level, student teachers are usually expected to engage with both processes and outputs of research. This requires both student teachers and teacher educators to create relations between research and professional practice. The main question we pursue in this article is *how* teacher educators and student teacher construct relations between research and professional practice, and what consequences these relations have for student teachers' learning. This question is important for several reasons: First, the ways in which teacher educators construct such relations are likely to shape student teachers' learning processes. Second, the ways in which student teachers learn to construct such relations is likely to inform both their pre-service qualification process and their future professional practice. Third, we argue that there is a need for more nuanced analytical conceptualisations of how such relations are constructed if we are to go beyond the metaphor of a "theory-practice gap" in teacher education research. The capacity to construct such relations is particularly important in professional education programs characterised by a heterogeneous knowledge base (Hegarty, 2000; Shulman, 1987), in which student learning fundamentally relies on the ability to create meaningful connections (Hatlevik, 2014) between different knowledge resources.

To address how teacher educators and student teacher construct relations between research and professional practice, we introduce the concept of *epistemic relations*. Epistemic relations refer to the relations that are constructed between different knowledge resources or processes of knowledge generation in teacher education. We are interested in three aspects of this process. The first aspect is how knowledge resources are related to an educational task or a problem of practice, for example, when student teachers are asked to use a variety of knowledge resources to design a mathematics lesson. The second aspect is how relations are created between different processes of knowledge generation, for example when student teachers are asked to combine research methods with the development of experience-based knowledge during a practicum period. Finally, we are interested in what kind of *pedagogical work* such relations do in the process of qualifying student teachers, and how the configuration of epistemic relations may support or hinder student learning.

We draw on theoretical assumptions from social practice-based perspectives on professional knowledge (Jensen and Lahn, 2012; Knorr Cetina, 2001; Nerland & Jensen, 2012) to outline our conceptualisation of epistemic relations in more depth. We demonstrate the usefulness of this term by re-examining published empirical studies (Damşa and Nerland, 2016; Heikkilä et al., 2020a; Heikkilä et al., 2020b; Risan, 2020). The next section provides a brief overview of research that has addressed the relationship between different forms of knowledge in teacher education. We then expand on the theoretical underpinnings of the concept of epistemic relations before we present three empirical examples from existing research to illustrate how the concept can be operationalised. We conclude with a discussion of how these relations shape opportunities for learning, and present implications for practice and further research.

2. Review: Discontinuities in knowledge in teacher education

The relationships between research-based and practical knowledge, and how to address the discontinuities between them, has been a persistent area of enquiry in research on teacher education. Problem formulations include the need to create stronger relations between research and professional practice, a theory–practice gap, a lack of coherence between the different components of teacher education programmes and weak collaboration between schools and higher education institutions (Canrinus, Klette, et al., 2017; Floden et al., 2021; Jensen et al., 2019; Lillejord & Børte, 2016; Penuel et al., 2015; Smeby & Heggen, 2012; Zeichner, 2010).

These issues have been addressed at different levels of analysis. One approach focuses on the perspectives of students and their experienced sense of coherence (Canrinus, Bergem, et al., 2017; Hatlevik & Smeby, 2015). Within this body of literature, a key question is how students make sense of the relationship between different forms of knowledge, such as how theoretical knowledge is supposed to inform professional practice. Methodologically, students' perceptions are recurrent units of analysis, typically documented through surveys or qualitative interviews. This strand of research emphasises that students need to be able to construct meaningful relationships (Hatlevik, 2014) between theoretical knowledge and professional practice in order to benefit from professional education.

Another strand of research has analytically focused on the organisation of study programmes, often using the term *coherence* (Author, 2019; Canrinus, Klette, et al., 2017; Darling-Hammond, 2006; Grossman, 2008; Smeby and Heggen, 2014) to indicate the need for different components of a study programme to be arranged into a coherent whole. Broadly speaking, programme coherence refers to 'the alignment of key assignments, activities, and experiences across coursework and fieldwork' (Grossman et al., 2008, p. 274). Within this literature, attention has been given to whether different components of educational programmes contribute towards

the same objectives and whether teacher educators have shared visions of teacher qualifications. Methodologically, the unit of analysis has typically been the relations between the different components comprising teacher education programmes (e.g. learning outcomes and pedagogical approaches, relations between campus-based education and practicum periods, and teacher educators' visions). The main message from this literature is the need to carefully align these components so that students can relate their experiences from different educational settings to one another.

A third strand, which is closely related to the literature on coherence, has examined how key features of professional practice can function as organising principles for campus-based teacher education (Forzani, 2014; Jensen et al., 2019; McDonald et al., 2013; Windschitl et al., 2012). A key concept in this research tradition is *core practices* (e.g. Forzani, 2014), which refer to recurring practices that in-service teachers engage in and which have been shown to support student learning. Research within this strand has examined the extent to which and how core practices form part of educational programmes (e.g. Jensen et al., 2019), as well as how core practices can contribute to creating linkages between campus-based education and practicum periods in schools. Methodologically, the key units of analysis are curricular design and the characteristics of specific teaching activities. A main message from this body of literature is that organising the teacher education curriculum around core practices has the potential to enhance student learning.

A fourth strand of research has examined partnerships between schools and higher education institutions, with a focus on how these institutions contribute with different forms of knowledge in joint development projects (Lillejord & Børte, 2016; Penuel et al., 2015; Zeichner, 2010). A recurrent concern in this literature has been how power dynamics inform whose knowledge counts in collaborative settings and how such partnerships can be developed on more equal terms. Several authors emphasise the need for increased recognition of schoolteachers' knowledge and of power imbalances in collaborations between schools and universities. One unit of analysis has been the conceptualisation of spaces that promote equal partnerships, such as the third space (Daza et al., 2021). The key message from this body of literature is the need to re-assess the historical relations between schools and higher education institutions and to develop partnerships that value schoolteachers' contributions to these partnerships.

In summary, significant attention has been given to the different types of discontinuities that occur in teacher education and their implications for educational quality. However, less attention has been afforded to how we can analytically account for the relations that teacher educators and student teachers create between knowledge resources as part of everyday work. By introducing the concept of epistemic relations, this article contributes to existing research by foregrounding how relations can be constructed between instantiations of research and professional practice, and how such relations can inform student teachers' opportunities for learning. In the following section, we outline the theoretical basis for this concept and expand on its different dimensions.

3. Social practice-based perspectives on professional knowledge

To elaborate on the concept of epistemic relations, we draw upon a social practice-based perspective on professional knowledge (Jensen et al., 2012; Knorr Cetina, 2001; Nerland & Jensen, 2012). Two basic assumptions underlying this perspective are that knowledge use is *situated* and emerges through the *use of conceptual and material artefacts*. In this section, we outline how these assumptions inform our understanding of the construction of epistemic relations in teacher education.

The first assumption refers to the context dependent characteristics of knowledge use. For example, a research article about the development of pupils' mathematical literacy can take on different purposes depending on its context of use. In a course in teacher education, the article can be used to develop student teachers' understanding of key concepts and practical approaches in the development of mathematical literacy. A teacher educator may design educational activities that challenge student teachers to critically examine these key concepts and to consider their implications for professional practice in schools. By contrast, the same article can have a different role in a research project conducted by a group of teacher educators. In this context, the article might be positioned as a representation of existing knowledge that is in need of renewal, providing a rationale for further knowledge generation. In a third version, the same article can be used in a school-based development project, involving teachers and teacher educators that collaborate to develop existing classroom practices in mathematics instruction. In this context, the research article can function as one of several knowledge resources that school teachers use to critically examine their own work.

In these three examples, the knowledge resource (the research article) remains constant, but its purpose and function vary based on the activities it is related to. Across the three examples, its relationship to other available knowledge resources will also differ. In the construction of epistemic relations, a key element is therefore to *relate knowledge resources to specific educational purposes or problems of practice*. This involves a dual analysis. The first element is an analysis of the task or problem to be addressed, such as the education of pre-service teachers, the design of a research project, or the development of mathematics instruction in schools. The second element is an analysis of how the given knowledge resources can contribute to addressing that task and defining its role and function. For the student teachers, the article partially has a prescriptive role, providing insights into mathematics instructions and directions for future practice. For the researchers, the article informs an argument for the need for more research and is also an object of criticism. For mathematics teachers in schools, the article can provide a set of analytical lenses for interpreting and modifying existing practices.

The relations that are constructed between the task at hand and the research article can be *designed for*. A teacher educator will typically invest a research article with a specific educational purpose when they are designing learning activities for student teachers. However, such relations also *emerge in the unfolding interaction* between the actors and the knowledge resource. For example, in a school-based development project, teacher educators may introduce the research article with specific intentions for its role in the development work, but the school teachers might reject the article as irrelevant for their practice (e.g. Cain, 2015).

The role afforded to the research article will also depend on *which other knowledge resources it is related to*. Student teachers may be provided with two articles outlining contrasting approaches to mathematics instruction and asked to compare them. This could support the student teachers in critically reviewing the advantages and challenges associated with both approaches. They could also be

asked to relate the articles to a future practicum period, encouraging them to assess the two approaches based on their imaged operationalisation in the classroom. In a school-based development project, the research article will typically be compared to teachers' experience-based knowledge. The relations constructed between the research article and the teachers' prior experiences are likely to inform whether the article is perceived as a relevant source of knowledge.

By analytically foregrounding the role of knowledge resources in the construction of epistemic relations, we rely on the second theoretical assumption that knowledge use emerges through the *use of conceptual and material artefacts*. Educational activities in teacher education involves a range of artefacts such as concepts, models, theories, books, curriculum documents, examples of students' work, research articles, teaching materials, assessment rubrics, and experience-based knowledge from professional practice. In general, all artefacts are invested with specific constraints and affordances that inform, but do not determine, their use. A typical affordance of a research article on mathematics literacy is that it offers generic theories and concepts, findings from empirical research, and general principles and guidelines for mathematics instructions in schools. A typical constraint is that the article will be unable to offer contextualised and detailed instructions for practice that take into account the particular needs of individual schools. For such purposes, the research article will need to be related to other knowledge resources that can provide this type of contextual knowledge. A more general implication is that both teacher educators and student teachers need to critically assess the characteristics of knowledge resources and their potential relations to the task at hand.

So far, we have argued that the construction of epistemic relations is characterized by the following elements: First, the construction of epistemic relations is context dependent and will be informed by the task, or the problem of practice, to be addressed. In the construction of epistemic relations, both teacher educators and student teachers need to analyse the relationship between the task at hand and the available knowledge resources, to define their overall purpose and function.

Second, the construction of epistemic relations is dependent on the characteristics of the knowledge resources used. In the construction of epistemic relations, teacher educators need to analyse the affordances and constraints of different knowledge resources and the role that they can play in student teachers' learning processes. Similarly, student teachers need to analyse how the knowledge resources they engage with can help them address specific tasks and, more generally, support their ongoing professional development.

Third, the construction of epistemic relations involves an assessment of how different knowledge resources relate to each other. The purpose or function that a knowledge resources is afforded in an educational activity, will depend on the relations that are created to other knowledge resources. When teacher educators select multiple knowledge resources for inclusion in an educational activity, the details of their interrelations will inform the characteristics of student teachers' learning processes.

As stated in the introduction, our conceptualisation of research includes analytical attention to both outputs and processes (Healey, 2005; Healey & Jenkins, 2009). Knowledge in teacher education is not only represented through a diversity of knowledge resources, but also through different *processes of knowledge generation*. For example, in research-based teacher education programs, student teachers are often expected to conduct research as part of a master's thesis, to conduct small action research projects as part of their practicum period, or to generally use a range of research skills to support their professional development. These research informed processes of knowledge generation co-exist with the development of experience-based knowledge during practicum periods in schools, including the automatization of skills, the development of tacit knowledge and the ability to quickly "read" and interpret a complex classroom situation that is in immediate need of attention. The construction of epistemic relations in teacher education also involves creating relations between these different processes of knowledge generation. For example, a student teacher that has been tasked with conducting a small action research project in connection with a practicum period, is expected to combine research-informed approaches to knowledge generation (such as systematic collection and analysis of data) with the generation of experience-based knowledge generated in the classroom (for example, as they practice teaching mathematics to pupils in 9th grade). When relations are to be created between processes of knowledge generation, a key question is how these processes can fruitfully complement each other to address a given task and, more generally, to support student teachers' learning and professional development. We explore this question further in the next section of this article.

In the following section, we apply the concept of epistemic relations to published empirical studies (Damsa & Nerland, 2016; Heikkilä et al., 2020a; Heikkilä et al., 2020b; Risan, 2020). These articles are all written from a relational perspective on knowledge; they address student learning in teacher education and analytically foreground the relations between research-based knowledge and professional practice. From our perspective, these studies also highlight how teacher educators and/or student teachers attempt to construct relations between instantiations of research/research methods and professional practice. Empirically, they represent national contexts (Finland and Norway) which emphasise research-based teacher education (Munthe & Rogne, 2010; Toom, et al, 2010), and where a master's degree is required to qualify as a teacher. Finally, the three articles provide variety in terms of the types of relations that are constructed and the implications that these offer for student learning.

The first study by Heikkilä et al. (2020a, 2020b) provides an example of how student teachers construct relations *between different processes of knowledge generation*. More specifically, it examines how they relate a selection of research skills to their experience-based learning process during a practicum period. The second study by Risan (2020) provides an example of how teacher educators construct *relations between different knowledge resources* as part of educational activities in teacher education. The educational settings are aimed at developing student teachers' knowledge in writing instruction and formative assessment. The third study by Damsa and Nerland (2016) provides an example of what happens when student teachers do *not* manage to construct epistemic relations as part of an instructional task, and how it affects their learning process. In each example, we also explore the characteristics of the relations that are constructed in more detail. We tentatively describe the functions of these relations as *transformative*, *evaluative* and *explorative*, respectively.

4. Creating epistemic relations between different processes of knowledge generation

The study by Heikkilä et al. (2020a, 2020b) illustrates how epistemic relations constructed between the use of research skills and experience-based learning during practicum periods have the potential to expand and transform student teachers' understanding of classroom settings and their professional identities. Heikkilä and colleagues define research skills as 'a collection of concepts, tools and embodied skills that have the potential to mediate student teachers' learning in ways that support agentic engagement with professional knowledge' (2020a, p. 4). The study examined student teachers' use of research skills in the context of practicum periods in schools. These students are exposed to "research methods such as observation, interview and survey" as well as skills focussed on "information seeking, research ethics, data analysis methods and scientific writing" (Heikkilä et al., 2020a, p. 4) during their first year as students, and carry out research in small groups in connection with the practicum period. An underlying assumption in their study is that research skills have the potential to strengthen student teachers' ability to make sense of professional practice during their practicum periods in schools and, more generally, to engage with professional knowledge in ways that go beyond mere knowledge acquisition.

Heikkilä and colleagues analysed 73 (2020a) and 79 (2020b) written reports produced by student teachers as part of assignments associated with the practicum period; they reflected upon their use of research skills and how these skills might benefit them in the future. For the current purposes, we focus on the students' constructions of epistemic relations and the relations they make between research skills and their experiences of professional practice during their practicum. One example of how these relations are expressed in the student teachers' reports is as follows:

When conducting research, I realised that a teacher does in his/her work research-like things all the time. You have to interpret and read pupils and, also, understand where the pupil's actions and reactions derive from. (Claus; Heikkilä et al., 2020a, p. 11, online first).

In this quote, research skills in the form of observation methods are understood not only as means for academic research but as an integral part of teachers' work. More specifically, they are related to developing a deeper understanding of pupils' behaviour, interpreting not only their actions but also what these actions derive from. The analytical gaze that comes with using research methods is explicitly related to teachers' everyday practice of interpreting what is happening in a classroom. The quotation implies that this perspective not only alters the students' understanding of the concrete instances of classroom events but also develops their more fundamental understanding of what it means to be a teacher.

Another example of the construction of epistemic relations is as follows:

The significance of research in teachers' work grew a lot in my eyes. I noticed that teachers' work is, in other words, consistent conducting of research. This research is not merely concentrated on pupils but also on oneself and one's own teaching. Moreover, the research publications mean more to me. Now, I understand to appreciate research results more and I am aware that the information gained by them is not some kind of everyday talk but with the help of them, one can really strive to improve pupils' learning outcomes, teachers' work, school satisfaction, to intervene in problems etc. Research goes deeper than the surface, it opens a door to the world that actually might not be seen with bare eyes in everyday life but that, however, has a great impact on pupils and on teachers (Heikkilä et al., 2020b, p. 6, online first).

In this quote, research skills are related to different dimensions of the student teachers' learning and professional practice. First, a relation is created between conducting research and their own professional development and identity. Second, a relation is constructed between conducting research and their understanding of how research can be used to support pupils' learning in schools. Third, the experience of conducting research is related to a qualitatively different understanding of what can be examined in a classroom, distinguishing between what can be seen with "bare eyes" and what can be explored "below the surface".

More generally, Heikkilä and colleagues document that research skills mediate student teachers' relationships to their work in the classroom and the development of their professional identities in multiple ways. Heikkilä et al. argue that this engagement supports the development of agency, which the students could potentially use to re-shape and develop established practices in schools in the long run.

The work by Heikkilä et al. (2020) illustrates epistemic relations in which research is afforded a transformative role with the potential to expand student teachers' understandings of professional practice and their professional identities. The point is not that all student teachers included in Heikkilä et al.'s study had this experience (they did not) but that the study documents a specific set of epistemic relations that can enable students to qualitatively change their views of what it means to work in schools. This is an example of epistemic relations that take on a *transformative* function, pointing to the transformations that the students undergo in their experiences of professional practice and professional identity as they experiment with research skills during their practicum.

5. Creating epistemic relations between different knowledge resources

The study by Risan (2020) illustrates how epistemic relations are created between research-related artefacts and professional practice. She examines how educators from three teacher education institutions "actively construct linkages between different forms of knowledge at the micro-level of educational activities in campus-based teacher education" (p. 1). Risan's empirical focus is on a category of teacher educators who have their main employment in schools but work part-time for a teacher education institution. These teacher educators are assigned specific responsibilities for making teacher education more professionally relevant. Risan (2020) uses observations of campus-based teaching and semi-structured interviews to examine how these teachers attempt to construct

epistemic relations between professional practice and research-based artefacts in their teaching.

In this example, we focus on the *teacher educators'* attempts at constructing epistemic relations. The research artefacts in question consist of a research article on writing development, a tool for applying the principles outlined in the article in the classroom (known as the 'writing wheel') and empirical and theoretical literature on formative assessment. Risan describes two situations in which the teacher educators construct relations between research-related artefacts and professional practice. A common characteristic of both episodes is the construction of relations characterised by an *evaluative* function.

One example concerns a tool used in schools to support the development of writing skills, referred to locally as the *wheel of writing*. The teacher education positions the wheel of writing as a research-based artefact, based on a scientific article. Risan's (2020) observational notes read as follows:

After showing the student teachers the two paper-versions of the wheels, Ingrid hands out a research article on the wheels of writing. 'We're going to read a lot of theory now, guys. This is so important because teachers are committing sins out there. [...] I have become much more aware after reading up on this; I've even become fond of the wheels'. She holds up a copy of the first wheel, explains its parts to the students, and reads an extract about the wheel from the article. She says they should read the entire article in order to understand the greater context. The students are asked to cut out and put together a paper version of both wheels, and Ingrid says they should bring it for their school placements. [...] After the students have cut out their wheels, Ingrid asks them to discuss how they could use these wheels when teaching. (p. 6)

In this instructional setting, the teacher educator constructs multiple relations between the research article and professional practice, as Risan (2020) elaborates:

Ingrid mobilises the research article as an artefact of 'theory', and as the article explains the research-based intentions of the wheels, the theory-practice linkages between the two artefacts are easily accessible. However, the example shows how theory-practice linkages are further forged as the article is not only used to validate the practical use, but also to challenge existing professional practice and the lacking use of the wheels. By emphasising the importance of the wheels for the student teachers' future practice and by characterising the lacking use of the wheels among her colleagues as 'embarrassing', Ingrid creates linkages between the two forms of knowledge through the notion of research-based practice and professionalism. (pp. 6–7, online first)

In this extract, the wheel and the article are positioned as an authoritative arbiter of teachers' professional practices and teacher identities. Research is constructed as a tool that can be used to legitimise or challenge specific ways of working with writing skills in schools, and it attains an evaluative purpose. At the same time, the article plays a pedagogical role. As Ingrid moves back and forth between the representation of professional practice (the writing wheel) and specific sections of text in the research article, the article is afforded an elaborative and explanatory role, intended to provide students with the greater context surrounding this approach to developing writing skills.

Risan (2020) also presents a contrasting example in which research is positioned as something that can be *challenged* by professional practice. In this lesson, which focuses on formative assessment, another teacher educator constructs relations between research-based theories of formative assessment and samples of pupils' texts that contain formative feedback from schoolteachers. The teacher educator addresses the students:

'You [the student teachers] are going to look at the first draft, my feedback, and the final text. I have removed the feedback from the text, so you have to find out where in the texts you think the feedback belongs. Do we think that the formative assessment, that research claims is so good, has had any effect?' The students read the text and feedback (p. 7)

In this example, the teacher educator constructs a relation in which the research literature is placed under scrutiny. Students are asked to use examples of student texts in order to assess the effect of formative assessment 'that research claims is so good'. Artefacts associated with professional practice, in the form of school students' texts that have been re-written based on teachers' feedback, are positioned with the potential to challenge research findings. The task placed upon student teachers is not only to examine the school pupils' texts as practical examples of formative assessment but also to use these texts to critically evaluate established theories of formative feedback.

In summary, these two examples represent contrasting epistemic relations between research and professional practice; in the first example, research is used to assess and validate (or challenge) professional practice, and in the second example, professional practice is used to assess and validate (or challenge) research. However, both examples rest on the assumption that these knowledge resources can be used to evaluate each other. We have therefore labelled this set of epistemic relations as *evaluative*.

6. Student teachers' failure to construct epistemic relations

In the theory section of this article, we noted that epistemic relations are emergent and formed in the interaction between actors and knowledge sources or processes of knowledge generation. An implication is that the epistemic relations that teacher educators imagine as part of their curriculum development do not necessarily correspond to the epistemic relations that student teachers create when the curriculum is enacted.

The study by Damsa and Nerland (2016) documents this kind of discrepancy, through a case study of inquiry-based learning in teacher education. Through audio recordings of group work and qualitative interviews, Damsa and Nerland documented a

collaborative inquiry activity that provided students with a case narrative from professional practice. Working in groups, they had to formulate an inquiry question and apply theoretical knowledge to address the question. The process occurred over the course of five weeks, and the main objective was for the student teachers to ‘analyze and report on an authentic case by using theoretical knowledge as analytic lens’ (Damsa & Nerland, 2016, p. 282).

The task description indicates that relations were to be constructed between theoretical concepts and theories and the authentic case, to strengthen students’ understanding of professional practice. However, the students struggled to construct such relations because they did not master the theoretical knowledge. Damsa and Nerland (2016) describe the first part of the students’ group work with the assignment as follows:

The students began by reading the case narrative to make sense of the story and identify themes for analysis, and continued with weekly discussions of the materials considered relevant. The student groups’ biggest efforts were directed towards constructing meaning of the theoretical concepts and of how conceptual knowledge could support them in addressing the inquiry question (p. 284).

Because their initial understanding of this conceptual knowledge was weak, they had difficulties undertaking the task of formulating an inquiry question and generating a theory-based analysis of the case study:

Besides these discussions of theory, the students made swift attempts to formulate inquiry questions. These attempts appeared beset with difficulties, mainly because the meaning of the conceptual knowledge had not yet been constructed sufficiently to become actionable, that is, sufficient to elicit a critical analysis and interpretation of the case (p. 284).

As a result of these challenges, the intended epistemic relations were partially reversed. Rather than using theoretical knowledge to explore professional practice, the authentic case and the task description triggered students’ exploration of theoretical knowledge. However, the relations between theoretical knowledge and the authentic case remained weak for a considerable period:

The videos of the ... group’s interactions repeatedly displayed conversations in which the students attempted to define theoretical concepts but encountered difficulties in connecting the conceptual knowledge to the concrete case (p. 286).

Damsa and Nerland (2016) describe how these difficulties eventually encouraged the students to engage in a thorough reading of the theoretical literature. In their discussions, the students acknowledged that their own personal experiences and insights would not suffice to address the task at hand, prompting them to engage more in-depth with the research literature. This eventually led the groups to using theoretical knowledge in the case analysis, but at this point, several of the groups had limited time left to complete the assignment. One of Damsa and Nerland’s conclusions is that the students might have benefitted from a stronger scaffolding of the content and structure of the task:

In the end, the relatively underrepresented guiding structures led to difficulties for students in organising their inquiry towards elaborating theory-based explanations and connecting these to the practical situation ... The students mainly used the practical context of teaching as a framework of reference when attempting to address the inquiry problem and understand theoretical perspectives and concepts. They appeared disoriented when dealing with conceptual knowledge that held few explicit linkages to practice and learning theories were reportedly perceived as disconnected from the teaching practice. (p. 286).

This example illustrates that student teachers’ capacities to construct epistemic relations cannot be taken for granted. Rather, students need to understand the constraints and affordances of a given artefact to agentically construct epistemic relations as an integrated part of instructional tasks. Making epistemic relations is not a ‘technical’ exercise, but an act that presupposes a depth of understanding of the resources that are available.

However, Damsa and Nerland also document moments where the back-and-forth movement between the authentic case and theoretical knowledge appears to provide new insights for the student teachers:

The case analysis involved the students probing the practical pedagogical situations and conceptual knowledge, requiring a movement back and forth between insights provided by knowledge sources and the meaning and use of this knowledge. (p. 286)

In spite of the difficulties encountered by the students, this statement suggests that the students managed to some extent to construct epistemic relations that helped them pursue the task. These relations appear to have taken on a function of mutual exploration, as the back-and-forth movements gradually increased the students’ understanding of both the practical case and the conceptual knowledge.

7. Epistemic relations as an analytical construct for teacher education research

In this article, we have illustrated the analytical value of the concept of epistemic relations and the role it can serve in conceptualising and examining the interrelationships between knowledge resources and processes of knowledge generation in teacher education. Our point of departure was that teacher educators and student teachers actively construct epistemic relations as an integrated part of activities in teacher education, but that this aspect of their work has not been sufficiently recognised and conceptualised in teacher education research.

We have argued that the construction of epistemic relations is characterised by the following aspects. First, the construction of epistemic relations is a situated and context dependent activity, which is shaped by the task or problem of practice that is being addressed. It follows that epistemic relations are not generic or universal but are shaped through specific activities. Second, as actors

assess how to address a given task, they can draw upon a range of knowledge resources as well as different processes of knowledge generation. A key question for consideration is which knowledge resources or what processes of knowledge generation that are appropriate, and how their constraints and affordances will shape the task at hand. Third, the construction of epistemic relations is shaped by the interaction between different knowledge resources or processes of knowledge generation. A key question for consideration is how that interaction will inform how the task can be addressed. Fourth, although knowledge resources and processes of knowledge generation are associated with specific characteristics, these characteristics do not determine how they are put to use. Epistemic relations are to a significant extent emerging as they are being enacted. Consequently, the construction of epistemic relations involves a considerable degree of creative and analytical work and the exercise of professional agency. Finally, the construction of epistemic relations is consequential for student learning. In our empirical examples, we used the labels of *transformative*, *evaluative* and *explorative* to describe some of the pedagogical purposes that may emerge from the construction of epistemic relations. This is, of course, not an exhaustive list. The point has rather been to illustrate how we can conceptualise the relationship between the construction of epistemic relations, on the one hand, and the characteristics of student teachers' learning processes, on the other hand.

This article has made a first attempt to demonstrate the analytical work that the concept of epistemic relations can do as a unit of analysis in teacher education research. We propose that this concept can complement other common units of analysis, such as students' sense of coherence (Hatlevik, 2014), programme coherence (Hammerness, 2008) and third space (Daza et al., 2021). For example, in studies of students' perceptions of coherence, a sensitivity towards epistemic relations can help examine how students actually construct a sense of coherence, as well as the roles that knowledge resources are afforded in such construction processes. This approach might illuminate not just *whether* a sense of coherence is achieved but also *how* students' work with knowledge might contribute towards this achievement.

In studies of programme coherence, the concept of epistemic relations may provide further analytical depth to the question of how campus-based coursework and school-based practicum periods can be aligned. For example, notions such as clinical teacher education (Bulterman-Bos, 2008; Burn & Mutton, 2015) and practice-based teacher education (Forzani, 2014; Jensen, 2017) share the fundamental assumption that professional practice should be used as a reference point for the organisation of research-based knowledge taught on campus. This again raises the question of how different knowledge resources and processes of knowledge generation should be brought together when students work on specific tasks characterised by epistemic diversity.

In examinations of third space settings, an emphasis on epistemic relations can help examine how the knowledge that different actors bring to the table can be placed in complementary relationships with one another. From this perspective, epistemic relations configure not only how knowledge is used to address specific tasks but also how relations are constituted between different actors in teacher education. A recurrent finding in teacher education research is that knowledge resources are afforded differential authority, frequently to the detriment of the knowledge that schoolteachers contribute (Daza et al., 2021; Zeichner, 2010). The concept of epistemic relations re-frames such power issues by highlighting the kind of *work* that knowledge does in a particular type of relationship. This question is not only of theoretical importance but can serve as an object of enquiry for communities attempting to develop third space collaborative settings.

More generally, more precise conceptualisations of epistemic relations can improve our understanding of what it means to address the gaps between research and professional practice while foregrounding *knowledge* as the object of inquiry. As Kvernbekk (2012) challenges us not to view theory–practice relationships as *singular* or to take them for granted, we need a conceptual vocabulary for the pluralism of relations that she asks us to recognise. The empirical examination of such relations allows us to expand that vocabulary and to better understand its implications for student teachers' professional development.

The notion of epistemic relations highlights the *active role* that teacher educators and student teachers play in constructing such relations through processes of teaching and learning, thereby illuminating an important part of professional agency. Epistemic relations are not given, but they emerge when actors define the role that different forms of knowledge should play in an educational process. From this perspective, the construction of epistemic relations can be understood as a professional responsibility for teacher educators and as an important competence to be developed by student teachers.

Our analysis goes some way in unpacking the range of pedagogical choices that teacher educators face when epistemic relations are to be constructed for the purpose of supporting student learning. First, there is the choice of the *types of relations* to be constructed. Second, teacher educators need to consider the *educational purpose* of the epistemic relations. Third, they need to take into account the *division of labour* between student teachers and teacher educators in terms of defining the characteristics of the epistemic relations. Our empirical examples illustrate considerable diversity in this regard. In the two examples taken from Risan (2020), the teacher educators have clearly defined the role that the knowledge resources should play in student teachers' learning processes. By contrast, the example taken from Damsa and Nerland (2016) illustrates an instructional activity that is open-ended and to a great extent leaves the construction of epistemic relations to the students. As their analysis shows, such choices can have significant implications for students' learning processes. An implication for teacher educators is that course design involves not only attention to learning outcomes and pedagogical approaches but also to students' capacities to recognise the multiple roles that knowledge resources and processes of knowledge generation can play in their professional qualification and in their daily work as teachers.

This study has several limitations arising from its exploratory nature and its reliance on secondary sources. Future research could benefit from pursuing a range of empirical and theoretical questions to further examine the potential of epistemic relations as a construct that can address barriers to and opportunities for student learning. Another question is how trajectories of construction unfold for students as they gradually work to construct epistemic relations as an integrated part of educational tasks. A third question is how teacher educators reason about the role of different knowledge resources and processes of knowledge generation in the qualification of pre-service teachers. Observational, process-oriented studies may be particularly beneficial for exploring these questions.

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