Epistemic Coherence in Teacher Education

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Abstract

This chapter presents the concept of epistemic coherence and discusses its implications for researchers and practitioners in teacher education. Epistemic coherence is conceptualized as an emergent achievement comprising two key components: a) student teachers creating relations between a range of knowledge resources or modes of knowledge production and b) student teachers creating personal relationships with professional knowledge. This analytical approach can help move beyond conceptualizations of a theory–practice gap and other dichotomies that characterize existing research on knowledge use in teacher education and serve to open up the black box of how knowledge relations are constructed in teacher education.

Keywords

Coherence • Epistemic coherence • Knowledge practices • Teacher education

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G. Doetjes et al. (eds.), *Coherence in European Teacher Education*,
https://doi.org/10.1007/978-3-658-43721-3_3

3.1 Introduction

In this chapter, we present the concept of epistemic coherence and discuss how it can be of use to both researchers and practitioners in teacher education. We understand epistemic coherence as an emergent achievement comprising two key components: a) student teachers creating relations between a range of knowledge resources or modes of knowledge production and b) student teachers creating personal relationships with professional knowledge. We propose that this analytical approach can help us move beyond conceptualizations of a theory–practice gap and other dichotomies that characterize existing research on knowledge use in teacher education and serve to open up the black box of how knowledge relations are constructed in teacher education.

Our point of departure is that a defining characteristic of professional work is the need to integrate multiple knowledge resources in order to solve practical problems (Lehmann, 2020a; Muller, 2009). Previous research has argued that knowledge integration across different domains and forms of knowledge constitutes "an integral part of professional development, professionalism, and competence" (Lehmann, 2020b, p. 1). Teachers draw on a diverse range of knowledge sources, including knowledge about their respective school subjects, subject didactics, pedagogical knowledge, human relations and mental health, organizational knowledge of the school sector, and knowledge about specific student groups, their families, and the community surrounding the school (Hegarty, 2000; Shulman, 1987). When teachers make decisions that inform their everyday work, they constantly assess the various knowledge sources in relation to both each other and the task at hand. The integration of different knowledge sources is, therefore, an inherent aspect of teachers' professional practice.

This epistemic diversity is also a key characteristic of teacher education. Teacher education programs draw on a diverse range of knowledge sources, including knowledge about school subjects (e.g., mathematics, history, languages or chemistry), subject didactics, pedagogical and psychological knowledge, and a broad range of practical skills. In addition, teacher education programs combine the two learning arenas of universities and school, which are characterized by different sets of institutional practices and logics (Hedegaard, 2014) and different conventions for developing and safeguarding knowledge (Knorr Cetina, 1999).

It follows that a key task for teacher education is to prepare student teachers to deal with this epistemic diversity in a competent manner. This means that student teachers should be able to create relations between different knowledge resources as well as different modes of knowledge production in order to address problems of practice. Epistemic coherence also requires that student teachers build

personally meaningful and agentic relationships with professional knowledge, thereby enabling them to foster their professional identities in a sustainable manner (Heikkilä, 2022). However, these characteristics of teachers' work and their implications for teacher education remain under-theorized. The current chapter aims to address this gap in the existing research.

In the field of teacher education, we need a conceptual apparatus for understanding how teachers deal with this epistemic complexity and the dynamics underlying their work in order to relate different knowledge resources to each other. Because knowledge is often perceived as abstract and immaterial, it can remain hidden from view unless the complexity is made visible. Much attention has been paid to the need to "relate theory and practice," but it remains unclear how this is actually done. There is also a need to overcome dichotomies that are dominant in much of the literature and, instead, focus on the processual aspects, which can be unpacked from a relational perspective.

3.2 Perspectives on Coherence in Teacher Education

There is a longstanding challenge of designing for coherence in teacher education (Canrinus et al., 2017; Hatlevik & Smeby, 2015; Jenset et al., 2018; Risan, 2020; Sjølie & Østern, 2021; Zeichner, 2010), and existing research provides several concepts that describe different aspects of coherence. These include structural and conceptual coherence (Hammerness, 2006), biographical, transitional, and program coherence (Hatlevik & Smeby, 2015; Smeby & Heggen, 2014), and institutional coherence (Hermansen, 2019).

Some of these concepts—such as structural, transitional, and program coherence—analytically foreground program characteristics. These constructs help conceptualize the interrelationships between different program components and the ways in which these relations may support or obstruct student learning. Other concepts, such as conceptual and biographical coherence, relate primarily to actors' perceptions and experiences. Such constructs help us examine the ways in which teacher educators' perceptions might inform program design and the extent to which student teachers experience a program as coherent. Finally, the notion of institutional coherence allows us to conceptualize the relationship between instantiations of program design and the institutional contexts of higher education institutions. In this chapter, we introduce the concept of epistemic coherence to show how student teachers can learn to construct meaningful relations between different knowledge resources and a personal relationship with

professional knowledge. These relations emerge when they define the role that different forms of knowledge should play in an educational setting.

Teacher education is characterized by curricular divides between academic disciplines and subjects and educational foundation and methods courses as well as a major separation between university and school as two distinct learning arenas (Sjølie & Østern, 2021). University teachers and practitioners responsible for student teachers during placement occupy separate and distinct modes of logic and epistemic beliefs (Hatlevik & Smeby, 2015). Previous research indicates that students experience classroom instruction and field placement as two very different learning arenas, where different forms of competence matter (cf. Hatlevik & Smeby, 2015). Thus, student teachers may have difficulty grasping the relevance of theoretical knowledge in teachers' work because the two contexts carry different institutionalized practices relating to the types of knowledge that matter. Thus, it is not easy for student teachers to develop a sense of epistemic coherence. Previous research on student teachers', university teachers', and practicum supervisors' evaluations of coherence in different professional education programs also indicates that teacher education programs may face greater challenges than other programs in terms of linking theory to practice (Hatlevik & Smeby, 2015).

Different learning arenas generate different perspectives about knowledge, and thus, knowledge acquired by student teachers must be recontextualized to become useful in practical work (Hatlevik & Smeby, 2015). Previous research has illustrated how student teachers actively engage in knowledge work as they tailor knowledge for their own purposes and adapt it in the transition from one institutional context to another (Heikkilä, 2022). Recontextualizing knowledge entails the ability to create meaningful relationships between different types and aspects of knowledge (Hatlevik & Smeby, 2015). This cannot be left exclusively to student teachers; fostering epistemic coherence is a matter for everyone working in and for teacher education.

In the existing literature, challenges in building these personal relationships have often been verbalized through the concepts of theory and practice—a dichotomy usually represented through the gap metaphor. In discussions around the theory–practice gap, theory usually means educational theories and research-generated knowledge taught in teacher education, whereas practice generally refers to teachers' practical work in classrooms (Hermansen, 2020; Korthagen, 2010; Leijen et al., 2015). In general, the notions of theory and practice date back to Aristotle's three-fold classification of human activity as consisting of theoretical action, productive action, and practical action, which were later elaborated in several ways (Mahon et al., 2020).

In the field of teacher education, a conceptual separation between theory and practice is popular but questionable (Hordern, 2019). Many scholars have documented that students struggle to construct relations between theoretical knowledge and professional practice (e.g., Jenset et al., 2018; Puustinen et al., 2018) as it causes problems for student and newly qualified teachers in terms of linking theories to their work (Leijen et al., 2015). The focus has often been on the question of how practice can be better linked to theory rather than vice versa (Korthagen, 2010). It has also been pointed out that simple dichotomies between theoretical knowledge and practical skills are inadequate in understanding the challenges of providing professional education (Smeby & Heggen, 2014). Instead, the concept of coherence has been proposed as an appropriate way to bring into focus the complexity of the meaningful interrelationships between theory and practice (Smeby & Heggen, 2014).

Some researchers have claimed that the problem labelled as a "gap" between theory and practice may derive from a lack of a shared understanding between student teachers and teacher educators (Sjølie & Østern, 2021). It may be that teacher educators are unable to connect to student teachers' personal experiences. In the same vein, some have argued that teachers as practitioners should have more control and specialized knowledge—and thus theory—assumes greater value (Hordern, 2019). In addition, some researchers have claimed that a narrow use of the term "practice" as what happens in the classroom, and making this the focus of a problem-solving research paradigm, mistakenly places it as the opposite of theory (Hodgson & Standish, 2009). Thus, rather than treating theory and practice as mutually exclusive, there is an increased focus on how different forms of knowledge are intertwined in specific situations of professional practice.

Helping student teachers build personal and agentic relationships with professional knowledge entails that theory and practice should not be presented as opposites. Theory and practice are not static or passive entities; both involve action and arouse further action. First, educational theories and research-generated knowledge are created in ongoing processes by academic researchers. In this activity, policy affects researchers, causing them to find balance between autonomy and control and creativity and accountability (Jacob & Hellström, 2018). Thus, how "theory" in the field of teacher education evolves is shaped by the possibilities afforded to teacher educators to engage in research. Second, similarly, practices in schools are constantly being shaped every day. Thus, educational practice is not merely habitual practice and routine action in everyday human activity; it involves moral action and is formed through history (Mahon et al., 2020). Therefore, the issue of theory and practice in teacher education seems to be much more complex than what is often assumed.

However, rejecting the notion of a "gap" does not imply that the relationship between theory and practice should be conceptualized as seamless (Kvernbekk, 2012). Theoretical development is a worthwhile academic pursuit in itself, free of allusions to practice (Kvernbekk, 2012), including in the field of education. When theoretical knowledge is related to professional practice, a more pertinent question is not how to "bridge the gap" but, rather, what kinds of relations might emerge as teachers, student teachers, or teacher educators work on problems of practice. Thus, we maintain that the "theory–practice gap" should not be viewed as a homogenous and static phenomenon. Instead, the relationship between theoretical knowledge and professional practice can be conceptualized as a generative and dynamic relationship with characteristics that are highly context-dependent. The concept of epistemic coherence aims to unpack some of these dynamics.

In the next sections, we outline our conceptualization of epistemic coherence with a focus on its two main elements: the creation of relations between different knowledge resources and the creation of personal relationships with professional knowledge.

3.3 Epistemic Coherence as Creating Relations Between Different Knowledge Resources

Previous research on knowledge integration has distinguished between research traditions that adopt a cognitive-psychological viewpoint, and those that view integration as a form of situated activity in which knowledge is applied towards specific tasks (Lehmann, 2020b). Drawing upon the latter tradition, this section outlines a conception of epistemic coherence that analytically foregrounds *how different knowledge resources are placed in relation to each other in order to address a specific task or problem.* A key assumption is that coherence in teacher education and teachers' professional practice can only be understood in the context of specific tasks or problems of practice. The task—or problem—is what provides different knowledge resources with integrative force and informs how relations can be constructed. In teacher education, such tasks can include student teachers collaboratively working on a case analysis, analyzing curriculum documents, or undertaking a research and development project as part of their practicum period. For teacher educators, such tasks could include lesson design, curriculum development, or providing formative feedback on student teachers' texts.

All tasks require the use of different material and conceptual artefacts (Cole, 1996), which are here referred to as knowledge resources (Hermansen, 2017). In teacher education, such knowledge resources include theories, scientific concepts,

models (for example, to support reading skills or for curriculum development), research articles, national or local curricula, lesson plans, assessment rubrics, reflection logs, case descriptions, multimedia representations of professional practice in schools, or simulated learning environments. These knowledge resources typically emerge from varied forms of knowledge production: some resources are produced through research (such as research articles and scientific concepts), while others are produced through professional practice in schools (such as reflection logs or teaching materials created during practicum periods in schools). Epistemic coherence is about creating relations *between these modes of knowledge production* as well as *between the different knowledge resources* that emerge from these processes.

Knowledge resources are not "neutral" but are characterized by a set of constraints and affordances that shape how they can be put to use in teacher education. For example, a scientific publication will often provide concepts and theoretical perspectives that can help student teachers expand their understanding of professional practice. However, such publications are unlikely to offer detailed "recipes" of how professional practice is to be carried out in the classroom because this kind of knowledge resource tends to be abstract and decontextualized (Hermansen and Mausethagen, 2016). Conversely, the experience-based knowledge of particular students is often essential to addressing challenges related to classroom management and social relations in a given classroom. However, such knowledge can be more difficult to generalize to other classrooms and other school settings.

In short, the role that a given knowledge resource might adopt in addressing a problem of practice depends on its characteristics. It follows that student teachers need to learn to analyze the affordances and constraints of specific knowledge resources. An important responsibility for teacher educators, therefore, is to support student teachers' capacity to assess the potential that different knowledge resources offer. Students should be able to identify the use scenarios that can be associated with specific knowledge resources. However, such potentials do not *determine* actual use, and student teachers can also invest knowledge resources with distinct purposes and characteristics.

The task or problem at hand informs how such purposes and characteristics are defined. For example, a journal article about how to support at-risk students may take on very different roles in a) a learning activity for student teachers; b) a research project conducted by teacher educators; and c) a school-based development project for in-service teachers. For student teachers, the main purpose of this article may be to develop their understanding of how to support at-risk students. In a research project run by teacher educators, the article may form a point

of departure for developing *new* understandings of at-risk students that challenge existing theoretical perspectives and practices. In a school-based development project, the article may act as one of several resources that allow teachers to critically examine and further develop their existing practices with at-risk students. Hence, the potentials of specific knowledge resources are realized in a mutually constitutive relationship to the task at hand.

Because the role of knowledge resources is not predetermined, interpreting and assessing their potential is an integral part of professional agency. The creation of relations between different knowledge resources *requires analytical and creative work*. As student teachers or teacher educators work to relate different knowledge resources to a given task, they will need to exercise professional discretion and critically evaluate the potential function and purpose of specific knowledge resources. Some key questions in this process include: What can these knowledge resources offer to address a specific task? What can they *not* offer? How can they be adapted to better suit the task at hand? How can they be placed into a fruitful relation with other knowledge resources? An important part of this assessment is to consider how different knowledge resources can *interact* to address a given problem.

In teacher education, creating relations between such knowledge resources is an inherent part of everyday activity. For example, student teachers may be asked to analyze a case description from professional practice in the light of learning theories, develop assessment criteria based on insights from existing assessment research and an assessment task developed at a local school, or apply educational theories, knowledge of school subjects, and experience-based knowledge from practicum periods in curriculum development. In all of these examples, the interplay between different knowledge resources needs to be carefully considered, both by teacher educators (in the design of the task) and by student teachers (as they complete the task).

For teacher educators, assessing the interplay between knowledge resources and relating them to specific purposes can be considered an integral part of curriculum design and enactment. For example, Risan (2020), in her doctoral work, exemplified how teacher educators work to create relations between what she described as artefacts related to theory and practice. She examined how teacher educators invest these artefacts (or, in our terms, knowledge resources) with specific meanings. For example, in a lesson on how to support the development of writing skills, one of the teacher educators that Risan observed used a research article and a tool for practitioners called ‘the wheel of writing’, which supports teachers to identify different dimensions and purposes of writing exercises. The

teacher educator assigned these resources with a range of purposes in the professional development of her student teachers. First, she used these knowledge resources to instruct student teachers in how to teach writing skills, using the 'wheel of writing' to operationalize the insights from the research article into specific classroom practices. Second, she used these knowledge resources to express and justify her criticism of how writing skills are generally taught in schools, contrasting her view of established approaches with the practices represented by the research article and the practical tool. Third, she used the research article to model her own trajectory of professional development as it relates to the teaching of writing skills, explaining to the student teachers how her exposure to research has changed her own teaching approaches. Finally, she used these knowledge resources to construct a specific kind of teacher professionalism that she urged the student teachers to adopt. In short, she used her agency and professional discretion to create multiple relationships between the research article and different aspects of professional practice, both at the individual and collective levels.

Another teacher educator in Risan's study, who was teaching a lesson on how to provide formative assessment, provides a contrasting example of how knowledge resources can be related to a problem of practice. In her lesson, she used three knowledge resources: research articles on formative assessment, examples of school pupils' writing, and her own formative assessment of the pupils' texts:

> Nina asks student teachers to read two sets of anonymised pupil texts and her feedback for the first and the final version of the texts. The feedback has been removed from the pupil texts, and the student teachers are asked to find out where the teacher feedback belongs: "You 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?" (Risan, 2020, p. 7).

Creating a relation between the research article and the examples of school pupils' writing, the teacher educator encouraged the student teachers to critically assess key insights from research on formative assessment in light of the examples she provided from her own professional practice. In contrast to the previous example, in which the research article on writing skills is employed as an example of 'best practice', this teacher educator positions the research articles as knowledge resources that can be critically explored in the light of professional practice.

In both examples, very different choices could have been made by the teacher educators. For the current purposes, the point is not whether these examples show "good" or "bad" teaching practice. Rather, they are analytically interesting because they illustrate teacher educators' professional discretion in terms of *how*

the knowledge resources were related to specific tasks and in terms of the *inter-relationships* created between instantiations of research and professional practice. In this case, we also do not know whether the student teachers themselves experienced these relations as meaningful, which is important for student learning. In the next section, we therefore proceed to look at epistemic coherence as a way of creating personal relationships with professional knowledge.

3.4 Epistemic Coherence as Creating Personal Relationships with Professional Knowledge

Another key element in developing epistemic coherence is that student teachers as well as other actors related to teacher education create personal and agentic relationships with professional knowledge. These relationships contribute to epistemic coherence by strengthening agency and professional identity in teachers' approaches to knowledge resources. Fostering these relationships helps take control of knowledge resources and the role they should play in professional work.

To help student teachers create personally meaningful relationships with professional knowledge, they should be involved in knowledge-creating processes themselves. The aim of research is usually understood as creating and bringing new knowledge into the world. Thus, the role of research in teacher education programs is an important issue for epistemic coherence.

There have been worldwide efforts aimed at improving the research base of teacher education (Afdal & Damşa, 2018; Afdal & Spernes, 2018; Darling-Hammond et al., 2017). According to prior research, research-based teacher education programs seem to be more effective than traditional ones (Tatto, 2015). Several factors appear to explain how a research-based approach can improve the quality of teacher education. Research-based teacher education can refer to the qualifications of teacher educators, their participation in research projects, and the goals of teacher education program leaders (Munthe & Rogne, 2015). At the level of teaching practices, research-based teacher education can involve a concentration on both the research content itself and the research problems and processes as well as both teacher- and student-focused practices (Healey, 2005). In building versatile relationships with knowledge, all such teaching practices tend to be valuable. However, student teachers' own research may be the key in supporting them in their relationship to educational knowledge.

According to the literature, research can be used as a conduit to support student teachers' learning to enact enquiry-based approaches into their teaching (Tatto, 2015). This is also one way of supporting student teachers' personal relationships with knowledge. For example, in Finnish primary teacher education programs, student teachers' research projects and the learning of research skills constitute part of their studies (e.g., Heikkilä, 2022). Thus, research skills are of particular interest because they concern how knowledge is produced, maintained, and reproduced in society (Murtonen & Salmento, 2019) and refer to the requisite concepts, tools, and embodied skills to apply these insights (Heikkilä et al., 2020). They help develop epistemic maturity and possibilities to realize that knowledge is always uncertain and created by humans (Murtonen & Salmento, 2019). In teaching, research skills also help in completing the degree as well as in observing pupils and analyzing their thinking (Toom et al., 2010).

Although commonly used as a term in Finnish teacher education (Mikkilä-Erdmann et al., 2019; Niemi & Nevgi, 2014; Stenberg et al., 2016), defining research as a skill in terms of learning to teach does not seem to be established in the international literature. Instead, researchers seem to use corresponding terms such as enquiry orientation (Tatto, 2015) or research-based thinking (Toom et al., 2010). However, the concept of research skills may be useful because it connects research with skills, which are often viewed as practical. For example, discussing theoretical knowledge versus practical skills (Smeby & Heggen, 2014) entails a dissociation of theory from skills and practice from conceptual knowledge. Thus, the concept of research skills is an example of the complexity of epistemic relations because the use of these skills certainly requires theoretical understanding. Moreover, the concept of research skills also points out that the research that student teachers learn in teacher education is not only about knowing but also doing.

In terms of student teachers' research, another concept in both research and policy is research literacy. It is topical in the current knowledge environment where factual arguments are replaced by emotional ones and personal beliefs prevail over expertise and academic values (Hauke, 2019; Hughes, 2019). Notwithstanding, teachers' work increasingly deals with knowledge in the form of teaching information literacy to pupils. Notably, however, the prevailing perspectives range from treating teachers as mere technicians who enact evidence-based scripts to professionals who exercise judgement in deciding what and how to teach (Boyd et al. 2021).

In highlighting the active role of teachers in epistemic relations, Boyd (2021, p. 19) proposed that research literacy should include an understanding of the contested nature of educational knowledge and the interplay between research

and practical wisdom. A step towards defining what research literacy means in the context of the teaching profession has been put forward by Eriksen (2022), who describes research literacy as an intellectual virtue that involves special tasks regarding the application of research to professional practice. Thus, supporting student teachers' research literacy requires making visible their personal relationships with professional knowledge.

To foster these relationships, there is a need for research on student teachers' experiences. Heikkilä et al. (2020) studied Finnish primary teacher students' epistemic agency (Damşa et al., 2010) when they engaged with research skills in a research-based program. The authors collected textual data as part of the student teachers' coursework. The first-year student teachers (N = 73) had just completed their first teaching practicum period at the university's teacher training school where they had put in action the skills learned on campus (e.g., research methods, information seeking, research ethics, data analysis methods, and scientific writing). In their reports, they were instructed to reflect on their experiences of using research skills during the practicum.

The following quotation illustrates a student teacher's insights on the role of research skills in developing one's professional practice and becoming aware of various knowledge-laden activities in teachers' work. In the reflection, the student teacher also brings ethical matters to the relationship by combining these activities with being responsible for pupils:

> In order to be responsible for future generations, we have to know what we do, how we do, when we do, and why we do the way we do. Research is the core of all this. As a teacher, it is extremely important to develop oneself and one's own thinking.

Conversely, the following quotation illustrates how another student teacher felt that the learning of research skills helped them question first-hand impressions about pupils and adopt a critical stance to "existing" knowledge. Here, the relationship with professional knowledge was characterized by an aspiration for depth:

> When conducting research, I realized 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.

In the findings of the study, four dimensions of epistemic agency were revealed, with research skills helping student teachers orient themselves toward professional knowledge. First, the dimension of the self concerned the student teachers'

professional development as epistemic agency was directed at these teachers' own teaching. Research skills served as a tool with which to question oneself and one's teaching practices. Second, in terms of the class dimension, epistemic agency was aimed outward, that is, toward what occurs in the classroom and the characteristics of the children. Here, research skills were related to systematic observation and analysis in understanding pupils and their backgrounds.

Third, the research literature dimension concerned critically relating oneself to existing research-based information. Research skills were used to interpret educational knowledge and assess its validity. Fourth, the dimension of everyday life emphasized the student teachers' desire to see the teachers' work in a larger context. Research skills were used to support the teachers when transmitting knowledge to their pupils and show connections between school learning and life outside of school.

The study depicted the way in which the fostering of epistemic agency and, thus, epistemic coherence required attention to student teachers' relationships with knowledge. Although some student teachers mentioned several dimensions, most of them seemed to focus on a single one. The conclusion of this study is that epistemic agency gained through all four dimensions could be made visible for student teachers, implying tremendous potential that has not been attained in teacher education.

In future research, new kinds of relationships with professional knowledge can be found among student teachers. These relationships arise and change constantly as student teachers study on campus and practice teaching in practicums. The relationships are shaped by interaction with teacher educators, peers, and pupils in the practicum. They are also permeated by culture, for example, how professional knowledge in general is discussed on campus and in the practicum. Epistemic coherence can be supported by paying attention to these relationships.

3.5 Conclusion

In this chapter, we have conceptualized epistemic coherence in teacher education as an emergent achievement comprising two key components: a) student teachers creating relations between different knowledge resources or modes of knowledge production and b) student teachers creating personal relationships with professional knowledge. We have argued that this concept can help re-configure the simplified dichotomies that often arise when knowledge is discussed in teacher education and can help analytically unpack the different dynamics at play when student teachers or teacher educators work relationally with knowledge.

More specifically, an analytical focus on the *relations between different knowledge resources* can help differentiate the role that a theory, concept, model, curriculum document, or assessment rubric can play in addressing a specific problem of practice. Rather than talking generically about "theory" or "practice" as homogenous entities, analytical attention to the actual *work* that different knowledge resources do in specific educational settings provides a differentiated view of what it means to "bridge the gap." Through such analyses, one might also find, as Kvernbekk (2012) has argued, that the "gap" is there to do a particular type of job that needs to be identified and exploited.

Second, an analytical focus on the relations between different modes of knowledge production highlights that student teachers (and teacher educators) are not just consumers or "appliers" of knowledge. They also *produce* knowledge as an integral part of tasks related to teaching and learning in teacher education. This happens through experience-based learning in practicum periods, small action research projects, and the application of a range of research skills. Through such processes, different modes of knowledge production contribute to student teachers' qualification processes in a variety of ways. Analytical attention to *what forms of knowledge production* are at play and *the ways in which they interact* enables a perspective that foregrounds how knowledge creation can support student teachers' opportunities for professional development.

Third, an analytical focus on the personal relationships that student teachers form with professional knowledge foregrounds the agency and sense of ownership that they need to develop with the knowledge base of the profession. In professional work, knowledge is not a "technical matter" of the application of rules and procedures. Rather, student teachers need to think analytically and creatively with knowledge as they exercise the autonomy and personal discretion that characterize their future professional practice in schools. Fostering an agentic relationship with knowledge enables student teachers to take control of knowledge resources and the role they should play in professional work.

Our perspective complements previous conceptualizations of coherence (Hammerness, 2006; Hatlevik & Smeby, 2015; Hermansen, 2019; Smeby and Heggen, 2012). Whereas previous perspectives have foregrounded actors' perspective, program characteristics, or teacher educators' visions for teacher education programs, there has been less attention on knowledge resources as an analytical construct in the literature on coherence. However, since knowledge itself is often constructed as the problem (through formulations such as the theory–practice gap or the divide between research and practice), the way in which we reason about knowledge must be an important part of the solution in our pursuit of coherence in teacher education. By approaching the question of coherence through a

relational perspective on knowledge resources, the concept of epistemic coherence provides an analytical entry point. Thereby it becomes possible to imagine how teacher educators, practicum supervisors in schools, and student teachers can work agentially with knowledge resources to create relations between "theory" and "practice" that are meaningful for professional work.

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