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Connecting academics' disciplinary knowledge to their professional development as university teachers: a conceptual analysis of teacher expertise and teacher knowledge

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Abstract
Disciplinary knowledge lies at the heart of academic work. However, connecting academics' disciplinary knowledge to their professional development as teachers has been a long-standing challenge for (research-intensive) universities. This is reflected in criticism of the practices that aim to support the professional development of university teachers. In order to create better connections, a deeper understanding is needed of how academics' disciplinary knowledge relates to the development of their teaching. In this paper, we therefore aim to advance theoretical insights about how academics' disciplinary knowledge connects to their professional development as university teachers. We do so by providing a conceptual analysis of teacher expertise and teacher knowledge perspectives. Literature discussed as part of the teacher expertise perspective provides insights into how knowledge is structured in order to perform teacher tasks. In our discussion of the teacher knowledge perspective, we include bodies of literature about teachers' knowledge base to explore the role of disciplinary knowledge in how to teach and about powerful knowledge to explore the role of disciplinary knowledge in what to teach. Insights from these bodies of literature can, from a teacher knowledge perspective, offer theoretical underpinnings for connecting academics' disciplinary knowledge to their professional development as university teachers. Adaptive expertise and practical knowledge are identified as concepts that include elements of both teacher expertise and teacher knowledge perspectives. Based on the conceptual analysis, we identify and discuss three aspects related to supporting the professional development of university teachers where attention to connection with teachers' disciplinary knowledge is important.

Keywords Academic development · Faculty development · Disciplinary knowledge · Teacher expertise · Teacher knowledge

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Introduction

> *I am among those who think that science has great beauty. A scientist in his laboratory is not only a technician: he is also a child placed before natural phenomena which impress him like a fairy tale.*[1]

This insight by nineteenth-century scientist Marie Curie illustrates what still characterizes present-day academics: a captivation by their various objects of study. It is academics' knowledge about these objects of study as well as their knowledge of their respective disciplines that lies at the heart of their academic work. Boyer (1990) famously described how academics use their knowledge in different ways; he did so by outlining four types of scholarship, those of discovery, integration, application, and teaching. With this typology, Boyer sought to offer a more holistic view of academic work that would transcend "the tired old 'teaching versus research' debate" (Boyer, 1990, p. 16). This is an integrative vision that emphasizes the importance of various aspects of the use of knowledge in the academy, while recognizing the centrality of disciplinary knowledge.

Concerning the scholarship of teaching, Boyer (1990, p. 12) explains the role of disciplinary knowledge as follows: "As a *scholarly* enterprise, teaching begins with what the teacher knows. Those who teach must, above all, be well informed, and steeped in the knowledge of their fields." Boyer's (1990) ideas have resonated with many scholars (Moser & Ream, 2015). In line with his ideas, several scholars in the 1990s argued that better connections were needed between academics' disciplinary knowledge and the ways they are supported in their development as university teachers (e.g., Millis, 1994; Shulman, 1993). While efforts have been made to establish such connections, there are differences among disciplines in the overall advancement of teacher professional development, with some disciplines being at the forefront (e.g., medical education; Steinert, 2014). Concrete examples of practices that aim to establish a connection with academics' disciplinary knowledge are as follows: discipline-based education research (e.g., Dewar & Bennett, 2015; Kaleci & Korkmaz, 2018; Kuper et al., 2010), discipline-specific teacher professional development activities and programs (Amundsen & Wilson, 2012; Steinert et al., 2016), and educational development centers connected to faculties or academic schools (Taylor & Rege Colet, 2010). Nevertheless, the role of academics' disciplines in academic development—being the professional development activities and other practices aiming to support university teachers in the development of their teaching—continues to be contentious (e.g., Bostock & Baume, 2016; Ragupathi, 2021; Sutherland, 2018). It seems that despite efforts to foster connections between academics' disciplinary knowledge and their development as university teachers, more work is needed in this regard.

This view is strengthened by recurring criticism of the generic character of academic development practices. Scholars argue these practices are too heavily focused on decontextualized and generic pedagogical knowledge and skills, which position university teachers as purely facilitators of learning (Ashwin, 2014; Pratt et al., 2019). Although approaches that focus on generic pedagogical knowledge and skills can be useful for stimulating positive teaching conceptions and behavior (e.g., Ödalen et al., 2019; Postareff et al., 2007), exclusively relying on them may cause fundamental problems. Among these is the possibility of academics considering their development as university teachers to be distinct

[1] This is a quote from Marie Curie during a debate in Madrid about "The Future of Culture" (Curie, 1937).

from their development as academics, when their development as university teachers is not connected to the disciplinary knowledge that is core to their academic work (Quinn, 2012). Secondly, academics may not recognize general pedagogical principles as valuable for their specific disciplinary contexts (Deaker et al., 2016; Kinchin, 2016; Quinn, 2012) and are often left to their own devices when it comes to applying generic pedagogic principles to their own contexts (McLean & Ashwin, 2016). Moreover, an instrumental focus on pedagogy and facilitation techniques can come at the expense of attention to the knowledge that constitutes curriculum. This is an important oversight, because academics in their role as university teachers, both individually and in teams, have a pivotal role in deciding what is taught as well as how it is to be taught (Ashwin, 2020b).

So, while disciplinary knowledge is of great importance for academics in their role as university teachers, evidence such as that cited above suggests that universities struggle to find a way to connect this knowledge to the activities and practices that aim to support academics' professional development of their teaching. In order to create these connections, we argue that we first need to have a deeper understanding of *how* disciplinary knowledge connects to the development of academics as university teachers. In the literature, multiple papers can be found in which studies are described that investigate interventions, such as lesson study (e.g., Hervas, 2021), peer observation (e.g., Zeng, 2020), or discipline-specific teacher courses (e.g., Amundsen & Wilson, 2012; Stes et al., 2010). In many of these papers, the role of academics' disciplinary knowledge in these interventions is discussed. However, rather than investigating specific activities or programs and their underlying strategies, we provide a theoretical foundation that enables a more holistic approach for advancing connections between academics' disciplinary knowledge and academic development. We do so by analyzing two concepts that are critical in shaping academic development practices: teacher expertise and teacher knowledge. Insights resulting from this analysis create a basis for shaping the purpose, design, and organization of academic development. In sum, the aim of this paper is to advance theoretical insights about the connection between academics' disciplinary knowledge and academic development and to identify considerations for academic development practice based on these insights.

To advance current theoretical insights, we provide a conceptual analysis of the literature on teacher expertise and teacher knowledge and how these two can be connected. Although both perspectives are connected and partly overlap, they are based on different bodies of literature, both of which are important for a better understanding of how to connect disciplinary knowledge to academic development. The literature on teacher expertise sheds light on how knowledge is organized in order to perform teacher tasks and as such can be considered as providing the theoretical underpinnings of many current approaches in academic development that focus on developing pedagogical routines, for example, microteaching (Remesh, 2013). By contrast, while the literature about teachers' knowledge base is helpful for understanding the role of teachers' disciplinary knowledge in *how* to teach, the literature about "powerful knowledge" offers insights into the role of teachers' disciplinary knowledge for deciding *what* to teach. Together, these two strands in the literature about teacher knowledge shed light on theoretical underpinnings for approaches in academic development that connect to disciplinary knowledge. After providing a conceptual analysis of these bodies of literature, we discuss "practical knowledge" and "adaptive expertise" as concepts that combine elements of both. Based on our conceptual analysis, which is the main focus of the paper, we end by discussing three aspects of academic development that are relevant for creating stronger connections to university teachers' disciplinary knowledge: the purpose of academic development, the design of academic development activities, and the organization of academic development.

Our paper is placed within a growing body of research that focuses on "academic development" as a field of study. Academic development is defined as an area of practice and research in higher education that intends to create "conditions supportive of teaching and learning, in the broadest sense" (Leibowitz, 2014, p. 359) in order to "help create learning environments that enhance educational quality" (Pleschová et al., 2012, p. 9). Aside from "academic development," professional, educational, faculty, or staff development are also commonly used terms. There is considerable overlap among these terms, with some differences in meaning depending on region and focus of the author (for overviews, see Clegg, 2009; Popovic & Baume, 2016; Stes et al., 2010; Taylor & Rege Colet, 2010). The differences in terminology typify the diversity in how academic development is thought of and practiced, including with regard to engagement with academics' disciplinary knowledge. In line with Popovic and Baume (2016), we use the term academic development because it covers both enhancement of academics' capabilities and improvement of educational methods as well as processes.

In the context of this paper, we will thus use the term academic development to refer to the professional development of academics in their role as university teachers. With our conceptual analysis, we aim to make a relevant contribution to the field of academic development, as it has been criticized for being undertheorized and intellectually fragmented (Boud & Brew, 2013; Clegg, 2009; Harland & Shay, 2012; Harland & Staniforth, 2003). Even though the perspectives of teacher expertise and teacher knowledge are not unfamiliar in the higher education literature, there have been relatively few discussions that focus on how they can be positioned relative to each other in the context of academic development (King, 2022).

Using our previous research into teacher development as a starting point (Geertsema, 2016; van Dijk et al., 2020; van Tartwijk et al., 2017, 2020), we reviewed concepts underlying current academic development practices as well as concepts relating to the role of disciplinary knowledge in teaching. In a series of discussions, we developed an understanding of how to connect these concepts, which resulted in the conceptual analysis presented in this paper. Based on this analysis, we identified implications for academic development practice.

Perspective of teacher expert performance

We first elaborate on teacher expertise as a conceptual perspective that is relevant for understanding commonly used teacher development approaches. Research that uses expertise as a central concept, in particular research focusing on expert performance, investigates the mechanisms that enable experts to carry out their tasks efficiently and effectively to reach high levels of quality in task performance (Ericsson et al., 2006, 2018). In this section, we present a brief overview of research that focuses on expertise, which has over time shifted from a cognitive to a more integrated focus.

Expert performance research: cognitive mechanisms and acquisition of expertise

According to Ericsson and colleagues, experts should not be identified by reputation or qualifications, but by establishing expert performance: a person's superior reproducible performance on representative tasks that capture the essence of a domain (Ericsson & Smith, 1991; Ericsson et al., 2018). Expertise then refers to what distinguishes experts

from others. Inspired by this definition of expertise, two main lines of research developed: research focusing on understanding the cognitive structures that account for difference in performance of novices and experts and research focusing on acquisition of expertise (Ericsson et al., 2006, 2018; Ward et al., 2020).

Studies from the first line of research have provided insights into the cognitive mechanisms that enable experts to perform their tasks better, faster, and with less effort (for an overview, see Ericsson et al., 2018). There is strong evidence that experts automatize strategies, decisions, and procedures in the form of routines (Ericsson et al., 2018; Gruber & Harteis, 2018). These routines are often described in terms of scripts (Boshuizen et al., 2020; Schmidt & Rikers, 2007). Scripts contain a network of higher-level concepts based on case-based and theory-based knowledge about how to "solve" the cases experts encounter, for example, illness scripts in medicine or scripts for legal issues in law. Research in the domain of teaching shows that classroom management scripts allow teachers to better recognize important cues, diagnose what is going on in a classroom, and decide on the best course of action (Berliner, 2004; Wolff et al., 2020). For example, expert university teachers may have a script for starting a lecture that guides them in what to do, and in what order. Routines are especially important in professional contexts, because they prevent an overload of working memory that can be caused by the demands of professional work. However, over the years, routines can become hard to change. This becomes problematic in dynamic professional contexts, such as higher education, that can cause routines to become inappropriate or redundant for solving unfamiliar problems (Bohle Carbonell & van Merriënboer, 2019; Ward et al., 2018). Thus, although routines—in the context of teaching also described as pedagogical skills —are valuable for university teachers, a too heavy focus on these in academic development carries risks because routines can inhibit innovation and adaptation to changes.

A second line of research has focused on how to develop expert performance. A key concept here is deliberate practice, which describes successive engagement in repeated practice of activities designed for self-improvement of performance, followed by immediate feedback about what and how to improve (Bronkhorst et al., 2014; Ericsson et al., 2018). Based on extensive research into novices and experts in music, chess, and sports, researchers conclude that deliberate practice is important for acquiring expert performance (Ericsson et al., 2018). Deliberate practice was later also further investigated and developed in other professional domains (Fadde & Klein, 2010; Gruber & Harteis, 2018), including teaching. In the literature about teaching, even more cyclic conceptual models are often used in which reflection on action is a key element (Bronkhorst et al., 2014; Korthagen, 2001). Unlike the domains of music and sports, however, it is not always possible to engage in deliberate practice off the "stage" or "field" in professional domains such as teaching. Therefore, research in professional domains focuses on how to use (routine) work activities for deliberate practice, how actors in workplace contexts can guide learning activities, and on sources of feedback in the workplace (e.g., Bronkhorst et al., 2014; Fadde & Klein, 2010; Gruber & Harteis, 2018).

A recent study used the expert performance perspective to define tasks of university teachers that are representative for their domain (van Dijk et al., 2020). The rationale for this study was that it is important to understand *what* university teachers must develop in order to support them in their development. An analysis and synthesis of 46 frameworks for university teacher expertise resulted in six distinct but interrelated tasks for university teachers: "teaching and supporting learning," "educational design," "assessment and feedback," "educational leadership and management," "educational scholarship and research," and finally "professional development" as a task that describes activities university teachers

engage in to develop their expertise in the other five tasks. Additionally, the study defined three dimensions for development in these teacher tasks: "better task performance," "greater variety of tasks," and "larger sphere of influence." The study thereby draws attention to other types of development than "task performance," which has traditionally been emphasized in expertise research (Ericsson et al., 2018).

Criticisms of expert performance research

The expert performance perspective, and research that has followed this perspective, has made major contributions to our understanding of how expertise develops and how this can be supported. However, this perspective has also been criticized because of its narrow focus (Engeström, 2018; Gruber & Harteis, 2018; Ward et al., 2018). At least two shared arguments can be found in these criticisms. Firstly, it tends to focus on stable tasks with objective standards for good performance that are not representative for complex professional domains. Secondly, by focusing on individuals and task performance as units of analysis, expert performance research overlooks the influence of the social and cultural context on the acquisition of expertise as well as what counts as expertise. In response to these criticisms, adaptive expertise has been proposed as an alternative conceptual perspective (e.g., Bransford et al., 2005; Engeström, 2018). This concept will be further discussed later in the paper, as it includes elements of both teacher expertise and teacher knowledge.

Besides these criticisms, we want to add another critical note that concerns the role of knowledge and is specifically relevant in the context of teaching. While research that focuses on expert performance certainly focuses on knowledge, it predominantly concentrates on understanding how knowledge is organized to be able to retrieve and use it to perform tasks at expert level. The focus of the knowledge itself—that is, what knowledge is about—does not receive as much attention in most of this research.

Perspective of teacher knowledge

Studies that use the perspective of teacher knowledge do focus on what knowledge of teachers is about and are therefore complementary to studies about teacher expertise. A specialized knowledge base is characteristic for professionals and provides legitimacy for a profession (Freidson, 2001). Research that has focused on describing and specifying the knowledge base of teachers has thus been pivotal for the widespread recognition of teaching as a profession. In light of this, we discuss the work on teachers' knowledge base and the role of disciplinary knowledge within this knowledge base. We also discuss the concept of "powerful knowledge" to elaborate on the role university teachers have in deciding what disciplinary knowledge is valuable for students and thus needs to be made accessible to them. Together, both concepts—teachers' knowledge base and powerful knowledge—provide insight into *how* to teach within the discipline and *what* to teach from the discipline.

Teachers' knowledge base

Shulman's (1986, 1987) work on teacher knowledge has been foundational in describing the knowledge base of teachers (Hashweh, 2013; Neumann et al., 2019). Shulman explored the nature and categories of teacher knowledge, conceptualizing them as contextualized in a specific discipline and environment. His work can be placed within the teacher thinking

perspective originating in the late 1980s, in which research focused on teacher cognitions and decision-making (Calderhead, 1996; Clark & Peterson, 1986). This research was a reaction to earlier "process–product research"—dominant in the late 1960s to the mid-1980s—that aimed to establish which (observable) teacher behaviors contribute to student learning. Shulman (1986, 1987), as well as other researchers focusing on teacher thinking and teacher knowledge, challenged the conceptualization of teaching as "skilled behavior" in process–product research. They argued that this conceptualization reduces teaching to a set of "tips and tricks" instead of an activity firmly rooted in teachers' knowledge of the specific disciplinary content being taught, pedagogy, the curriculum, and the students (Gage & Needels, 1989).

Pedagogical content knowledge

Within the framework proposed by Shulman (1986, 1987) for the knowledge base of teachers, he distinguishes between knowledge about learners, the curriculum, educational contexts, and educational ends, as well as content knowledge (i.e., knowledge of the subject), general pedagogical knowledge (i.e., knowledge about strategies for classroom management and organization that transcend the subject), and pedagogical content knowledge (i.e., knowledge about how to teach a specific subject which is a "special amalgam of content and pedagogy"; Shulman, 1987, p. 8). Pedagogical content knowledge is specific for a certain topic (e.g., photosynthesis or the French revolution) and includes both knowledge representations as well as learning difficulties related to the topic and how to overcome these. Shulman (1987, p. 8) emphasizes the importance of pedagogical content knowledge for teachers by describing it as "uniquely the province of teachers, their own special form of professional understanding." Pedagogical content knowledge resembles what in the continental European tradition is referred to as "Fachdidactic" (German) or "vakdidactiek" (Dutch). Research findings in secondary education emphasize its importance for student learning (e.g., Mahler et al., 2017; Sadler et al., 2013). The hypothesis seems reasonable that pedagogical content knowledge—that is, the knowledge about how to "teach specific topics" (Shulman, 1987, p. 20)—is pivotal for student learning in higher education as well. This implies that while general pedagogical knowledge is valuable for university teachers, an exclusive or heavy focus on this type of knowledge alone is not desirable.

Shulman (1986) also includes curriculum knowledge as part of a teacher's knowledge base and defines this as knowledge about topics and materials as well as knowledge about what is addressed in the curriculum, when to address it, and how it relates to what others are teaching in the curriculum. In this paper, we call for more attention to the curriculum by highlighting an aspect to which Shulman (1986, 1987) arguably pays less attention: the active role of teachers, and in particular university teachers, in deciding on the content of the curriculum. We do so by discussing literature about "powerful knowledge." This literature signals that what is taught and why it is taught are important for both students and teachers.

Powerful knowledge

Powerful knowledge focuses on what counts as valuable knowledge for students. It is a term that derives from the sociology of education, in particular social realism (Young & Muller, 2013). Social realism assumes both the sociality of knowledge and the existence of "a reality that is independent of us" (Young & Muller, 2013, p. 230). It is based on the core

ideas of knowledge differentiation and specialization, such that conceptual and theoretical knowledge of a subject or discipline is to be distinguished from non-theoretical knowledge and everyday experience (Young & Muller, 2013). This conceptual and theoretical knowledge is described as "powerful knowledge," because it gives epistemic access to people by enabling them to explain the world they live in and to understand it in new ways: "Powerful knowledge is powerful because of the access it provides to the natural and social world and to society's conversation about what it should be like" (Wheelahan, 2010, p. 9). As this is considered a key purpose for (higher) education, social realist scholars argue there is a need to equip students with powerful knowledge.

Curricula are important for equipping students with powerful knowledge, because they define what should be learned by students during their education. Accordingly, instead of following "the strategy of stipulating the curriculum in terms of what learners are able to do rather than what they should know," social realists are of the view that we need to ask: "what is it learners must know when they can do something expertly?" (Young & Muller, 2016, p. 9). The argument here is that students are done a disservice if the focus of the curriculum is on skills alone at the exclusion of theoretical knowledge, as then they are deprived of the epistemic access that is important for understanding and contributing to the world they live in. This has often been the case in vocational education and training (VET) (Wheelahan, 2010; Young & Muller, 2016), which is why there is significant work on powerful knowledge in this context. Nonetheless, in the context of higher education, there is also a growing body of literature about powerful knowledge and the curriculum (Ashwin, 2020b; McLean et al., 2017).

As university teachers have a significant role in not only teaching in a subject area but also designing the educational program for teaching it (van Dijk et al., 2020), they are crucial for equipping students with powerful knowledge. In the literature about powerful knowledge, teachers are positioned as "crucial mediators of the transformative capacity of PK [Powerful Knowledge] in their subjects" (Muller & Young, 2019, p. 210). Ashwin (2014, 2020a) sheds further light on this mediating process in higher education. He does so by using Bernstein's (2000) "pedagogical device," which pertains to the process of how knowledge is produced through research, transformed into curriculum, and then again transformed as students develop their own understanding. Ashwin (2014, 2020a) argues that transformation of knowledge into the curriculum is not only steered by the logic of knowledge itself, but is the result of negotiations between those shaping the curriculum, who seek to impose their ideas about what should be included in the curriculum and in what way. In other words, disciplinary knowledge is transformed into a curriculum through active decisions by an educational community, including both individual teachers and teacher teams.

Following this line of reasoning, knowledge that is taught to students should not be considered "a given" for teachers; instead, it is actively chosen, presented, and sequenced by teachers, which has profound consequences for students. This is an additional perspective to the literature that describes the teachers' knowledge base, because it highlights the importance of *what* the valuable disciplinary knowledge is that should be included in the curriculum and *why*, as distinct from a focus on *how* it is taught or students (co-)construct knowledge. A key point here is that while disciplinary knowledge is widely considered a foundational aspect of teaching, the process through which disciplinary knowledge is transformed into the curriculum often passes relatively unremarked and is overlooked as relevant for the professional development of university teachers (McLean & Ashwin, 2016).

Adaptive expertise and practical knowledge: helpful concepts for combining teacher expertise and teacher knowledge perspectives

While teaching routines and pedagogical knowledge are important for university teachers, as highlighted above, we argue that a focus on these alone is not enough in academic development. Therefore, we propose stronger connections to disciplinary knowledge to complement the existing strengths of academic development practice and research. To aid this proposal for stronger connections, we now discuss "adaptive expertise" and "practical knowledge" as concepts that combine elements of both the teacher expertise and teacher knowledge perspectives. "Adaptive expertise" takes the expertise perspective as a starting point through its focus on task performance, but draws attention to the importance of abstract and theoretical knowledge on top of teaching routines for being able to deal with novel situations (Bohle Carbonell et al., 2014). "Practical knowledge" takes the knowledge perspective as a starting point, but also emphasizes that this knowledge is used to guide teachers' actions in practice (Cochran-Smith & Lyle, 1999; Verloop et al., 2001).

Adaptive expertise

In 1984, Hatano and Inagaki coined the term "adaptive expertise" and distinguished it from "routine expertise." (Hatano & Inagaki, 1984). While no widely accepted definition was developed in the research that followed, almost all studies emphasize that routine experts are able to perform familiar tasks with high effectiveness and efficiency, while adaptive experts are also able to perform at a relatively high level in unfamiliar situations (Bohle Carbonell & van Merriënboer, 2019; Bransford et al., 2005; Ward et al., 2018). Interest in adaptive expertise can be considered a response to criticisms of expert performance research. As noted before, this research mainly focuses on stable tasks with objective criteria for performance, which is not representative for volatile professional domains like teaching (Stigler & Miller, 2018). Ward et al. (2018) therefore argue that one can only be an expert in these domains if he or she is an adaptive expert.

Research into adaptive expertise has found that adaptive experts are better able to deal with changing (professional) demands and circumstances because of how their knowledge is structured. Adaptive experts have the same extent of knowledge as routine experts, but their knowledge representation is more abstract. This enables adaptive experts to modify their conceptual understanding of an unfamiliar task and in the process create new procedures to deal with this task (Bohle Carbonell et al., 2014). Adaptive expertise also relates to literature about teachers' knowledge base, because it provides insight into what the abstract knowledge of teachers could be about. This means that knowledge about what should be taught and why, and how specific topics should be taught, could be considered a type of abstract knowledge that is important for teachers' adaptive expertise.

Practical knowledge

The concept of "practical knowledge" has been developed to describe knowledge that guides teachers' actions in practice (Calderhead, 1996; Cochran-Smith & Lyle, 1999; Fenstermacher, 1994). A widely accepted conceptualization of practical knowledge was developed in research of van Driel et al. (2001) and Verloop et al. (2001). These authors define practical knowledge as tacit knowledge that is action-oriented and person- and context-bound. Practical knowledge integrates scientific (or formal) knowledge, everyday

knowledge, and experiential knowledge and is constructed through experiences in the context of work. Beliefs, for example, about students, the subject matter, and teaching, play a key role for how knowledge is interpreted and integrated.

The concept of practical knowledge provides a foundation for strengthening connections with the disciplinary knowledge of teachers in academic development, because teachers' pedagogical content knowledge is considered "a central element" of practical knowledge (van Driel et al., 2001, p. 143). There is also a connection between practical knowledge and powerful knowledge, because teachers' knowledge about what counts as valuable knowledge in a discipline, and why, can be considered a part of their knowledge base that guides their actions in teaching practice, in particular pertaining to their decisions about what to teach to students. Practical knowledge also includes elements from expertise in a conceptual perspective, because it is described as action-oriented and constructed through experiences. This is comparable to a focus on task performance and deliberate practice in research on expertise. The context-specific nature of practical knowledge is another parallel with contemporary understandings of the concept of expertise.

Constraints of adaptive expertise and practical knowledge

As adaptive expertise and practical knowledge include elements of both perspectives, they can be used as theoretical underpinnings for creating stronger connections to disciplinary knowledge that at the same time incorporate the strengths of other bodies of literature. However, these concepts also have their limitations, a major one being a limited connection with powerful knowledge. Adaptive expertise and practical knowledge can be linked to powerful knowledge by teachers' disciplinary knowledge, and their reasoning related to what disciplinary knowledge should be taught and why. However, this is only one aspect of powerful knowledge, and there seems to be limited connections to other key aspects, such as what can be considered a powerful knowledge and the ethical imperative for equipping students with powerful knowledge.

Discussion: considerations for academic development practice

Based on our conceptual analysis, we now propose three aspects of academic development that are relevant for supporting academics in connecting their professional development as teachers to their disciplinary knowledge. By identifying and discussing these aspects, we aim to illustrate how the conceptual analysis of our paper may provide guidance for theory-informed approaches to shape academic development practices. In our view, attention to these aspects will be helpful to academics in developing their teaching, thereby enhancing the quality of education and empowering students with epistemic access. In line with this, the suggested aspects for consideration are likely to be most relevant for those in a position to influence and shape academic development policies and practices. As indicated at the start, we recognize that there is diversity in the ways that academic development is practiced, and undoubtedly good academic development practices that connect to academics' disciplinary knowledge already exist in some contexts. We expect our work in this paper to be potentially valuable even in those contexts where such connections are already successfully made, in that we provide a stronger theoretical basis for good practices as well as inspiration and direction for further improvement, extension, and diversification of practices.

First, the *purpose* of academic development is a fundamental aspect to consider, because it is what steers academic development practices. Following the argument in this paper, it is important to explicitly include the aim of connecting to teachers' disciplinary knowledge as one of the purposes of academic development. The concepts "pedagogical content knowledge," "powerful knowledge," "adaptive expertise," and "practical knowledge" from the analysis in this paper may help to articulate this purpose, for example, in statements pertaining to the mission, strategy, and goals for academic development. This articulation is not only important for academic developers or for positioning academic development in the institution, but may also help increase individual teachers' awareness that their development as teachers is not separate from but connected to their disciplinary knowledge.

A second aspect for consideration is the *design* of academic development activities—both formal and informal—focused on teacher learning and development. Connections to teachers' disciplinary knowledge could be strengthened by contextualizing these activities in teachers' disciplines (Boud & Brew, 2013; Silander & Stigmar, 2021). This can be both by situating these activities in teachers' work environments and by paying explicit attention to teachers' disciplines in the content and execution of academic development activities. In literature about practical knowledge (e.g., Driel et al., 2001) and adaptive expertise (e.g., Stigler & Miller, 2018), several activities are suggested that connect to teachers' disciplinary backgrounds and at the same time also incorporate mechanisms for learning from other conceptual perspectives. Possible activities with a primary focus on connecting to disciplinary knowledge of teachers can be found in the literature on pedagogical content knowledge (e.g., Hashweh, 2013) and powerful knowledge (e.g., Lambert, 2018). The literature about powerful knowledge in particular stresses the importance of supporting teachers and teacher teams to explicitly reflect on choices related to the curriculum, pertaining to what they teach and why it is important.

Thirdly, the *organization* of academic development is an aspect worthy of consideration. This pertains to a variety of matters, including how academic development is embedded in academia (e.g., centrally or in faculties), the background and roles of academic developers (e.g., from educational sciences or related disciplines or from a broad variety of disciplines), the location where academic development is organized (e.g., away from everyday teaching activities, at the same location as these teaching activities, or intertwined with them), and how university teachers are engaged in academic development (e.g., groups with similar or different disciplinary backgrounds). Organizing these aspects of academic development close to actual teaching locations and processes offers the most immediate and obvious possibilities for creating connections to university teachers' disciplinary knowledge. We do not propose specific ways of organizing academic development, since each way of organizing may offer different opportunities and challenges, but we do suggest that effects on connections to university teachers' disciplinary knowledge should be considered in decisions about the organization of academic development.

Conclusion

Disciplinary knowledge is of great importance for academics, and connecting academics' disciplinary knowledge to the development of their teaching remains a longstanding challenge for universities. To advance theoretical insights about how disciplinary knowledge connects to academic development, we have in this paper provided a conceptual analysis of two theoretical perspectives underlying teacher professional development—teacher

expertise and teacher knowledge—as well as how these perspectives relate. Teacher expertise perspectives give insight into how university teachers' knowledge is structured to perform teacher tasks, while teacher knowledge perspectives offer understanding of the focus of the knowledge itself. Within the teacher knowledge perspective, we have identified pedagogical content knowledge and powerful knowledge as concepts that help to illuminate the relationship between the teachers' disciplines and the development of their teaching. Powerful knowledge thereby draws attention to an often-overlooked part of teacher development in higher education: university teachers' decisions about *what* disciplinary knowledge is taught to students and *why*. We have argued that expertise and knowledge perspectives are complementary, also when aiming to connect teachers' disciplinary knowledge to academic development. Adaptive expertise and practical knowledge were proposed as concepts that include elements of both expertise and knowledge perspectives, although neither of these concepts is strongly linked to powerful knowledge.

With our conceptual analysis, we intend to help develop a framework which can be useful for analyzing the strengths and weaknesses of current academic development approaches and for creating a foundation to realize stronger connections to disciplinary knowledge in academic development practice. Our analysis of concepts that connect to both the theoretical perspectives of teacher expertise and teacher knowledge might be specifically relevant for shaping academic development practices that connect to academics' disciplinary knowledge as well as incorporate strengths of current approaches that have been criticized as being too generic (Boud & Brew, 2013; Clegg, 2009; Harland & Staniforth, 2003; Shay, 2012). We realize that there are other relevant perspectives on academic development besides teacher expertise and teacher knowledge that we have not addressed. For example, our discussion of the two theoretical perspectives mostly focuses on individual teachers, though without thoroughly considering the social and institutional contexts of teachers. Accordingly, we consider our theoretical analysis as a relevant contribution to the literature, but also hope that it sparks further theoretical and practical development by those who work in the field of academic development. To inspire this development, we have discussed the implications of our conceptual analysis by identifying three aspects where attention to connection with academics' disciplinary knowledge is important: the aims, activities, and organization of academic development. We consider attention to these areas as complementary to attention to development of pedagogical knowledge and general didactic skills and routines, which are and will remain important.

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Declarations

Conflict of interest The authors declare no competing interests.

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