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Developing Teachers' Competences with the Focus on Adaptive Expertise in Teaching[1]

Jan van Tartwijk, Rosanne Zwart and Theo Wubbels

In this chapter, we summarize a rich tradition of research on the development of teachers during their career. Kagan (1992) identified two models of teacher development that were based on the results of empirical research carried out previously. The first model was based on Fuller's groundbreaking work on stages in teacher development (Fuller, 1969; Fuller & Bown, 1975), the other on Berliner's research on differences between novice and expert teachers (Berliner, 1994, 2001; Carter, Sabers, Cushing, Pinnegar, & Berliner, 1987; Sabers, Cushing, & Berliner, 1991). In line with the distinction that Kagan made between these two lines of research, we will first summarize research on stage models of teacher development. Next, we will introduce research on the development of competence that has been carried out both within and outside the context of teaching. Competencies are conceptualized in this section as the mental conditions that are necessary for achievement (Weinert, 2001), with expertise being described as a very high level of a competency (Mayer, 2003). We will conclude this chapter with a section on adaptive expertise and relate the development of adaptive expertise in teachers to models for teacher learning and professional development.

Stage models of teacher development

Several scholars have proposed stage models for the professional development of teachers (e.g. Burke, Christensen, Fessler, McDonnell, & Price, 1987; Huberman, 1993; Maskit, 2011) that all owe to Fuller's work. In her publications in the 1960s and 1970s, Fuller defined four stages in teachers' concerns in the process of becoming a teacher (Fuller, 1969; Fuller & Bown, 1975). Until they actually start teaching, prospective teachers are mainly concerned about their own progress as a student, according to Fuller. They are not yet thinking from the perspective of a teacher, but from a student's point of view. As a consequence, they might be very critical of teachers they observe. Once they have actually started teaching, their concerns primarily refer to their own survival and they focus on, for instance, content mastery, class control, and being liked by students. Questions they ask themselves are for example 'Will I be able to create an orderly classroom atmosphere?' and 'Will the students listen to me?' Next, a mastery stage can be distinguished, in which beginning teachers' concerns focus on being

able to perform well. In this stage, the concerns are less emotionally colored than in the survival phase and there is room for thinking about the best pedagogical approach. In the final stage of Fuller's model, teachers may settle into stable routines or become resistant to change. Fuller and Bown (1975) describe teachers in this stage as being responsive to feedback and being concerned about their impact on pupils. For the first time, they consider the best ways to encourage student learning. In the Netherlands, Griffioen (1980) added a fifth stage, in which concerns about the effectiveness of the school policies and environment surface. In this stage, only encountered by in-service teachers, teachers may question to what degree the school is well-organized and in what way it could contribute best to student learning.

Building on Fuller's early work, several other stage models of teacher development have been described. Some of these models cover a longer period of the teaching career, even into retirement. In the Teacher Career Cycle Model for instance, Fessler and Christensen distinguish eight stages in teachers' development (Burke et al., 1987; Fessler & Christensen, 1992). The first stage is the *Pre-service* period of preparation for teaching through studying in a college or university. Student teachers then move to the second stage, *Induction*, the first few years of employment as teacher, when they are socialized into the education system. Following Fuller's concerns model, student and beginning teachers in this stage are assumed to strive for acceptance from their students, peers, and supervisors, and they attempt to achieve a certain level of comfort and security in dealing with everyday issues. The third stage, analogous to Fuller's third and fourth one, includes *Competency Building*, when teachers perceive their work positively and find it challenging, want to teach well and try to improve their teaching competence. They are usually open to innovative ideas and want to use new teaching materials and pedagogical approaches. In the fourth stage of *Enthusiasm and Growth*, teachers reach the top competence level. They usually very much appreciate working as a teacher, are fully committed to the job, and actively seek professional development opportunities. Moving to the next stage of *Stability*, teachers do what is expected of them, and sometimes little more. Professional development often is no longer felt to be useful and from this stage the following, *Stagnation and Career Frustration*, may develop when job satisfaction becomes lower. When teachers are preparing to leave the profession, they are in the stage of *Career Wind-Down*. Subsequently, they actually leave the profession: *Career Exit*. Huberman (1993), based on a Swiss study, mentions similar phases, such as: career entry, stabilization, diversification and change, stocktaking and interrogations at mid-career, serenity and affective distance, conservatism, and disengagement.

More recently, based on a longitudinal study in the United Kingdom, Sammons and her colleagues (Sammons, Day, Kington, Gu, Stobart, & Smees, 2007; see also Day & Gu, 2010) proposed stages that are characterized in terms of the number of years that teachers have been teaching. In all stages, subgroups with quite dissimilar features are reported. In the first four years, the phase of *Commitment*, two subtypes were present: one group of teachers with growing sense of efficacy and another group for whom the sense of efficacy was dwindling. During years 4–7 (*Identity and Efficacy in the Classroom*), a group was found with a sustained sense of identity, self-efficacy and effectiveness, and another for whom identity, efficacy and effectiveness were at risk. Later in the career, the stages gradually come to span a longer time period. From 8–15 years (*Managing Changes in Role and Identity*), the identified groups of teacher were either experiencing sustained engagement or feeling detachment and loss of motivation. For teachers with between 16 and 23 years of experience (*Challenges to Motivation and Commitment*), work-life tensions arose, and again groups with rather opposite features were found. In one group, further career advancement and good pupil results had led to increased teacher motivation and commitment, whereas in others workload and the difficulty of managing competing tensions or career stagnation had led to decreased motivation, commitment, and effectiveness. Between 24 and 30

years (*Challenges to Sustaining Motivation*), some teachers showed a sustained strong sense of motivation and commitment, whereas others were holding on but were losing their motivation. Finally, after over 30 years (*Sustaining/Declining Motivation, Ability to Cope with Change, Looking to Retire*), again some teachers sustained their motivation, while others felt tired and trapped.

Based on the work of Huberman (1993), Hargreaves (2005) differentiated the last phases of the teacher career further. He distinguished four types of teachers, according to dominant career trajectories in the later years of the teaching career (see also Veldman, van Tartwijk, Brekelmans, & Wubbels, 2013). The first types of teachers are those who are able to keep finding challenges beyond and within their classrooms. The second type, the positive focusers, concentrate their efforts in the small world of their own classrooms, where they can pass their wisdom to young people in the autumn of their career. In contrast, the negative focusers, the third type, have always managed to protect their self-interest rather than the interests of the students. In their later career, they try to find ways to get the easiest timetables and classes. Finally, the disenchanted have typically committed themselves to educational reforms earlier in their career, which have been discharged of later. As a consequence, they have lost their ideals and motivation and often feel nostalgic.

It is important to emphasize that none of these models claim that all teachers go through the same stages and even the order in which teachers go through stages may vary. For instance, it is striking that in the phases distinguished by Sammons et al. (2007), which are ordered by years of experience in the teaching career, teachers were found in every phase who had quite opposite experiences. Furthermore, it seems that these phases may overlap in time. This may imply that teacher professional development is a highly idiosyncratic process. Maskit (2011) mentions three common denominators in stage models that could potentially influence facets of the individual development process. The first is an informational factor, including teacher age and experience. The second, the professional factor, contains work and teaching proficiencies, such as: the commitment and responsibility that teachers are willing to shoulder during various professional stages; their self-perception, perception of teaching as a profession, and attitudes toward their students; and the give-and-take relationship between students and teachers. The last factor, the psychological one, includes teachers' emotional state, their concerns and preoccupations during different stages, and the relation between items of individual developmental data, such as chronological age, and various stages of professional development. According to Maskit (2011), some models describing professional stages in a teaching career focus on a linear progression in professional development, with constant improvement in a teacher's abilities and professional proficiencies. Other models describe 'ups and downs in professional development, repetitions of certain processes, progressions and withdrawals. Both types of models underscore individual variants such as one's character, work environment, chronological age and work experience' (Maskit, 2011, p. 852). Similarly, Huberman concluded that 'professional career journeys are not adequately linear, predictable or identical – are often, in fact, unexplainable…' (Huberman, 1993, p. 264).

Dall'Alba and Sandberg criticized stage models of professional development for lacking 'clarity about *what* is being developed. (…) A focus on stages veils more fundamental aspects of development; it directs attention away from the skill that is being developed' (2006, p. 388). In other words, the literature on stages in professional development only explains in a limited way what it is that experienced teachers have developed that distinguishes them in actual classrooms from their less experienced colleagues. This is the focus of the literature to which we turn in the next section.

What Teachers Develop

When studying teacher development from the perspective of what it is that teachers develop, researchers focused on, for instance, the differences in how expert and novice teachers perceive classroom situations (Sabers, Cushing, & Berliner, 1991; Peterson & Comeaux, 1987), the knowledge underlying successful teacher behaviors in classrooms (Mulholland & Wallace, 2005; van Tartwijk, den Brok, Veldman, & Wubbels, 2009; Verloop, van Driel, & Meijer, 2001), and the development of specific teacher competencies such as delivering pedagogically sound lessons (Maulana, Helms-Lorenz, & van de Grift, 2015) and building good, productive relationships with students (Brekelmans, Wubbels, & van Tartwijk, 2005). In these studies, different concepts such as competence (Maulana et al., 2015), practical knowledge (Verloop et al., 2001), and expertise (Berliner, 2001; Mayer, 2003) are used to describe what teachers develop. Blömeke, Gustafsson, and Shavelson (2015) write that competence is a 'messy construct' because competing definitions are used, building on a misleading dichotomy of performance and traits. In some of the definitions the focus is on 'performance', that is, being successful in achieving desired outcomes. In others, characteristics or 'traits' underlying superior performance are emphasized. To overcome this dichotomy, Blömeke et al. propose to model competence as a continuum, by connecting cognitive, affective, and motivational traits to real-world performance through a set of perceptual, interpretive, and decision-making processes. Klieme, Hartig, and Rausch (2008) describe what they refer to as the functional-pragmatic concept of competence. When this conceptualization of competence is used, the focus is on a person's readiness to cope with challenges in particular situations, instead of the generative, cognitive system that is independent from situations. They refer to Weinert (2001), who refers to competencies as 'the mental conditions necessary for cognitive, social and vocational achievement' (p. 56), which resembles Verloop's definition of teacher practical knowledge as 'the whole of the knowledge and insights that underlie teachers' actions in practice' (Verloop et al., 2001, p. 446). In this functional-pragmatic conceptualization of competence, Mayer (2003) defines expertise as 'a very high level of competency' (Mayer, 2003, p. 265). Berliner (2001) also points to the importance of traits –which he refers to as 'talent' – in the study of expertise. In domains such as sport the importance of talent is obvious, but according to Berliner (2001) a focus on talent is of little practical interest when studying pedagogical expertise, because 'talent for teaching is probably an extremely complicated interaction of many human characteristics (...) well beyond our ability to catalog' (p. 465).

THE NATURE OF EXPERTISE

Much research is available on the nature of expertise and its development in domains such as chess (de Groot, 1965; Chase & Simon, 1973), software design (Sonnentag, Niessen, & Volmer, 2006), and medicine (Norman, Eva, Brooks, & Hamstra, 2006; Schmidt, Norman, & Boshuizen, 1990). This research, which formed the basis of a general theory of expertise and its development, was summarized in the Cambridge Handbook of Expertise and Expert Performance (Ericsson, Charness, Feltovich, & Hoffman, 2006). In this research, experts are distinguished from other professionals by their superior reproducible performances of representative tasks that capture the essence of a domain (Ericsson, 2006b). To be able to carry out these tasks as efficiently and effectively as possible, experts have restructured and refined their representation of knowledge and procedures (Feltovich, Prietula, & Ericsson, 2006). For this reason, expertise can be regarded as a maximal adaptation of experts to domain-specific task constraints (Ericsson & Lehmann, 1996), which helps experts overcome fundamental limitations in the human cognitive architecture (Feltovich et al., 2006). First, there is a limitation in attention and perception, which is related to the capacity of the human working memory

(Baddeley, Eysenck, & Anderson, 2009; Sweller, 2004; Miller, 1956). This limited capacity to handle information is clearly visible when novice teachers feel overwhelmed by their classrooms, in which many things seem to happen at the same time, as they have to simultaneously take care of classroom management, lesson planning, monitoring the progress and well-being of individual students, etc. Developing routines helps to prevent this perceptual and working memory overload, because, when teaching strategies and decisions are automatized in routines, no more working memory capacity has to be spent on it. A downside to this is that, after years, routines may become so internalized that experts are not aware of them anymore. This makes it harder to analyze and change them (Bransford, Derry, Berliner, Hammerness, & Beckett, 2005). A second limitation of human cognitive architecture is access to long-term memory. Research has shown that the capacity of human long-term memory for permanently storing information is unlimited in practice, but being able to retrieve this information is challenging (Baddeley et al., 2009). Experts are very good at doing this, because of the way information is stored in their long-term memory. For instance, de Groot (1965) showed that chess grand masters are much better at reproducing chess board positions, because they recognize them immediately from the tens of thousands of these configurations which they have stored in their long-term memory (and know the best move associated with them). In medicine, Rikers, Schmidt, and Boshuizen (2000) showed that expert physicians diagnose clinical cases faster and more accurately than novices and intermediates (sixth-year medical students), although intermediates remember more information from the cases and produce more elaborate explanations for the described signs and symptoms. Experts seem to 'encapsulate' knowledge into *illness scripts* as examples of previously analyzed patients (Norman et al., 2006; Schmidt & Rikers, 2007). In teaching, Berliner and his colleagues showed that expert teachers were much better than novices at recognizing the important cues in classroom situations and diagnosing what was going on (Berliner, 1994; Sabers et al., 1991).

THE DEVELOPMENT OF TEACHER EXPERTISE

Research in various domains shows that experts have spent thousands of hours carrying out the tasks that make them stand out to build such a knowledge base (see Ericsson, 2006a for an overview). The domain of teaching is no exception. In research with our colleague Mieke Brekelmans, we investigated the development of teacher expertise in the building of good working relationships with students during their career (Brekelmans, Holvast, & van Tartwijk, 1992; Brekelmans et al., 2005). It appeared that on average, in the first years of the career, student perceptions of teacher agency (which we referred to as teacher influence in our earlier research) grew considerably and stabilized after about six years. Maulana et al. (2015) studied the development of a broader array of teacher competencies during the first years of the career, which included improvements in the learning climate, classroom management, clarity of instruction, activating learning, adaptation towards the students, and teaching strategy. For all six variables, they found a steep increase during the first year and a slower increase afterwards for the average teacher.

However, research shows that experience alone is not sufficient for developing expertise (Ericsson, 2006a). Beyond the first two years, the length of experience even turns out to be a weak correlate of performance. Ericsson writes that the 'select group of individuals who eventually reach very high levels do not simply accumulate more routine experience of domain-related activities, but extend their active skill-building period for years or even decades' (Ericsson, 2006a, p. 691). They do this by deliberately improving their performance through identifying suitable training tasks that are outside their current realm of performance, but that they can master by concentrating on critical aspects and by gradually

refining performance through repetitions and feedback. Ericsson (2006a; Ericsson, Krampe, & Tesch-Römer, 1993) refers to this as *deliberate practice*.

In research on teacher development, the concept of deliberate practice is not used very often. One exception is the work of Bronkhorst, Meijer, Koster, and Vermunt (2014). These authors describe four characteristics that have been used in the literature to define deliberate practice: (1) it is designed for self-improvement, (2) it is repeated to enable successive refinement, (3) it is followed by immediate, informative feedback, and (4) it requires significant effort and concentration or motivation. They point to the similarities with self-regulated or self-directed learning, but emphasize that these concepts refer to different outcomes (i.e. 'practice' and 'learning'). Bronkhorst et al. (2014) analyzed the self-reported learning activities of 67 student-teachers who were enrolled in a one-year post-graduate teacher education program. Half of this program consisted of school internships, in which the students also taught classes themselves. Their analyses showed that deliberate practice activities turned out to mostly result in an increase in teaching performance. However, they also found that other vitally important learning processes – for instance, concerning identity development – are less likely to be realized with deliberate practice.

A concept that resembles deliberate practice and that is used more often in the literature on teacher development is *reflective teaching*. Authors such as Calderhead (1989) and Korthagen and his colleagues (Korthagen & Kessels, 1999; Korthagen, Kessels, Koster, Lagerwerf, & Wubbels, 2001) describe reflective teaching 'as an ongoing process of experiencing practical teaching situations, reflecting on them under the guidance of an expert, and developing one's own insights into teaching through the interaction of personal reflection and theoretical notions offered by the expert' (Korthagen & Kessels, 1999, p. 6). Korthagen et al. (2001) place the reflective aspect of learning to teach within the context of realistic teacher education, meaning that teacher growth covers a complex system of processes in which teachers are engaged in active and meaningful learning (cf. Borko, 2004; Clarke & Hollingsworth, 2002; Desimone, Porter, Garet, Yoon, & Birman, 2002; Guskey, 2002).

Adaptive Expertise

In the previous section, we wrote that developing expertise implies developing routines and organizing information in memory in such a way that relevant situations are recognized more quickly and better. Routines, however, are also risky, because they may become outdated when tasks change. In teaching, an example is the change in classroom teaching because of the use of computers, which would for instance make it harder for the expert teacher to recognize the relevant cues in class environments. Here, it is important to distinguish types of experts that have been mentioned in the literature: routine and adaptive experts (Bransford et al., 2005; Hatano & Inagaki, 1986; National Research Council, 2000). *Routine experts* have a number of core competencies that they develop throughout their lives with growing efficiency, whereas *adaptive experts* are much more likely to change their core competencies and expand and restructure their expertise. According to Bransford et al. (2005, p. 49) this restructuring may reduce efficiency in the short run, but makes adaptive experts more flexible. They emphasize that these processes of restructuring 'often have emotional consequences that accompany realization that cherished beliefs and practices need to be changed'. These emotional consequences can explain the resistance of many teachers towards educational change, in particular when they feel that their voice is not heard and their expertise is not valued (van Veen, Sleegers, & van de Ven, 2005). A recent review by Bohle Carbonell, Stalmeijer, Könings, Segers, and van Meriënboer (2014) identified a number of

differences between routine and adaptive experts. The first of these differences is that, although adaptive and routine experts have a similar extent of knowledge, the knowledge of adaptive experts seems to be more abstract, that is, theoretical. Adaptive experts also seem to have more cognitive flexibility and more problem-solving skills. They rely more on analogical reasoning in which they use their knowledge base.

The National Research Council of the USA discusses adaptive expertise as the new golden standard for learning (National Research Council, 2000). A framework for promoting the development of adaptive expertise in teacher education and professional development is crucial.

DEVELOPING ADAPTIVE EXPERTISE

Hammerness and her colleagues (Hammerness, Darling-Hammond, Bransford, Berliner, Cochran-Smith, McDonald, & Zeichner, 2005) distinguish two dimensions of teacher expertise: efficiency and innovation. Developing expertise on the efficiency dimension implies developing routines or, in other words, 'performing particular tasks without having to devote too many attentional resources to achieve them' (p. 360). Developing expertise on the innovation dimension 'typically involves moving beyond existing routines and often requires people to rethink key ideas, practices, and even values in order to change what they are doing'. (p. 361). Moving on the innovation dimension can be highly emotionally charged, because it requires teachers to reconsider the routines that help them perform their tasks efficiently. The route to adaptive expertise is described by Bransford et al. (2005) as balancing between development on both dimensions. Hammerness et al. (2005) write that making progress on both dimensions can be complementary, when appropriate levels of efficiency make room for innovation. It may also imply letting go of efficient routines, which implies that teaching may temporarily become less efficient. According to Hammerness and her colleagues (2005), developing adaptive expertise requires that teachers make preconceptions explicit, that teachers learn to take control of their own learning which can be stimulated by 'providing tools for analysis of events and situations that enable them to understand and handle the complexities of life in classroom' (p. 366), and that they not only develop a strong foundation of factual and theoretical knowledge, but also that this knowledge is organized in such a way that retrieval and action are facilitated.

RELATING CHANGE IN TEACHER KNOWLEDGE TO CHANGE IN TEACHER PRACTICE

Hammerness and her colleagues (2005) actually make the case not only for helping student teachers build a strong knowledge base, but also for helping them organize this knowledge in such a way that it can easily be enacted. However, a major question in the literature on teacher change is whether and how changes in knowledge, beliefs, and attitudes relate to changes in teacher practice (Bolhuis, 2006; Richardson, 1996; Wongsopawiro, Zwart, & van Driel, 2016). For a long time, it was widely assumed that, when teachers change their knowledge, beliefs, and attitudes, this will automatically lead to improved teaching practice, and subsequently better student outcomes (De Corte, 2010). In 2002 Clarke and Hollingsworth wrote:

> Teacher growth becomes a process of construction of a variety of knowledge types (content knowledge, pedagogical knowledge, and pedagogical content knowledge) by individual teachers in response to their participation in the experiences provided by the professional development program and through their participation in the classroom. (Clarke & Hollingsworth, 2002, p. 955)

They introduced the Interconnected Model of Teacher Professional Growth (IMTPG, see Figure 47.1) and argued that teacher professional growth can best be understood in terms of reciprocal relationships between four different domains which encompass teachers' professional world: (1) the *Personal Domain,* which contains teachers' knowledge, beliefs, and attitudes; (2) the *External Domain*, which contains external sources of information or stimuli; (3) the *Domain of Practice*, which involves professional experimentation; and (4) the *Domain of Consequence*, which contains salient outcomes related to classroom practice.

Using this model, Clarke and Hollingsworth show that, when learning happens in teaching practice, often change in one of the domains is 'translated' into a change in another domain through mediating processes of enactment or reflection. They call these translations pathways of change or growth networks. 'Enactment' is defined as something the teacher does as a result of what 'the teacher knows, believes, values or has experienced'. The term 'reflection' refers to 'a set of mental activities to construct or reconstruct experiences, problems, knowledge or insights'. The IMTPG is *recurrent* and has multiple entry points, meaning that it involves rather idiosyncratic, iterative processes of change as teachers learn new knowledge and refine existing skills, try things out in practice, work out what is and is not working for students, revisit conceptions and misconceptions, and try again (see also Wongsopawiro et al., 2016). In today's understanding of teacher development, this is most effectively done in collaboration with peers, pupils or others (cf. Desimone et al., 2002).
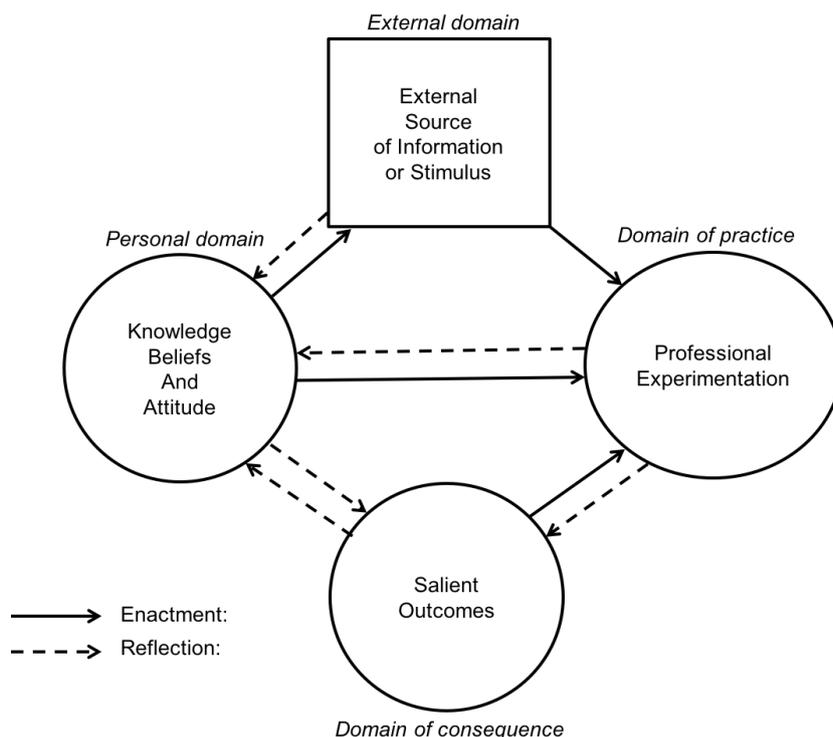

Figure 47.1: Interconnected Model of Teacher Professional Growth (IMTPG) (adapted from Clarke & Hollingsworth, 2002)

LESSON STUDY AS AN EXAMPLE

The change mechanisms proposed in the IMTPG can be illustrated using the context of lesson study as an example (cf. Dudley, 2013, 2015). Lesson study is a strategy for professional development that originated in Japan more than a century ago and provides a well-developed set of principles and procedures that provide teachers with the support needed for the development of the knowledge and

skills needed to become an effective teacher (Xu & Pedder, 2014). Lesson study is associated with high student performance (Dudley, 2015) and positive effects on teacher learning (cf. Dudley, 2013; Xu & Pedder, 2014).

In lesson study, a team of teachers collaboratively designs a research lesson (the IMTPG's domain of practice). One team member then executes the lesson while the other team members gather data on student learning processes (domain of consequence), including live observation. After collectively reflecting upon the data (domain of consequence), resulting in changed knowledge or ideas, the change in the domain of consequence is firmly tied to the teacher's existing value system and to the inferences drawn from the practices of the classroom. The lesson is then revised and taught again (i.e. deliberate practice in the domain of practice). A lesson study-cycle is concluded by reflecting on the learning outcomes and sharing the results with colleagues (i.e. de-contextualizing knowledge and using information in and from the external domain). Within one or more lesson study-cycles, professionals engage in guided and collaborative experiential learning activities, resulting in change or growth networks. These learning activities provide challenges that go beyond the teacher's current level of reliable performance, ideally in guided and collaborative learning contexts that allow immediate feedback and gradual refinement by repetition. Also, related to novice teacher development, these learning environments can be viewed as scaffolds that facilitate attainment of a higher level of performance. The scaffolds can be gradually eliminated later, so performance can be embedded and elicited in the natural environments in the domain of expertise (Ericsson, 2014). The characteristics of the learning activities described above resemble essential aspects of learning environments that could foster adaptive expertise, even of novice teachers (Anthony, Hunter, & Hunter, 2015; Bohle Carbonell et al., 2014; De Arment, Reed, & Wetzel, 2013).

Concluding remarks

Timperley, Wilson, Barrar, and Fung (2007) (see also Timperley, 2013) synthesized evidence on approaches to professional learning and development. This synthesis showed that no particular professional development experience was consistently associated with improved outcomes for students, because for every instance of an activity leading to improved outcomes, another was found in which it did not. What did make a difference was how the activities were constructed. In this synthesis, as in many others (e.g. Koellner & Jacobs, 2015), effective professional development aimed at continuous development of teacher competence is considered an ongoing process with a focus on understanding student learning.

The lesson to be learned is that deliberately working on the development of teacher competence should have a focus on adaptive expertise (cf. Hammerness et al., 2005). This development implies the development of routines *and* a knowledge base. This knowledge base is constantly calibrated in a two-way process: contextualizing general principles and models by analyzing experiences in practice; and decontextualizing practical experiences through systematic reflection resulting in new or refined insights. This process starts in teacher education when student teachers are encouraged and trained to develop routines and reflect on their own practice using factual and theoretical knowledge. Teacher education thus can be the start of a process of continuous life-long teacher development throughout the various stages of the teacher career. In this development, 'expert level' of teachers is not a static endpoint, but a dynamic state in which teachers *are* experts because they continuously adapt their routines to help their students learn in various and changing contexts in the best possible way.

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