



Situated learning theory and the pedagogy of teacher education: Towards an integrative view of teacher behavior and teacher learning

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ABSTRACT

Lave and Wenger have greatly influenced existing views of learning and teaching, but relatively little has been written about the implications for the understanding of teacher behavior and teacher learning, and for the pedagogy of teacher education. Based on their work, a three-level model of learning is used to analyze the friction between teacher behavior in practice and the wish to ground teachers' practices in theory. Supported by empirical data on teacher learning and brain research, this model reconciles the situated learning perspective with traditional cognitive theory, and leads to concrete implications for the pedagogy of teacher education.

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1. Introduction

In their thought-provoking book, *Lave and Wenger (1991)* introduced a specific view of learning, and new concepts such as legitimate peripheral participation, and situated learning. Their work has influenced many teacher educators and researchers, and as a logical consequence, it has opened up new perspectives on teaching. Hence, it is remarkable that their consequences for teaching and teacher education have hardly been fully analyzed in this journal, even though in several educational fields, for example e-learning, much progress has been made using analyses from a situated learning perspective (see e.g. *Ponti, Lindström, Dirckinck-Holmfeld, & Moeller Svendsen, 2004*).

The aim of the present article is to go straight to the heart of the question of what the Lave and Wenger perspective could mean to teacher educators' and researchers' understanding of teacher behavior and teacher learning, and to the pedagogy used in teacher education. Although this perspective was published more than 15 years ago already, today this question seems more urgent than ever. The reason is that, as *Grossman (2008)* argues, we are currently facing a crisis in teacher education, given the many research studies showing the disappointing impact of teacher education on teacher behavior and teacher learning. Already in the early 1980s, *Zeichner*

and *Tabachnik (1981)* noted that the effects of university teacher education were being "washed out" by school experiences. In the same period, the 'practice shock' phenomenon started to draw international attention, and many researchers from various countries demonstrated that teacher education graduates were facing severe problems trying to survive in the classroom, and were implementing little of what they had learnt during their professional preparation. For example, in a large-scale German study, *Müller-Fohrbrodt, Cloetta, and Dann (1978)* showed that novice teachers changed rapidly from an idealistic attitude towards a more custodial one. In a teacher education program at Linköping University, *Bergqvist (2000)* studied student teachers and their tutors, and found that, contrary to the curriculum goals, many student teachers had indeed acquired the techniques of carrying out a small scientific study, e.g. they had learnt how to find relevant literature, but they had not developed the critical scholarly attitude their program had aimed at.

Although initially many studies on the practice shock and the problems related to the induction into teaching were carried out from a somewhat local or national perspective, an extensive meta-study by *Wideen, Mayer-Smith, and Moon (1998)* led to the more general conclusion that the impact of teacher education on practice tends to be minimal. In a review of North-American research on teacher education, the AERA Panel on Research and Teacher Education (*Cochran-Smith & Zeichner, 2005*) came to the conclusion there is no convincing evidence that teacher education really makes a difference. However, there are

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also other contrasting studies showing that teacher education based on specific pedagogies does have the potential to influence the practices of teachers (e.g. Brouwer & Korthagen, 2005; Day, 1999). It means that the picture may well be less negative than some researchers suggest. Nevertheless, we can conclude that to date there are at least some serious doubts about the effectiveness of teacher education in general. This means that, although at some institutions teacher education may be successful, new and promising views of learning and teaching may still insufficiently reach the schools. Many scholars have framed this problem in terms of a divide between theory and practice (e.g. Broekkamp & Van Hout-Wolters, 2007; Burkhardt & Schoenfeld, 2003; Kennedy, 1997; Robinson, 1998).

2. Views of knowledge

Several researchers have pointed to the underlying causes of the theory–practice divide. One important reason may be that for quite some time there has been a simplistic view of what goes on in teachers and teaching, caused by the fact that researchers often looked at teachers and schools from the outside, and not from what Anderson and Herr (1999) call an *insider perspective*, as is common in anthropological research. Those researchers who really went into classrooms, and used qualitative approaches with the “purpose to obtain a description of the life world of the interviewee with respect to interpreting the meaning of the described phenomena” (Kvale, 1996, p. 5), discovered that much of what was going on inside schools looked different from what university researchers or teacher educators would expect (see e.g. Bullough, 1989; Day, 1999). When going a step further than merely interviewing teachers about their work – with its inherent problem of reconstructing the process of meaning making from the perspective of the interviewees (cf. Kvale, 1996) – and taking a more anthropological stance in their research, this promoted a more profound understanding of teaching from the perspective of what Chaikin and Lave (1996, p. 378) call “societally significant practices”. For example, contrary to what many teacher educators had hoped, much of the learning taking place in student teachers appeared to have the characteristics of *apprenticeship learning*, and looked quite similar to what Lave saw happening in novices entering a community of Liberian tailors (Lave & Kvale, 1995), namely a subtle process of enculturation, shaped by language and implicit norms. In an ethnographic study, Beach (1995) demonstrated that political, economic, cultural and ideological factors play an important role in this process. In summary, observation of the reality of teaching as embedded in a societal and historical system (Chaikin & Lave, 1996, p. 18), opened up new ways of looking at teaching, and as a consequence, at teacher education.

This line of research has revealed differences between the nature of the knowledge existing in the minds of teachers that really helps them to act effectively, and the knowledge as it is taught in teacher education (see e.g. Fenstermacher, 1994; Kessels & Korthagen, 1996; Wubbels, 1992). Seen from the Lave and Wenger perspective, one could say that – even though everybody is currently talking about situated learning – many teacher educators seem to forget that educational knowledge cannot be simply ‘transmitted’ to teachers, and thus improve their actions. Lave and Wenger would argue that the opposite is true: learning emerges from our own actions in relation to those of others. Thus, the learning outcomes are socially constructed (Lave & Wenger, 1991, p. 95). Wenger (1998) states:

“Being alive as human beings means that we are constantly engaged in the pursuit of enterprises of all kinds, from ensuring our physical survival to seeking the most lofty pleasures. As we define these enterprises and engage in their pursuit together, we interact with each other and with the world and we tune our

relations with each other and with the world accordingly. In other words we learn.” (p. 45).

If we take Wenger’s quote seriously, it tells us that the learning processes taking place in student teachers is fundamentally different from those that many teacher educators seem to assume. Student teacher learning does not simply result from teaching them valuable educational theories, and does not result from the serial learning of concepts on a scale of growing complexity (Arnseth & Säljö, 2007; Derry, 2008). From an anthropological perspective, as proposed by Lave, we should view student teacher learning as being part of the process of participation in social practice, especially the social practice in the schools. As Marton (1996) puts it, with a wink to Descartes: “I experience, therefore I exist” From the Lave and Wenger perspective, we could say: “I experience, therefore I learn.” If we contrast this view with the traditional cognitive perspective, it implies nothing less than a paradigm shift, as DeCorte, Greer, and Verschaffel (1996) see it. Cobb and Bowers (1999) describe it as a radical move away from the idea that learning “entails the transportation of an [knowledge] item from one physical location to the other”.

Isn’t this somewhat confusing, though? Many of us have frequently had the experience of learning a lot from an inspiring teacher or teacher educator, whose lectures on theory opened our eyes, who helped us understand phenomena not understood before, or at least not so deeply. We may even remember a specific book that strongly boosted our own learning and changed our worldviews. How can we reconcile such experiences with the notions of situated learning and communities of practice? As Putnam and Borko (1997, p. 1254) say: “Explaining how transfer to new contexts does occur is an unresolved issue for proponents of a situated view of cognition.”

Summing up, we seem to be faced with an intriguing and unsolved theoretical question, namely how the situated learning perspective and the perspective of traditional cognitive theory can be reconciled. The objective of this article is to offer some building blocks towards answering this question, as well as the more practical question what such an integrated perspective could mean to the pedagogy of teacher education.

3. An integrative perspective

Cobb and Bowers (1999) argue that the different metaphors underlying situated learning and cognitive theory are incompatible. However, it is important to realize that they are incompatible in so far as they serve different functions. Situated learning theory tries to explain the role of embodied social learning, while cognitive theory aims at describing the characteristics of knowledge and knowledge development per se. Similar to a position defended by Bereiter (1997); Korthagen and Lagerwerf (1996) suggested that it is possible to integrate these two perspectives. They did so using a three-level model, which contributes to a better understanding of the relationship between theory and practice (see also Hoekstra, Beijaard, Brekelmans, & Korthagen, 2007). Their perspective can be explained by using a metaphor described by Schön (1993) in relation to the well-known figure shown in Fig. 1:

“The gestalt figures are used ordinarily to show how “the same figure” may be seen in very different, incompatible ways. For example, in the well-known figure shown here some people see two profiles, others the vase. Usually, one can manage (after learning what is there to be seen) to move rapidly from one way of seeing the figure to the other. It is unusual to find someone who claims to be able to see both at once. Yet this, too, can be managed if one thinks of the figures as two profiles pressing their noses into a vase! It is this integrating image which makes it possible to bring together the two different ways of seeing the figure.” (p. 163).

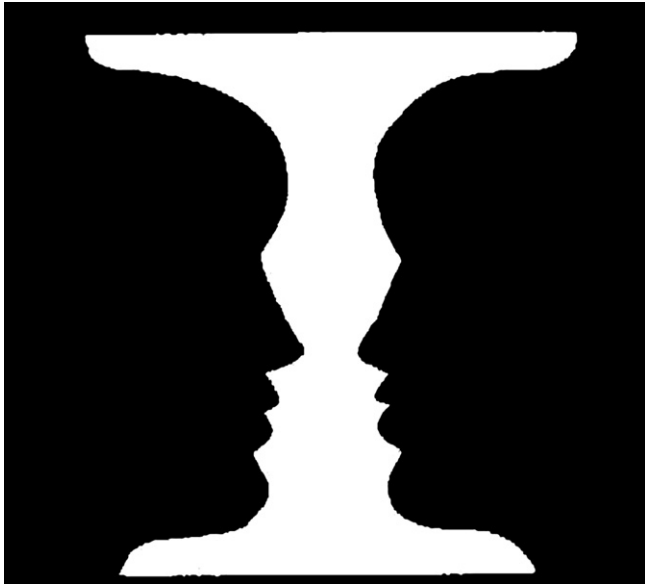


Fig. 1. Classical gestalt figure.

In the same manner, the three-level model proposed by Korthagen and Lagerwerf (1996) tries to offer an 'integrating image', by taking into account the shift in the purpose of knowledge, which can take place during a teacher's development. The model is an elaboration of a theory on levels in mathematics learning developed by Van Hiele (1986), which, in turn, is based on Piagetian notions about levels of cognitive development. Empirical data supporting the model were presented in Korthagen and Kessels (1999), and most extensively in Korthagen and Lagerwerf (2001, pp. 185–190). Below, the model will be summarized and illustrated using examples from a recent empirical study on teacher behavior and teacher learning.

4. The three-level model

The model is visualized in Fig. 2, including the possibility of level reduction, which will be discussed in the next section.

4.1. The gestalt level

First, I will focus on the left-hand side of Fig. 2, i.e. on the relationship between experiences and internal processes in the teacher. This means that – based on what is currently known from research into teaching and from brain research – I will discuss the intrapersonal and psychological counterpart of the social process of situated learning. I will make use of examples from a study by Hoekstra et al., (2007).

4.1.1. A study into informal learning

This was a research study into the so-called 'informal learning' from classroom teaching of 32 Dutch teachers. At the time, an important national educational reform was taking place, promoting a pedagogy of active and self-regulated learning in students. Since this reform was introduced by the government with hardly any financial support for professional development, it was characteristic for the situation of the teachers studied that no structured professional development took place. Hence, the learning situation of these teachers was quite 'natural', in the sense that it was not embedded in any formal learning trajectory. The aim of the research study was to find relationships between the teachers' behavior and accompanying mental processes, and the influence on their professional learning in the workplace. The 32 experienced teachers were monitored over a period of 14 months. Both at the beginning and end of the study, they all filled out a questionnaire asking for their conceptions of students' active and self-regulated learning, and their students were asked to score their classroom behavior. Between these two measurement moments, every teacher wrote six reports on their learning experiences regarding active and self-regulated learning, which they e-mailed to the researchers. Specific data relevant to our present discussion came from an in-depth component of the study, in which four of the 32 teachers were monitored more closely. From each of these four teachers, six lessons were video-taped. The researcher chose three to four episodes from each lesson which seemed to be interesting from the perspective of active and self-regulated learning, and, in semi-structured post-lesson interviews, probed the teacher's thoughts and feelings during these episodes and following. Here the researcher followed Kvale's (1996) guideline to try and understand the process of meaning making from the perspective of the teacher.

4.1.2. Albert

I will now focus on one of the teachers, by the name of Albert. During one of the observed lessons, he was teaching on the topic of potential energy. In the interview after the lesson, Albert said:

"I later noticed they did not have a clear idea of what that [potential energy] was. (...) And looking back, I am not quite satisfied with how I've done it. Some concepts were not clear enough to the students. To understand the whole story, you actually have to know more about the phenomenon 'potential energy'. I ignored that concept, because it had been talked about in the previous assignment. But in that very assignment, the question of 'what exactly is potential energy?' had not been dealt with either."

This is a good example of a phenomenon well-known in teaching: the teacher goes on, although, from the perspective of his objectives, something seems to be going wrong. A sequence of actions unfolds, probably triggered by the (conscious or unconscious) need to get the concept of potential energy across, and based on a (perhaps not even

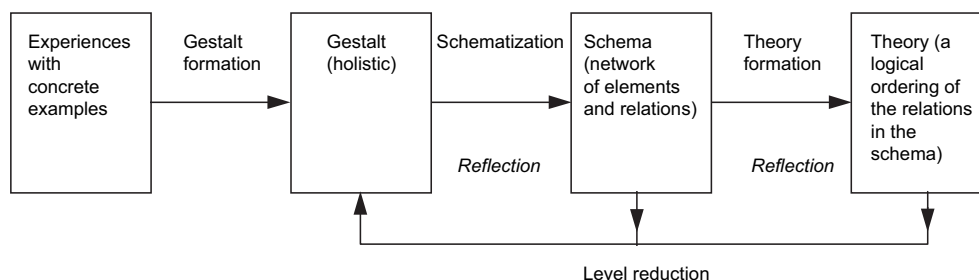


Fig. 2. The three-level model and the accompanying learning processes.

completely conscious) notion that the concept had already been dealt with. Albert chose to give an explanation to the class. Especially because potential energy is quite a difficult concept, one may well wonder whether this teaching strategy was in itself a good choice, even apart from Albert's erroneous judgment about the previous assignment. Why does he choose this strategy? As Stofflett and Stoddart (1994) suggest, teachers often more or less unconsciously project their own way of learning the subject matter onto their students. As Russell (1999) puts it: "The image of 'teaching as telling' permeates every move we make as teachers, far more deeply than we would ever care to admit to others or ourselves."

4.1.3. Degrees of consciousness

In the example, Albert becomes aware of the fact that his teaching strategy was not very effective, and he also reflects on why he did what he did. This may have been triggered by the fact that he was being interviewed about the situation. In many cases, however, teachers are not really aware of the effects of their behavior and its underlying causes, as several authors (e.g. Clark & Yinger, 1979) have found. One explanation is that so many things happen during a lesson that it is impossible for a teacher to be aware of all of them, let alone to reflect on their causes (Dolk, 1997; Eraut, 1995). Hence, much of a teacher's classroom behavior is what Dolk (1997) calls *immediate behavior*, i.e. behavior that occurs without reflection. A similar position is taken by Eraut (1995), who stresses the influence of available time on the "mode of cognition". In line with this, many publications on the role of teacher routines (e.g. Halkes & Olson, 1984) emphasize that the automatic or mechanical performance of acts is characteristic of a good deal of teacher behavior.

4.1.4. The notion of a gestalt

Based on a concurring, more general psychological perspective, Epstein (1990) argues that human behavior is mediated by the so-called experiential body-mind system, processing information in a very rapid manner. He argues that this system involves cognitive, emotional, motivational, and behavioral factors. It means that if a teacher reacts without much reflection, his or her reaction is based on unconsciously and momentarily triggered images, feelings, notions, values, needs or behavioral inclinations, etcetera, and often on combinations of these factors. Exactly because such factors often remain unconscious, they are intertwined with each other (Lazarus, 1991), and thus form a whole that Korthagen and Lagerwerf (2001) call a *gestalt*. As this concept was originally used to just describe the organization of the visual field (Köhler, 1947), this implies a broadening of the classical gestalt concept, as proposed by Lacky (1945), and Korb, Gorrell, and Van de Riet (1989). This broader conceptualization of a gestalt, considered as a dynamic and constantly changing entity, encompasses the whole of a teacher's perception of the here-and-now situation, i.e. both his or her sensory perception of the environment as well as the images, thoughts, feelings, needs, values, and behavioral tendencies elicited by the situation.

4.1.5. Cognition, emotion and motivation

This view is different from the traditional explanation of teacher behavior, dominant at the end of the 20th century (see e.g. Clark, 1986; Clark & Peterson, 1986; Peterson & Walberg, 1979), which focused rather exclusively on teachers' thoughts as the source of their behavior. Seen from the gestalt perspective, the sources of teacher behavior are much more complex, cognitive as well as affective and motivational (Hargreaves, 1998; Sutton & Wheatley, 2003), and often not conscious to the actor (Dolk, 1997; Eraut, 1995). This concurs with the observation by brain researcher Damasio (1994, pp. 83–84) that behavior is grounded in many parallel bodily systems, and that emotion is strongly linked to the primary decision-making process (see for a more detailed elaboration and

a model of the complex relations between cognition, emotion and motivation: Immordino-Yang & Damasio, 2007). The notion of a gestalt seems to be the psychological counterpart of what Immordino-Yang (2007) describes on the basis of brain research:

"Contrary to a long philosophical tradition in which rational thought ruled (...), we now know that emotions involve the largely automatic and often non-conscious induction of behavioral and cognitive packages, which percolate into and out of our conscious minds, influencing our decision making, our thinking, our memory, and learning." (p. 67)

Hence, brain research may provide us with insights for understanding the psychological processes involved in situated learning.

4.1.6. Awareness

The implicit learning taking place during the process of gestalt formation is not so much characterized by *conceptual* development, but rather by what Marton and Booth (1997) call the *development of awareness*. These authors strongly emphasize the role of perception in learning, and state that after the intended learning process "the learner has become capable of discerning aspects of the phenomenon other than those she had been capable of discerning before" (p. 142). This is exactly what Lave found in her anthropological studies (Lave & Kvale, 1995). Marton, Dahlgren, Svensson, and Saljö (1977, p. 23) refer to this kind of learning as "a change in the eyes through which we see the world." Marton and Booth (1997, p. 142) emphasize that, through the changed awareness of the phenomenon, the relationship between the person and the phenomenon has changed.

4.1.7. Another example

As noted above, the gestalt concept helps to view the cognitive, affective, motivational and behavioral aspects of human functioning as being interrelated. I can further illustrate this aspect with another example from the study by Hoekstra et al., (2007). A teacher named Nicole wishes to encourage her students' intrinsic motivation so that they can become more capable of working and learning on their own. She wants to reduce direct instruction time and increase the time students' work on tasks collaboratively. However, in several lessons, Nicole falls back into her old tendency of giving frontal instruction, which is an example of the strong influence of previously formed gestalts on behavior. This specifically happens when Nicole perceives her students to be uncertain. In an interview she reports:

"I have to present an overview of the theory quickly and convincingly, because they [the students] said they no longer saw the structural outline. (...) That was my intention. (...) [I thought] now I have to make sure they know exactly what to expect [on the test]."

Nicole explains to the interviewer that supporting the students when they felt uncertain made her feel good. This means that her own feeling is an important aspect of the underlying gestalt, as is her implicit belief that students should not feel insecure. In a particular lesson, she told the students that she would once again go over the most important subject matter items of the past few months. About this situation she reported:

"I noticed they liked the fact that I put them on the rails. I gave them a feeling of certainty about the exams next week, because they were not particularly looking forward to them."

In this example, we see 'situated learning in action', although from the vantage point of an educational expert, the further strengthening of Nicole's existing gestalt may not be viewed as very productive teacher learning in the area of promoting self-directed student learning. (For more empirical support of the gestalt concept, see Korthagen & Lagerwerf, 2001).

4.1.8. A comparison with theoretical notions from situated learning theory

In accordance with the ideas introduced by Lave and Wenger (1991), the gestalt formation process is the result of a multitude of encounters with similar situations in everyday work or life. Building on the work of Lave and Wenger, Gee (1997, p. 243) introduced the notion of *midlevel situated meaning*, which comes close to the gestalt concept. He defines situated meaning as “specific patterns of experience tied to specific sorts of contexts” and states that “these patterns represent midlevel generalizations, not too specific and not too general, not totally contextualized, not totally decontextualized.” Concurrent with the view of Lave (Lave & Kvale, 1995, p. 219), this results in “a vision of cognition as the dialectic between persons acting and the settings in which their activity is constituted”. Also in line with Lave and Wenger (1991), the gestalt concept aims at describing the individual as a ‘whole person’.

4.2. The schema level

As noted, many of the sources of a teacher’s behavior may remain unconscious to the teacher. However, he or she may become consciously aware of at least some of these sources. In the first example, Albert became aware of at least one underlying cause of his behavior, namely his (wrong) idea about the previous assignment. In the quote in the Section 4.1.2, we can see him reflect, and come to a conclusion. During this reflection process, notions or concepts become interrelated. Although it may sound trivial, he does relate the effectiveness of his teaching to the concept of students’ prior knowledge, and their prior knowledge to their previous experiences, which means that he has at his disposal some kind of cognitive schema in which such notions are connected.

Sometimes when a teacher starts reflecting, we can in the here-and-now see a previously unconscious gestalt develop into such a conscious cognitive schema. For example, Miranda, another teacher from the same study by Hoekstra et al., (2007), explains after a lesson in which her students were asked to evaluate each others’ work:

“A few times during this lesson, I had given the students an answer rather quickly. Then I thought, I should not do this, because they are busy formulating good feedback points for the student whose work they are evaluating. So I have got to help them to explicitly describe their own feedback. Thus, I should not be answering questions which they themselves have not even adequately formulated yet. So I thought, I had better join in with what the student says.”

Here Miranda shows reflection-in-action and, on the spot, she uses or perhaps develops a schema in which the concepts ‘questions’ and ‘valuable feedback’ become connected, and she develops a pedagogical principle: ‘I can stimulate students to use their questions as feedback to each other’.

In more general terms, when an actor reflects on a situation and the actions taken in it, and perhaps also on other similar situations, he or she may develop a conscious network of concepts, characteristics, principles, and so on, helpful in describing practice. Such a mental network is called a schema, and the development of such a schema is an important next level in the learning process.

Generally speaking, the schema level is grounded in concrete situations, although after many confrontations with similar situations, a more distanced kind of network of concepts and relationships can be formed. This means that the transition from the gestalt to the schema level is one of *desituating* the knowledge derived from specific situations (cf. Hatana & Inagaki, 1991; Lauriala, 1998). Carraher, Nemirovsky, and Schliemann (1995) speak about “situated generalization”, a term also used by Simons, Kushner, Jones, and James (2003).

Still, practitioners’ schemata are very much colored by the desire to know how to *act* in particular situations, instead of having an abstract *understanding* of them. This is very clear in the examples of Albert and Miranda. To give another example, a scholar’s schema of motivation may contain the Self-Determination Theory (Deci & Ryan, 2002), which helps this scholar to understand motivational processes in general and on an abstract level. In contrast to this, a practitioner’s schema of motivation may be focusing on phenomena such as students’ body language and the level of excitement that is “in the air”, because a perceptual awareness of these phenomena is helpful in knowing how to act in the here-and-now.

4.3. The theory level

If someone aims at developing a more theoretical understanding of a range of similar situations (as researchers often want and do), this may lead to the next level. This is the level at which a logical ordering is constructed in the knowledge formed before: the relationships within one’s schema are studied or several schemata are connected into one coherent “theory”. The knowledge at this level is helpful in *understanding* a certain class of situations on the basis of a logical framework.

According to Kuhn (1977), there are at least five characteristics of a ‘good’ theory: it is *accurate*, i.e. consistent with known data; it clarifies a *broad range* of data; it is both *internally consistent* and *consistent with other accepted theories*; it is *simple*, i.e. it brings order to a variety of isolated phenomena; and it is *fruitful*, i.e. it generates new results. These seem to be five criteria for establishing whether a person has fully developed the theory level.

Interestingly, in the study by Hoekstra et al., (2007) on teachers’ informal learning, no examples were found in which teachers demonstrated this level. This concurs with the findings mentioned in our introductory section, showing that teachers do not use much theory in their work. The theory level is aimed at deep and generalized understanding of a variety of similar situations, whereas practitioners are often focusing on directions for taking action in a particular situation, and as a consequence, often do not reach the theory level. This was also the conclusion of an empirical study by Korthagen and Lagerwerf (2001, pp. 185–190). They interviewed lay people, high school students, student teachers, beginning and experienced teachers, after presenting them with a 5 min video vignette showing a discussion between a small group of high school students and their biology teacher about a test many of the students had failed.

Only in an interview with an education professor, they found an interesting example of the theory level. In answer to the question “What do you know about this kind of situation?” this respondent referred to publications on teacher–student interaction, on interpersonal behavior, and on theory of discussion techniques.

Interviewer: “It is rather a lot of different subjects you mention there. Is there any logical structure behind that multitude of things? Is there a logic which ties them all together?”

Professor: “If I start with non-communication, I’d probably be able to draw circles and arrows or something to connect it to the other concepts. [He starts to draw a concept map.] Leary is one way of studying that communication; Gordon provides another way of looking at it, and I should add here that I usually tend to use this to look at classroom situations and that I apply it to discussion situations outside the classroom. And of course, they’re closely related, because of escalating processes, for one thing, symmetrical communication and complementary relationships, things like that. This makes up one theory, and then you have...” [he is elaborating the drawing].

Interviewer: “You’re referring to this as a theory?”

Professor: “You can combine this into one theory, I think that in my head this might be something in the shape of one theory, more or less.”

5. Level reduction

After some time, schematized or even theoretical knowledge can become self-evident, and the schema or theory can then be used in a less conscious way. It is as if the whole schema or theory has been reduced to one gestalt. Van Hiele (1986, p.46) calls this *level reduction*. I give an example. Before entering teacher education, a student teacher reacted automatically to a student writing down ‘ $12 + 9 = 22$ ’, by pointing out his mistake. During teacher education, she went through a process of change by experiencing in a variety of situations that knowledge transmission is actually not very effective. She became aware of the importance of creating experiences for children, and promoting their reflection as a prerequisite to their learning. In supervision and during group discussions, she developed a schema about teaching and learning of which she is consciously aware. In this schema, notions such as ‘experience’ and ‘reflection’ play a central role. Having taught for a time on the basis of this schema, she again reacts ‘automatically’ to a student writing ‘ $12 + 9 = 22$ ’, but this time her reaction is to ask him how he can check his work. In the concrete action situation, her schema now functions as a gestalt: she uses it almost unconsciously.

Thanks to level reduction, the relevant schema or theory needs less attention during one’s actions. This allows the individual to concentrate on other things. The phenomenon of level reduction concurs with Berliner’s (1986, 1987) model of professional growth, in which the expert level is the level at which the professional can act fluidly on the basis of an intuitive grasp of the situation.

6. A closer look at the model

The empirical data show that it would be a misunderstanding to believe that schemata and theories are not grounded in concrete situations or that they are purely personal and can be separated from social contexts. On the contrary, similar to the view of Lave and Wenger, a basic principle underlying the three-level model is that all knowledge, including scientific knowledge, is originally grounded in personal encounters with concrete situations and influenced by social values, the behavior of others, implicit perspectives, and generative metaphors. Perhaps the term ‘schema level’ evokes a connotation with how schemata are sometimes viewed in cognitive theory, namely as entities separated from their origins. The three-level model emphasizes that all knowledge has its roots in practical situations and is socially constructed, but that there is a difference in how knowledge can be used. If the focus is more on using knowledge for *action*, parts of the model come to the fore that are different from those triggered when knowledge aims at *understanding* a category of situations.

It is also important to clarify that the three-level model builds onto *both* an individual and a social perspective (compare Lemke, 1997, pp. 48–49). Gestalts, for example, cannot be considered in isolation from the social contexts in which they are evoked. Learning is embedded in the relationships between people, as Lave and Wenger emphasized. On the other hand, with different teachers the same situation (for example a motivation problem in a particular class group) will elicit different gestalts, as these are also grounded in the person’s individual life history.

The same combination of social and individual influences determines the schemata and theories that people develop. Firstly, this is because they are grounded in gestalts (which are both individually and socially determined). Secondly, because the

process of reflection leading to a higher level is both an individual process and socially determined, as this process always requires a particular vantage point (Hatton & Smith, 1995). The choice of this vantage point is influenced by social factors and is at the same time an individual decision.

This analysis is in line with Cobb’s (1996) discussion of the complementarity of the socio-cultural and cognitive constructivist perspectives. Cobb concludes that

“... learning is both a process of self-organization and a process of enculturation that occurs while participating in cultural practices, frequently while interacting with others.” (p. 45)

Lave and Wenger (1991) take a similar position when emphasizing that “learning is an integral part of generative social practice in the lived-in world” (p. 35), and notice the “concerned” (engaged, dilemma-driven) character of situated activity (p. 33). They state that

“There may seem to be a contradiction between efforts to “decenter” the definition of the person and efforts to arrive at a rich notion of agency in terms of “whole persons”. We think that the two tendencies are not only compatible but that they imply one another; if one adopts as we have a relational view of the person and of learning: It is by the theoretical process of decentering in relational terms that one can construct a robust notion of “whole person” which does justice to the multiple relations through which persons define themselves in practice.” (Lave & Wenger, 1991, p. 53, 54)

One could thus conclude that the three-level model builds onto the situated knowledge perspective. Such a conclusion, however, hides the other side of the coin (as if one only sees the vases in Fig. 1 and not the noses). After one has reached the schema level, the need for a more profound understanding and thus for theory may present itself. This need is often only triggered when a sufficiently rich schema has been developed, and the learner feels the need to bring order into the complexity of this schema. In fact, this is a need for the kind of reorganization that makes it more manageable through logic. Theory building can thus be seen as introducing a logical ordering into the complicated mental network at the schema level. At this stage, traditional cognitive theory may be very helpful, because it describes many features of the process of knowledge transfer, for example the contribution of visual support by means of pictures, schemes, etcetera. We can conclude that the model of levels in learning helps to reconcile the situated learning perspective with the perspective of traditional cognitive theory. The two perspectives represent two complementary ingredients of an integrated view of learning to teach.

7. Implications for teacher education practices

The above analysis has strong implications for teacher education. It points towards the need to take immediate teacher behavior more seriously and to emphasize the development of adequate gestalts. This requires a pedagogy of teacher education different from the theory-based strategies at present used in many programs. The three-level model explains why much of the theory presented to teachers in teacher education programs is seldom used in practice, even after all kinds of sophisticated pedagogical measures have been taken. The explanation is that teaching is to a large degree a gestalt-driven activity. As a consequence, the presentation of theory is not sufficient in trying to influence the more perception-driven gestalts. Hence, we need a pedagogy of teacher education that combines fruitful practical experiences – i.e. experiences that help form the type of gestalts the teacher educator wishes to develop – with the subsequent promotion of reflection in student teachers aiming at

the development of adequate schemata. The development of such a pedagogy seems an answer to the serious findings about the minimal impact of teacher education referred to in the introductory section. It requires a rethinking of teacher education practices, as the fundamental (and complex) question now becomes: what kind of experiences can be organized that will both effectively shape student teachers' gestalts, and elicit concerns in them that can serve as a good launch pad for joint reflection within a professional community, leading to the development of adequate schemata? (cf. Putnam & Borko, 1997, p. 1267, who on the basis of their analysis of teacher cognition, take a similar stance). This is a question completely different from the traditional question of what theory can best be presented during teacher education. A consequence is that the fragmentation into different subjects characteristic of many teacher education programs disappears, for teaching experiences are not as fragmented as the structuring of many teacher education programs would suggest.

The three-level model not only explains the lack of success of many teacher education programs, but also offers a theoretical foundation for the so-called *realistic approach* to teacher education described by Korthagen et al. (2001). Realistic teacher education builds on the framework discussed above. Most fundamental to this approach is the idea that what is needed for a process of schematization in the direction preferred by teacher educators is the organization of sufficient suitable and realistic experiences tailored to the needs and concerns of student teachers, and at the same time preparing the way for the intended process of schematization through opportunities for reflection on those experiences. The inherent difficulty is that this brings with it some degree of uncertainty in the teacher educator: one can never be sure what the experience brings about in the student teacher. As a consequence, the educator cannot completely plan the program in advance. On the other hand, years of experience with the realistic approach have shown that the outcomes of certain types of experiences are more or less predictable. For example, early experiences with classroom teaching at the beginning of a program tend to trigger gestalts in student teachers related to survival or classroom discipline, and this may not be the best way of starting the process of learning to teach. In other words, such a start does not represent what I called 'suitable' experiences.

When more fruitful gestalts have been developed through suitable experiences, reflection on these gestalts can be promoted, for the student teacher to arrive at the schema level. After a period of further development of the schema, time may be ready for the step towards theory to be made. However, as noted above, theory can only become useful if students themselves develop the wish for a more profound understanding. For example, if a student teacher with a focus on student motivation starts to develop a variety of notions about this issue, such a student often begins to feel an intrinsic need to see a structure in all these notions, which may call for a reorganization of the schema in the form of theory. At present, however, many teacher educators tend to introduce theory before this need for a deeper understanding arises, and then this often seems to work counterproductively.

The term 'suitable experiences' also means that the experiences are challenging enough to offer opportunities for a confrontation with gestalts the educator would like to change. If, for example, a student teacher has the rigid view of teaching as knowledge transmission, suitable experiences would be those which offer the student teacher an opportunity to discover that the transmission did not work, thus promoting a process which Schön (1993) calls *reframing*.

In this context, it is important to keep in mind that, with classroom teaching in a pre-service program, early practical experiences often serve to strengthen traditional views of teaching and learning (Feiman-Nemser & Buchman, 1986). Korthagen et al. (2001, pp. 73–75)

describe a program element called the *one-on-one experience* that avoids this problem: at the start of the teacher education program, each individual student teacher teaches one individual high school student a one-hour lesson per week. The lessons are recorded on audio cassettes, and reflected on by the student teacher, who keeps a pre-structured logbook. This arrangement appears to be very 'suitable' in the sense elaborated above: the student teachers are confronted with the effects of their implicit gestalts about learning and teaching, in a fairly simple and non-threatening situation. As one of our student teachers characterized the experience: "it brought about a shift in me, from a teacher perspective to a student perspective".

The example of the one-on-one experience shows that in such an approach to teacher education, the professional expertise required on the part of teacher educators is completely different from that of a traditional lecturer. Most of all, they need to have the ability to skip the theory for a while, to first create suitable learning experiences, and to promote reflection on these experiences. This is no simple task, given the traditional practices in many schools. On the one hand, the experience should be as real as possible, i.e., the student teacher has to be able to consider it as directly relevant professionally, while on the other, premature socialization into traditional practices should be avoided. Moreover, the experience should not be too threatening, otherwise the process leading from gestalt formation to schematization will be blocked by the wrong gestalts, namely, those triggered by survival needs.

In line with the situated learning perspective, a so-called *realistic approach* to teacher education (Korthagen et al., 2001) should also take the 'distributed' nature of knowledge into account. According to Lave (1988), knowledge is distributed over persons, and symbolic and physical environments. This points towards the need for many opportunities of *peer supported learning* in teacher education, which also prepares teachers for the kind of professional development that is much more grounded in collaboration and exchange with colleagues than is common in many schools. It implies an emphasis on the co-creation of educational and pedagogical meanings within professional communities of teachers-as-learners, as also proposed by Simons et al. (2003). When teacher educators start to see cohort groups in teacher education as such communities, and treat them as such, this in itself may have an important positive influence on their practices in schools.

The resulting approach to teacher education has been put into practice, and described in detail (Korthagen, Kessels, Koster, Lagerwerf, & Wubbels, 2001). Empirical research has shown its positive effects (Korthagen, & Kessels, 1999). The approach has much in common with the pedagogical approach proposed by Freire (1972), who advocates the development of *conscientização*, i.e. critical consciousness about reality, which supports effective action. Freire emphasizes that when people lack a critical understanding of their reality, apprehending it in fragments which they do not perceive as interacting constituent elements of the whole, they cannot truly know that reality. He argues that such critical understanding can only develop through active dialogue within a community. Hence, in line with Säljö and Bergqvist (1997), I consider learning to teach as a socio-cultural process relying on discursive resources. As Lave (1993, p. 6) states, "there is no such thing as "learning" *sui generis*, but only changing participation in the culturally designed settings of everyday life".

Nevertheless, a fundamental conclusion within the context of this article, is that the presentation of theory, either by teacher educators or through books, can have a significant place in teacher education, for it can help to support the transition from the schema level to the theory level. As such, the presentation of theory is not necessarily in conflict with the Lave and Wenger theory of situated learning. However, not every moment in the process of learning to teach is suitable for the presentation of theory. The three-level model helps to

identify those moments in which a transition to the theory level can be supported. In addition, the model points to the need of a follow-up in the form of sufficient practical experiences in which the theory is consciously used, in order to facilitate level reduction. This means that the learning involved in level reduction needs to be carefully organized and structured, something that is often undervalued. Only then is the presentation of theory not in conflict with, but an important addition to the views of Lave and Wenger, and can we hope that theory will find its place in the practices of teachers.

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References

- Anderson, G. L., & Herr, K. (1999). The new paradigm wars: is there room for rigorous practitioner knowledge in schools and universities? *Educational Researcher*, 28(5), 12–21, 40.
- Arnsæth, H. C., & Säljö, R. (2007). Making sense of epistemic categories: analysing students' use of categories of progressive inquiry in computer mediated collaborative activities. *Journal of Computer Assisted Learning*, 23(5), 425–439.
- Beach, D. (1995). *Making sense of the problems of change: An ethnographic study of a teacher education reform*. Göteborg: Acta Universitatis Gothoburgensis.
- Bereiter, C. (1997). Situated cognition and how to overcome it. In D. Kirshner, & J. A. Whitson (Eds.), *Situated cognition: Social, semiotic, and psychological perspectives* (pp. 281–300). Mahwah, NJ: Lawrence Erlbaum Associates.
- Bergqvist, K. (2000). Examensarbetet: Ett bidrag till vetenskaplighet i lärarutbildningen? [The master work sample: A contribution to the academic level of preservice teacher education?]. *Pedagogisk Forskning I Sverige*, 5(1), 1–18.
- Berliner, D. C. (1986). In pursuit of the expert pedagogue. *Educational Researcher*, 15(7), 5–13.
- Berliner, D. C. (1987). Ways of thinking about students and classrooms by more and less experienced teachers. In J. Calderhead (Ed.), *Exploring teachers' thinking* (pp. 60–83). London: Cassell.
- Broekkamp, H., & Van Hout-Wolters, B. (2007). The gap between educational research and practice: a literature review, symposium, and questionnaire. *Educational Research and Evaluation*, 13(3), 203–220.
- Brouwer, N., & Korthagen, F. (2005). Can teacher education make a difference? *American Educational Research Journal*, 42(1), 153–224.
- Bullough, R. V. (1989). *First year teacher: A case study*. New York: Teachers College Press.
- Burkhardt, H., & Schoenfeld, A. H. (2003). Improving educational research: toward a more useful, more influential, and better-funded enterprise. *Educational Researcher*, 32(9), 3–14.
- Carragher, D. W., Nemirovsky, R., & Schliemann, A. D. (1995, July). Situated generalization. In *Proceedings of the 19th annual meeting of the international group for the Psychology of mathematics education, Vol 1* (pp. 234). Recife, Brazil: Universidade Federal de Pernambuco.
- Chaikin, S., & Lave, J. (Eds.). (1996). *Understanding practice: Perspectives on activity and context*. Cambridge, UK: Cambridge University Press.
- Clark, C. M. (1986). Ten years of conceptual development in research on teacher thinking. In M. Ben-Peretz, R. Bromme, & R. Halkes (Eds.), *Advances of research on teacher thinking* (pp. 7–20). Lisse: Swets & Zeitlinger.
- Clark, C. M., & Peterson, P. L. (1986). Teacher's thought processes. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.), (pp. 255–296) New York: Macmillan.
- Clark, C. M., & Yinger, R. J. (1979). Teachers' thinking. In P. L. Peterson, & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings and implications* (pp. 231–263). Berkeley, CA: McCutchan.
- Cobb, P. (1996). Where is the mind? A coordination of sociocultural and cognitive constructivist perspectives. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice* (pp. 34–52). New York: Teachers College Press.
- Cobb, P., & Bowers, J. (1999). Cognitive and situated learning perspectives in theory and practice. *Educational Researcher*, 28(2), 4–15.
- Cochran-Smith, M., & Zeichner, K. M. (Eds.). (2005). *Studying teacher education: The report of the panel on research and teacher education*. Washington, DC: American Educational Research Association/Mahwah, NJ: Erlbaum.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason and the human brain*. New York: Grosset Putman.
- Day, C. (1999). *Developing teachers: The challenges of lifelong learning*. London/Philadelphia: Falmer Press.
- Deci, E. L., & Ryan, R. M. (Eds.). (2002). *Handbook of self-determination research*. Rochester: The University of Rochester Press.
- DeCorte, E., Greer, B., & Verschaffel, L. (1996). Mathematics learning and teaching. In D. Berliner, & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 491–549). New York: Macmillan.
- Derry, J. (2008). Technology-enhanced learning: a question of knowledge. *Journal of Philosophy of Education*, 42(3/4), 507–519.
- Dolk, M. (1997). *Onmiddellijk onderwijsgedrag. [Immediate teaching behavior]*. Utrecht: WCC.
- Epstein, S. (1990). Cognitive-experiential self-theory. In L. A. Pervin (Ed.), *Handbook of personality, theory and research* (pp. 165–192). New York: The Guilford Press.
- Eraut, M. (1995). Schön shock: a case for reframing reflection-in-action? *Teachers and Teaching: Theory and Practice*, 1(1), 9–22.
- Feiman-Nemser, S., & Buchman, M. (1986). Pitfalls of experience in teacher preparation. In J. D. Raths, & L. G. Katz (Eds.), *Advances in teacher education, Vol. 2* (pp. 61–67). Norwood, NJ: Ablex.
- Fenstermacher, G. D. (1994). The knower and the known: the nature of knowledge in research on teaching. *Review of Research in Education*, 20, 3–56.
- Freire, P. (1972). *Pedagogy of the oppressed*. New York: Herder & Herder.
- Gee, J. P. (1997). Thinking, learning and reading: the situated sociocultural mind. In D. Kirshner, & J. A. Whitson (Eds.), *Situated cognition: Social, semiotic and psychological perspectives* (pp. 235–259). Mahwah, NJ: Erlbaum.
- Grossman, P. (2008). Responding to our critics: from crisis to opportunity in research on teacher education. *Journal of Teacher Education*, 59(1), 10–23.
- Halkes, R., & Olson, J. K. (1984). Introduction. In R. Halkes, & J. K. Olson (Eds.), *Teacher thinking, a new perspective on persisting problems in education* (pp. 1–6). Lisse: Swets & Zeitlinger.
- Hargreaves, A. (1998). The emotional practice of teaching. *Teaching and Teacher Education*, 14(8), 835–854.
- Hatana, G., & Inagaki, K. (1991). Sharing cognition through collective comprehension activity. In L. Resnick, J. Levine, & S. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 331–348). Washington, DC: American Psychological Association.
- Hatton, N., & Smith, D. (1995). Reflection in teacher education: towards definition and implementation. *Teaching and Teacher Education*, 11(1), 33–49.
- Hoekstra, A., Beijaard, D., Brekelmans, M., & Korthagen, F. (2007). Experienced teachers' informal learning from classroom teaching. *Teachers and Teaching: Theory and Practice*, 13(2), 189–206.
- Immordino-Yang, M. H. (2007). A tale of two cases: lessons for education from the study of two boys living with half their brains. *Mind, Brain, and Education*, 1(2), 66–83.
- Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: the relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, 1(1), 3–10.
- Kennedy, M. M. (1997). The connection between research and practice. *Educational Researcher*, 26(7), 4–12.
- Kessels, J. P. A. M., & Korthagen, F. A. J. (1996). The relationship between theory and practice: back to the classics. *Educational Researcher*, 25(3), 17–22.
- Köhler, W. (1947). *Gestalt psychology*. New York: Liveright.
- Korb, M. P., Gorrell, J., & Van de Riet, V. (1989). *Gestalt therapy, practice and theory* (2nd ed.). New York: Pergamon Press.
- Korthagen, F. A. J., & Kessels, J. P. A. M. (1999). Linking theory and practice: changing the pedagogy of teacher education. *Educational Researcher*, 28(4), 4–17.
- Korthagen, F. A. J., Kessels, J., Koster, B., Wubbels, T., & Lagerwerf, B. (2001). *Linking practice and theory: The pedagogy of realistic teacher education*. Mahwah: Lawrence Erlbaum Associates.
- Korthagen, F. A. J., & Lagerwerf, B. (1996). Reframing the relationship between teacher thinking and teacher behaviour: levels in learning about teaching. *Teachers and Teaching: Theory and Practice*, 2(2), 161–190.
- Korthagen, F., & Lagerwerf, B. (2001). Teachers' professional learning: how does it work? In F. A. J. Korthagen, J. Kessels, B. Koster, B. Lagerwerf, & T. Wubbels (Eds.), *Linking practice and theory: The pedagogy of realistic teacher education* (pp. 175–206) Mahwah: Lawrence Erlbaum Associates.
- Kuhn, T. S. (1977). *The essential tension: Selected studies in scientific tradition and change*. Chicago: University of Chicago Press.
- Kvale, S. (1996). *InterViews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.
- Lackey, P. (1945). *Self-consistency: A theory of personality*. New York: Island Press.
- Lauriala, A. (1998). Reformative in-service education for teachers (RINSET) as a collaborative action and learning enterprise: experiences from a Finnish context. *Teaching and Teacher Education*, 14(1), 53–66.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life*. Cambridge: Cambridge University Press.
- Lave, J. (1993). The practice of learning. In S. Chaikin, & J. Lave (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 3–30). Cambridge: Cambridge University Press.
- Lave, J., & Kvale, S. (1995). What is anthropological research? An interview with Jean Lave by Steinar Kvale. *Qualitative Studies in Education*, 8(3), 219–228.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York/Oxford: Oxford University Press.
- Lemke, J. L. (1997). Cognition, context, and learning: a social semiotic perspective. In D. Kirshner, & J. A. Whitson (Eds.), *Situated cognition: Social, semiotic, and psychological perspectives* (pp. 37–55). Mahwah, NJ: Lawrence Erlbaum Associates.
- Marion, F. (1996). Cognosco ergo sum. Reflections on the reflections. In G. Dall'Alba, & B. Hasselgren (Eds.), *Reflections on phenomenography: Toward a methodology?* (pp. 163–202). Göthenborg, Sweden: University of Göthenborg.

- Marton, F., & Booth, S. (1997). *Learning and awareness*. Mahwah, N.J.: Lawrence Erlbaum.
- Marton, F., Dahlgren, L. O., Svensson, L., & Saljö, R. (1977). *Inlärnning och omvärldsuppfattning*. [Learning and conceptions of reality]. Stockholm: Almqvist & Wiksell.
- Müller-Fohrbrodt, G., Cloetta, B., & Dann, H. D. (1978). *Der Praxischock bei jungen Lehrern*. [The transition shock in beginning teachers]. Stuttgart: Klett.
- Peterson, P. L., & Walberg, H. J. (Eds.). (1979). *Research on teaching: Concepts, findings and implications*. Berkeley CA: McCutchan.
- Ponti, M., Lindström, Dirckinck-Holmfeld, L., & Moeller Svendsen, B. (2004). *Report on the conceptualisation of typical case studies*. Sweden/Denmark: Göteborg University/Aalborg University.
- Putnam, R. T., & Borko, H. (1997). Teacher learning: implication of new views of cognition. In B. J. Biddle, T. L. Good, & I. F. Goodson (Eds.), *International handbook of teachers and teaching* (pp. 1223–1296). Dordrecht/Boston/London: Kluwer Academic Publishers.
- Robinson, V. M. J. (1998). Methodology and the research-practice gap. *Educational Researcher*, 27(1), 17–26.
- Russell, T. (1999). *The challenge of change in (teacher) education*. Keynote address to The challenge of change in education conference, Sydney.
- Säljö, R., & Bergqvist, K. (1997). Seeing the light: discourse and practice in the optics lab. In R. Reznick, R. Säljö, & C. Pontecorvo (Eds.), *Discourse, tools, and reasoning: Essays on situated cognition* (pp. 385–405). Berlin: Springer Verlag.
- Schön, D. A. (1993). Generative metaphor: a perspective on problem-setting in social policy. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed.) (pp. 137–163). Cambridge: Cambridge University Press.
- Simons, H., Kushner, S., Jones, K., & James, D. (2003). From evidence-based practice to practice-based evidence: the idea of situated generalisation. *Research Papers in Education*, 18(4), 347–364.
- Stofflett, R., & Stoddart, T. (1994). The ability to understand and use conceptual change pedagogy as a function of prior content learning experience. *Journal of Research in Science Teaching*, 31(1), 31–51.
- Sutton, R., & Wheatley, K. (2003). Teachers' emotions and teaching: a review of the literature and directions for further research. *Educational Psychological Review*, 15, 327–358.
- Van Hiele, P. M. (1986). *Structure and insight: A theory of mathematics education*. Orlando: Academic Press.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.
- Wideen, M., Mayer-Smith, J., & Moon, B. (1998). A critical analysis of the research on learning to teach: making the case for an ecological perspective on inquiry. *Review of Educational Research*, 68(2), 130–178.
- Wubbels, T. (1992). Taking account of student teachers' preconceptions. *Teaching and Teacher Education*, 8(2), 137–149.
- Zeichner, K., & Tabachnik, B. R. (1981). Are the effects of university teacher education washed out by school experiences? *Journal of Teacher Education*, 32, 7–11.