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An inquiry into the effects of video upon teachers in training

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1

Introduction

This dissertation aims to provide an academic insight into the use of real-life video cases, in order to enhance and improve teacher-training courses. In improving teacher-training courses, the ultimate aim is to deliver better teachers, an invaluable asset in facilitating pupils' learning processes (http://www.lerarenopleider.nl/velon/). The fact that better trained teachers are an invaluable asset in facilitating sound learning processes, and maximizing the learning results in students, is illustrated by the following case.

Explaining the fourth grammatical case had cost more time than Peter Boonstra, a teacher recently graduated from teacher-training college, had foreseen. His pupils appeared to find the topic much more difficult than expected. Now, there is only a little time left to practice some sentences together, before the pupils work on it independently. The first practice sentence appears in the PowerPoint presentation and Peter asks who knows the answer. Bart raises his hand and is asked by Peter to provide his answer. It is correct. "Well done Bart", Peter says, as he moves on to the second sentence. "Monique, what would the answer to this one be?" Monique doesn't know the answer and Peter goes down the line until he finds another student, Mirjam, who does know the correct answer. "Excellent", he says, "so this is all clear then I take it?" The students keep quiet and Peter tells them to start doing the exercise.

Straight after class, Peter's break begins. In the staffroom, he tells an experienced colleague about his class. The colleague poses him the following questions:

- *Did Monique and the other students get it eventually?*
- *Did they feel like making an effort?*
- *How did Bart and Mirjam come to the right answers?*
- *Is it, in fact, all clear then?*

To improve the output of education, the answers Peter is going to provide to his colleague are vital. However, it is still all in retrospect, for class is already over. In order to have optimized the pupils' learning process, Peter should have analyzed the situation, considered how to deal with it and then should have acted accordingly – all within a matter of seconds. In practice though, we see that day-to-day teaching is greatly influenced by time, or lack thereof. For a new teacher, this means

that executing a class is mostly about anticipating on the spot; improvising if needs be and coming up with an adequate response to whatever situation is presented. There is no time to sit back and think about what would be the best approach; one must act. This dissertation focuses on the best approach towards general teaching techniques and skills, rather than specific subject-based knowledge.

All questions posed by the experienced colleague in the case above concern specific students. Evidently, this teacher knows a thing or two about the pupils. Through his experience, he knows what will and will not work in a certain situation. It is mainly because of his know-how that Peter has a high regard for this colleague. Not only does he know everything there is to know about the school, he also manages to get good results with his students. How he does it exactly is still a bit of an enigma to Peter, but it seems as if all social interactions within the school that involve his colleague have a positive effect on the pupils' learning processes. He seems to know a specific, adequate response to any specific situation (Keller-Schneider, 2014). Clearly, there's more to this than just "book knowledge". His adequate actions are always connected to specific, real-life situations, which is why it is called situational knowledge. This type of knowledge and skills is always specifically linked to the situations, interactions or activities in which they occurred (Brown, Collins, & Duguid, 1989). Each new experience with this situation, interaction or activity will add to the knowledge and skills the experienced teacher has already acquired.

Looking back at the case above, Peter feels a little disenchanted after his chat with his colleague. Yes, he did pose some valuable questions, but he hardly provided any answers or solutions. At the same time, Peter knows that his colleague's decision-making in his own classes is much more intuitive. In the amount of time it will take Peter to even notice a complex issue in the first place, his colleague will probably already have come up with an appropriate action. This is a solid observation, and research by Brown, Collins & Duguid (1889) illustrates that an experienced teacher tends to have 'embedded knowledge', which is somewhat explicit but largely implicit knowledge. Embedded means that the knowledge is entrenched in the context of a specific teaching situation. This is mainly the reason why this type of knowledge is not easily transferred to other classes and situations, such as in Peter's case.

In short, the art of effective day-to-day teaching is to respond quickly, intuitively and adequately to dynamic, complex situations. What is deemed adequate depends on the context, making it not only embedded but also situational knowledge, as it is fully connected to the situation in which the knowledge is acquired. This is what makes teaching such a dynamic occupation: each day in front of a class is different. Sure, this is part of what makes teaching an attractive profession, but it also makes it a challenge to learn, as a large part of learning how to become a teacher has to do with context. In addition to practical experience though internships, such a context can be provided through using real-life video cases. This thesis aims to explore the role video cases can play in acquiring the necessary embedded knowledge.

1.1 Training teachers

Throughout both economically difficult and stable climates, a relatively similar amount of people chooses to enter a 'tweedegraads' teacher-training college. In The Netherlands, 'tweedegraads' means that one will be educated to become a teacher for vmbo, mbo and the first three years of havo and vwo levels (http://stamos.nl/). Despite this relatively stable influx, a striking amount of teachers-in-training drop out either during college, or decide to not further pursue a teaching career shortly after finishing it. The dropout rate is around 40% (SBO, 2010). In the first five years in the profession, another 25% decides to call it quits (Van der Grift, Helms-Lorenz & Maulana, 2014). Research done by ITS, at the request of AOb (Sikkes & Voorwinden, 2014), shows that many teachers who drop out simply find it all too demanding. Many conclude they are not fit for the job after all, or that they are lacking necessary skills. This makes sense, as there simply is a lack of finesse and expertise with regard to beginning teachers that their experienced colleagues do possess. So of course, there is plenty of room for improvement for new teachers. What we see here is a twofold issue.

On the one hand the question is: how can teacher-training courses better prepare their teachers-to-be for a reality in which many standard solutions ('book knowledge') do not suffice? Secondly, how can the working environment be more supportive when a freshly-graduated teacher is employed? This dissertation will look at the first part of the problem: improving teacher-training college to better suit the needs of new teachers. During college, a teacher-in-training will need to acquire theoretical knowledge, but he[1] should also learn how to apply this knowledge in the workplace. To make this connection between theory and practice, teachers-in-training have to do multiple internships. This dissertation investigates how certain courses can provide an additional connection, and aid in further bridging the gap between theory and practice, by featuring real-life video cases in class.

By certain courses we mean those subjects that are taught to prepare teachers-in-training for their practical experience. There are five possibilities to enrich these courses with context: visiting an actual class, preparing mini lessons to teach fellow students, peer-to-peer coaching, written case studies and video cases. When considering aspects such as authenticity and availability, all five methods have pros and cons. The topic of this dissertation, video cases, scores relatively well on both accounts, even though the production costs are not taken into consideration here. Once produced, however, a video case enables one to holistically create a picture of teaching in practice. This helps a teacher-in-training to reflect on a real-life case, which can then be directly discussed with peers during that course. This type of reflection consistently allows the teacher-in-training to consider the 'what' and 'why' of a specific situation. Just as the ever-returning question for Peter from the case study above is: "What am I doing and why am I doing it?"

[1] *Where 'he' or 'him' is read, both he, she or him, her can be interpreted. This for the sole purpose of making reading easier.*

In asking 'why', what matters are the teacher's educational intentions. In the case above, Peter asked his pupils questions to create insights into the knowledge they are to acquire. Peter chose to do so based on earlier experiences in teaching: he connected those situations, his theoretical knowledge and certain principles he has formed over time and concluded that explanation alone is not enough, a teacher should also ask students to answer questions. Such a principle is called an educational purpose (Copeland and D'Emidio-Caston, 1998). As a lesson progresses, the teacher continually states new process goals to make the lesson flow in a way that he deems best. Whatever it is that he deems best, is in turn determined by the way the lesson flows. The educational purposes determine the teacher's actions. Depending on the goal, he makes decisions regarding the actions that might contribute to achieving it.

Consequently, the answer to the "what" question is found in the way Peter turns his educational intentions into action. In the case above, he asks an individual student a specific question. He could have instead posed his question to the entire class, wait a few seconds to give them time to think, and then point out a random student to answer. For what he wants, gaining insight into the knowledge among his students, is a sound didactical technique, but apparently one he has not fully mastered yet. It is therefore a recurring problem for him. A set of actions to deal with such recurring issues is also called a design pattern; an arrangement of solutions for a recurring problem that a teacher can apply in practice (Alexander et al., 1977; Goodyear et al., 2004).

To optimize teaching and to limit drop-out rates during and right after teacher-training, colleges should facilitate their students in building situational knowledge by means of educational purposes and design patterns, which will ultimately lead to a higher level of competence among teachers. This will be challenging, for the college will not only have to transfer 'book knowledge', it is also vital that students get the opportunity to analyze, evaluate and create situational knowledge in practice. Not so much to be able to act quickly, but to be able to connect practical situations, theoretical knowledge and principles that are being formed along the way.

Three activities: analysis, evaluation and creation, are described by Bloom (2002) as 'higher learning objectives'. Their importance lies in the fact that the ability to reflect on practical experiences (gained during internships) will form the basis of being able to competently act in a complex, dynamic, real-life teaching situation. Even though competence growth still takes time long after graduation (Van der Grift, 2010), the importance of the learning process during college cannot be underestimated. Simply because a new teacher will have full responsibility over a classroom from day one, it is of vital importance that he is competent enough to experience it being a success right from the start. In order to be able to react quickly and adequately, teachers-in-training need to possess knowledge that is situational and embedded. This dissertation will explore the role that video cases could play in the process of acquiring these competences during teacher training.

1.2 Dissertation overview

Chapter two lays out the theoretical framework. To contribute to the scientific knowledge on the use of video cases during teacher training, understanding exactly how one develops into a competent teacher is essential. It raises the question of what the essence is of competent teaching and how this perspective has changed throughout the years. It then analyses how teacher-training schools can contribute to the development of teachers-in-training. In order to visualize the college's set-up, a didactical triangle is used, including the teacher-in-training, the teacher trainer and the task. In shaping the task, the importance of reflection is discussed, as well as how reflection can be guided by higher learning objectives and which theory can help in examining this process. In the reflection process, it is determined how watching video cases can teach about the 'what' (design patterns) and the 'why' (educational intentions). These variables are then mixed together to create an image of the role of video cases in acquiring situational knowledge.

Chapter three entails the principal research and provides insight into the scope of the use of video cases at international teacher educations; more specifically to what extend are video cases helpful in achieving higher learning objectives and acquiring situational knowledge? In order to answer this question, nineteen articles have been selected based on the following criteria: they concerns teacher-training colleges that use video cases in class, there is a description of intended or achieved learning objectives, the case is not about the student studying it himself and the article is published somewhere between the 1st of January 2000 and the 30th of April 2014. The articles were drawn from the ERIC database, Springerlink and Sage. Consequently, the objectives found in the articles have been categorized by two individual researchers according to Kratwhol's reviewed taxonomy of Bloom (2002). This taxonomy consists of six levels: knowing, remembering, using, analyzing, evaluating and creating (Athanassiou, McNett & Harvey, 2003). Where as the first three mainly deal with lower learning objectives such as factual knowledge, on the other hand analyzing, evaluating and creating can be classified as higher learning objectives (Kratwhol, 2002). Higher learning objectives are the catalyst in a training program that kick-starts a process of reflection, helping students to acquire embedded and situational knowledge.

Chapter four delves deeper into the extend to which these higher educational objectives are focused on in Dutch teacher-training courses, apart from internships. Video cases are potentially the most effective way of introducing practical situations in such courses. To find out whether acquiring situational knowledge is an integrated learning objective, eleven accredited (NVAO) teacher-training colleges were asked to send in a case-based test. Then, to establish whether these colleges have their students work actively on acquiring situational knowledge, the case-based tests were analyzed by two separate researchers, using a specifically

designed instrument. The goal was to assess whether the tests contain higher learning objectives, deal with authentic cases, take into account both validity and reliability, whether they name the most important factors (the key to the solution) and whether general, overarching questions were asked, which focused on the essential aspects of being a teacher. From the fact that ten out of the eleven colleges were able to present such a case-based test, it was deduced that they strive to build up situational knowledge.

Chapter five tries to answer the question whether the development of situational knowledge, by a second-year teacher-in-training, is helped using video cases during a classroom management course. Situational knowledge is operationalized here through educational purposes, as well as the design patterns 'teaching' and 'dealing with disorder'. Participants were put into one of two groups. One group of second-year students watched video cases during a course (experimental group) whereas a control group, also consisting of second-year students, did not. By conducting a 'before' and an 'after' test, the educational intentions that the teachers-in-training managed to discern were measured, as well as the mentioning of - and being able to apply to a video case - 'teaching' and 'dealing with disorder' design patterns.

Chapter six is explorative and focuses on visualization the development of a teacher-in-training into a beginning expert. Is the level of situational knowledge of a fourth-year student like that of a beginning expert? Since forming educational intentions and design patters transpires through reflection, a theory on reflection has been used to answer this question. Argyris (2002) introduced the term loop learning, with which reflection can be divided into three levels of complexity: single-loop, double-loop and triple-loop learning. Fourth-year teachers-in-training were divided into duos and asked to write an advice to the teacher in the chosen video case. This was followed by an interview and an individual follow-up conversation. Statements made by the teachers-in-training were then categorized into single-loop, double-loop or triple-loop learning. Finally, the scope of educational intentions and design patterns was determined. Going through all three of Argyris' loops and the said scope is a clue as to the amount of situational knowledge a fourth-year student has acquired during teacher-training college.

Chapter seven is a summary of the empirical data collected throughout the previous chapters, as well as a discussion on its conclusions. Furthermore, the implications of these conclusions are discussed, with regards to existing literature and, moreover, in a practical sense. Recommendations are made towards teacher-trainers regarding the use of real video cases in their educational courses. Ultimately, a sound teacher-training college will lead to better teachers. And Peter, his pupils, colleagues, school and education in general will reap the benefits. Finally, based on the insights and limitations discovered through both the literature review as well as the three empirical studies, the implications for further research will be discussed.

2

Can teacher courses contribute to the training of competent teachers?

2.1 The essence of competent teaching and the dynamic, didactical triangle

To contribute to the scientific knowledge of the training of teachers and thereby in the long run to improve teacher education, it is necessary to understand that the teaching profession is complex. This chapter will discuss the essence of teaching and will provide an outline of a theoretical framework for the development of beginner to expert. To function well as a teacher is complex, because a teacher acts in a dynamic and complex organization (Council of Education, 2013). The dynamic and complex character of the teacher profession is compared by Van der Wolf and Van Beukering (2013) with the work of a frontline worker, because teachers are confronted daily with dilemmas and decisions they quickly need to take, based on events that are often vague. An experienced teacher generally proves to be able to react immediately and adequately during these events. He[1] does this in the classroom situation intuitively and targeted. This intuition is based on his experience, which he uses to understand what is going on in the classroom. The experienced teacher is an expert that always acts with intent. This reasoning is based on his judgment and assessment of the situation in the classroom. Practical experience plays a key role in this case, because due to his experience, an expert can assess and evaluate the situation faster. This type of knowledge is therefore always linked to a real-world situation or context (Brown, Collins & Duguid, 1989).

In that real-world situation, the teacher always teaches in a particular course, or cluster of courses. Several authors (Berliner, 2004; Van Veen & Janssen, 2016), have pointed out that a teacher not only maintains knowledge of this particular course, but also didactic knowledge about teaching. The combination of teaching skills, knowledge of the course itself and didactic knowledge related to the course is often referred to as Pedagogical Content Knowledge (PCK) (Shulman, 1987; Geveke, 2016). When it comes to this thesis, as is mentioned in chapter 1, the focus is restricted to general teaching skills. A beginner teacher

[1] Where 'he' or 'him' is read, both he, she or him, her can be interpreted. This for the sole purpose of readability.

should acquire these general teaching skills, the first element of PCK, to function well as a teacher. An expert can, by means of his practical experience, link his knowledge more quickly to the relevant aspects of the situation (Putnam & Borko, 1999; Borko, 2004). The perception of the situation is influenced by the teacher's experience (Wolff, van den Bogert, Jarodzka and Boshuizen, 2015), and this has consequences for the way teachers are trained.

Training teachers to become more experienced in the general teaching skills, is a complex process in which previous experiences play a role. This process generally occurs during the teacher education. Zooming in on the functionality of the teacher course can be done by describing the learning environment constructed in the course as a dynamic, didactic triangle formed by the teacher trainer, the teacher in training and the task. This triangle, as shown in Figure 1, is based on the classic didactical triangle (Geelhoed & Vieijra, 2014) but also on a similar triangle based on the classic one, that describes talent development as a process (Steenbeek & Uittenbogaard, 2009). It determines the style of the teacher course. Using the model represented by the triangle, section 2.4 explains the core concepts in this thesis. The sides of the triangle concisely represent the entire learning environment. Of course, translating any section of this model into an education is a complex matter, as multiple underlying variables play a role, and continuous interaction occurs within it. A study by Assies, Steenbeek & Van Geert suggests that attention to the relationship between the teacher trainer and the teacher in training is essential because mutually reinforcing relationships have a positive influence on motivation (2017).

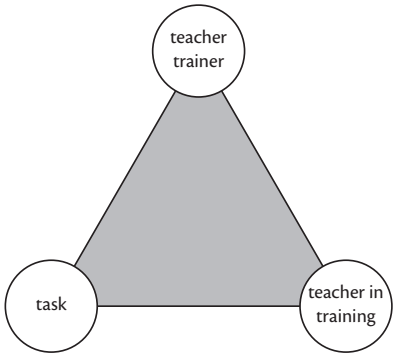
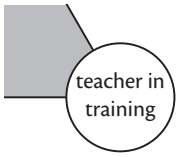


Figure 1
Dynamic, didactic triangle of education (2002)

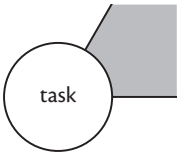
Regardless the nature of the relationship, this triangle represents a constant and continuous interaction, in the sense of continuous, is occurring within this triangle. For example, the interaction not only occurs while a lecture is going on, but continues through each subsequent lecture. This process of constant interaction influences not only the teacher in training's learning process, but also the teacher trainer and the task. Initially, the constant interaction in this triangle

ensures that the teacher in training is continuously developing. How the teacher handles the task depends on earlier experiences with the task. Connecting these earlier experiences to the theory leads to the development of underlying principles. An example of one such principle is that simply explaining the teaching material is not enough and that the teacher should ask questions about the knowledge gained by the students. The process described here can be linked to the angles of the triangle, which are explained in the following paragraphs.



Section 2.2 zooms in on the role of the teacher in training in the dynamic didactic triangle by outlining how the development of the teacher in training evolves from novice to expert. This section details how increasing insights into this development yield starting points to determine how to improve the design of the teacher education. Subsequently, the role of schemata, scripts, mental models and embodied knowledge within this development is described. Social constructivism is briefly outlined as a predecessor to situated knowledge in the form of design patterns.

Section 2.3, dealing with the societal context of the teacher trainer in the dynamic didactical triangle, puts the essence of competent teaching to the question, and details how throughout the years the societal perspective on the interpretation of the teaching profession has changed. This societal perspective influences the teacher trainer's perspective on the teacher course. That perspective subsequently determines whether there is room for reconsidering and re-conceptualizing the teacher in training's thoughts about teaching and educating during the training. This section zooms in on the teacher trainer's contribution to designing training that combines the three corners of the dynamic didactical triangle.



Section 2.4 describes how teacher education facilitates the development of teachers in training within the dynamic didactic triangle using a sound curriculum with corresponding learning tasks. These tasks cover all the learning assignments that the teacher trainers consider part of the teacher education's curriculum. This thesis focuses mainly on developing a type of task in the field of teaching skills that contributes to the development of the teacher in training. This development should aid the teacher in training to narrow the gap between the theory of teaching and their teaching practice. Teachers in training do experience this gap, particularly when they are not competent enough to carry out their internship or job as required. The eventual task should contribute to reflecting on one's own handling in practice, because it is essential to developing the necessary competences. For this reason, the fourth section talks about the importance of reflection, how it can be guided by setting higher learning goals and which theoretical framework can be used to examine the reflection process. It refers to what (design patterns) and why (educational purposes) teachers in training can learn from watching real-world situations. How much teachers in training can learn depends on their actual development; the level of the assignment must fit with the teacher's level of development, so it is necessary to look at the development

of the teacher in training. In short, in determining the assignment, there is a link with one of the sides of the above described dynamical didactic triangle: the teacher in training. The link with the third corner of the triangle, the teacher trainer, also becomes evident because the teacher trainer's perspective on training teachers contributes to his choice of assignments. In section 2.4.2, the potential of an assignment with video to show practical situations as a basis of a meaningful learning experience, is discussed. To conclude, this section briefly indicates what each research question in this thesis contributes to the main research question regarding the role that video cases can play in improving teacher education.

2.2 The development of the teacher in training

2.2.1 Development from novice to expert

A teacher in training should normally develop from novice to beginning expert during the time he is following the teacher education. At the beginning of his education he is labeled a novice. A recently graduated teacher is viewed as a beginning expert because he still has to work several years in the profession to become a full expert (van der Grift, Helms-Lorenz & Maulana, 2014). The development to full expert continues, ideally, during the first years of practicing the profession. In an often-quoted research by Ericsson (1993), the importance of practice for reaching an expert level is emphasized. He states that a novice must practice for 10,000 hours to become an expert. A healthy, optimal development is not always guaranteed, however, as developments can stagnate. More recent research reports that just practicing for many hours is not sufficient to account for the difference between performance levels (Hambrick et al., 2014) and that more deep practice is needed to do so. Deep practice involves experiences with continuous reflection and focus on what can still be learned from that experience. In this thesis, the term experienced teacher refers to a teacher who has acquired a lot of experience during the first years of practicing his profession and has grown into a full expert.

2.2.1.1 Representation theory

The difference between an experienced teacher and a novice cannot be explained by the fact that the expert might have a higher intelligence, a better memory or more developed general strategies for solving problems, but because the expert has acquired more knowledge within a specific domain (Bransford, Brown & Donovan, 2000) and mentally perceives the problem in a different way. The expert's more extensive knowledge influences the way in which he classifies, interprets and perceives information from his surroundings (Bransford, Brown & Cocking, 2000). This is because an expert's knowledge within a specific domain does not consist of fragmented facts, but is of a holistic nature, as well as organized around a specific core concept (Chi, 2011), for example classroom

management or cooperative learning. Furthermore, experts categorize problems differently than beginners do. According to the representation theory, the way an expert processes information into a representation of reality is different from the way a novice does (Persky & Robinson, 2017).

The holistic nature of this knowledge means that an expert has a holistic representation of the problem. A novice, unlike the expert, sees more details of a problem. This may seem like an advantage, but it causes him to see the whole in a fragmented way (Chi, 2006). By looking at the big picture, the expert can recognize the underlying source of the problem. For example, he may realize that his pupils are displaying disruptive behavior because they are bored. By contrast, a beginner will merely recognize the actual disruptive behavior. Consequently, the beginner reacts to the actual behavior instead of the underlying cause of the students being bored. And because he uses their behavior as a starting point, he can only solve the problem by reasoning backwards from that behavior. An expert will, in contrast, find a solution going forwards, because he has room in his mental representation of the reality for the underlying principle (bored students) which he recognizes as being the starting point of the problem (Simon & Simon, 1980). In this example, his solution would be to motivate the students.

2.2.1.2 Dreyfus's model of skills acquisition

Several theories split expert development into phases. Most of them mention a long-term development. Dreyfus, Dreyfus & Athanasiou (1986) propose a heuristic model, in which the development from novice to expert goes through five phases. The phases differ from each other in the way reality is interpreted by the learner. Different interpretations lead to different actions. The model is based on research of expertise in chess players and pilots. Later research by Day and colleagues challenges the traditional character of the 'stage theory', which conceptualizes teachers' professional development as moving through a number of linear skills development stages – from being a 'novice' through to 'advanced beginner', 'competent', 'proficient' and 'expert' (Day, et al., 2007).

The first phase in Dreyfus's model of skills acquisition is described as novice. In this phase, mainly domain-specific facts and functions are learned (Gobet & Chassy, 2008). They are dealt with fragmentally and are not yet placed in a holistic context. Someone in the second phase is *an advanced beginner* and links concrete, context-bound experiences more often to domain-specific knowledge. In this way, what is learned becomes more meaningful. An individual in the third phase is *competent*. Solving problems or making decisions becomes more efficient, but solutions and decisions are still made very consciously during this phase. Someone in the fourth phase is *proficient*. The problems one comes across are understood intuitively, the rules used to come to a decision on how to tackle the problems, however, are still analyzed and evaluated. In the final phase one has become an *expert*. Decisions are taken intuitively, which means immediately, without calculating and comparing alternatives or based on what is felt without

having to think about it. Dreyfus and Dreyfus (1988) describe an expert who acts intuitively as someone who, in routine situations, does not solve problems or make decisions, but as someone who 'does what he always does' effectively, because his actions are based on interiorized knowledge that was built through experience and reflection. Other researchers refer to intuitive experts (Kahneman & Klein, 2009) or mention decisions that are made without formula, but are based on normal routine (Hyle, Ivory & McClellan, 2010). Because of their experience with previously applied solution patterns, the patterns are recognized and applied automatically (Gobet & Chassy, 2008). Apart from the fact that an expert recognizes solution patterns faster, he can also do so at a higher abstraction level than a novice (Nieuwenhuizen 2013). Berliner (2004) has argued that experts in teaching share characteristics of experts in fields such as chess, medical diagnosis, and physics problem solving. Hence, there is reason to believe that the sophistication of the cognitive processes used by teachers and experts in other fields are similar.

2.2.1.3 Ericsson's theory of expert performance

According to Ericsson's theory, expert development does not result from experience, but includes deliberate training and practice of the matter to be learned. The previous section states that the development from novice to expert, with its corresponding difference in performance levels cannot be explained using practice hours alone (Hambrick et al., 2014). For example, it turns out that teaching lessons without a diploma or qualification, barely contributes to the development of the competencies of a teacher. Teachers working without a qualification or diploma are either in training or not. If, during the unqualified teaching, they are in training, deliberate practice takes place using assignments from the teacher education, and competence growth is higher than without deliberate practice (Hoy & Spero, 2005). Teaching lessons is a complex skill, which means that its development does not end once the initial grasp has been achieved and that it does not grow by itself through practice, as opposed to ordinary skills. According to Ericsson (2008), when it comes to expert development, the difference between ordinary skills and skills that can be described as complex is important. Ericsson (2008) described the difference between these two types of skills in the form of a graph (Figure 1): the vertical axis shows the difference in performance levels and on the horizontal axis the amount of experience.

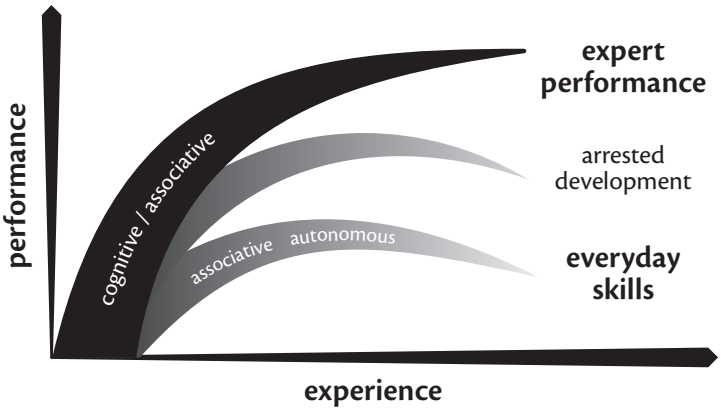


Figure 2
The Influence of Experience and Deliberate Practice on the Development of Expert Performance (Ericsson, 2006,).

The lower line in the graph, describes everyday (common) skills, and features no further development after automation. Ericsson (2008) provides the example of tying one's shoelaces as an everyday skill. When, for example, this skill is learnt at nursery school by practicing on a shoe, there is a cognitive phase specifically aimed at acquiring the knowledge. The child might articulate, for example, that a loop is made. Once the skill is acquired it becomes autonomous and the underlying knowledge does not specifically need to be recalled.

Teaching, however, is not an everyday or common skill, but a complex skill, which development continues after the initial grasp has been achieved. Particularly, a novice teacher can ultimately develop into someone who can deliver an expert performance. The upper line shows that this development can be described as a process of deliberate practice. To reach the level of expert, a teacher must keep challenging himself by setting new targets and higher performance targets (Ericsson, 2008). This means that a novice teacher applies his knowledge in interaction with the teaching setting again and again, and as a result his development within a specific context continues. If someone lapses into performing exclusively automated actions, arrested development occurs, as is shown in the middle line. Arrested development is fatal to the evolution from beginning to full expert.

It is important to note whether a skill is complex or common when describing its development. A skill might seem common, for example using the whiteboard or the electronic learning environment, but might really be a complex skill for which growth is still possible. Specifically, the use of the whiteboard might augment the way the goals of the lesson are reached. Besides being a script containing outline of the lesson, the whiteboard can also function as a visualization tool. There are many ways in which the contents of a lesson can be visualized. Additionally, the teacher should be aware of his timing, in order not to disturb the lesson's momentum. All these factors contribute to the complexity of using the whiteboard.

The performance of a teacher in training also includes several actual common

skills, like the use of a school timetable. Once these everyday skills become automated, any additional experience will not lead to improvement of the skill. Returning to the example of working with a whiteboard, simply writing on it with a marker is an everyday skill. On the other hand, several common skills can form a complex skill. Using the whiteboard to its full didactic potential is a complex skill.

2.2.1.4 Fischer's Skill Theory

Teachers in training do not automatically grow into expert teachers. Fischer and Rose (2001) point out that the development of experts begins only when people experience that they are unable to react adequately to a new situation. For teachers in training, educational situations often do not feel new because the secondary school domain is known to them from the time they were students themselves. When a teacher in training realizes that his solutions are inadequate, he might develop into an expert with the help of other experts and/or reactions from the environment (van de Grift, Helms-Lorenz, Maandag & de Vries, 2012). This development is not linear (King, Jones & Hecke, 2006). A non-linear development means that the growth is not constant but transpires unevenly, as is shown in the next example. A teacher in training who tries to better carry out an existing task will often perform at a lower level, compared to when he did not yet see the task as a challenge (immediate behavior, although it may not be optimally effective, can become lagged and deteriorate if it is thought through too much). Only secondarily, during the ongoing process of learning the new task, will he develop more skills, which he will use to ultimately perform at a higher level than he did originally. Nonlinear growth is represented by curves that take various shapes, for instance a U-shape, or a curve with a sudden change. This means that there is no continuous, proportional relationship between the amount of effort a teacher in training exhibits and his progress.

Fischer's Skill Theory (1980) is a theoretical framework that describes how one links newly developed skills to previously developed skills. Although the way in which one uses one's cognitive means is a conscious decision, skill development evolves automatically while practicing. According to this theory, learning takes place in the 'development range'. This is the distance between the functional level and the optimal level of performance. The functional level means the daily performance and the optimal level means the performance under ideal circumstances. These ideal circumstances refer to circumstances in which adequate help and support are provided by competent people. In an environment where there is little support for learning, a person will continue to perform at a lower level compared to an environment where there is a high level of support provided. Skill Theory covers a wide variety of processes of acquisition and can fruitfully be applied to the long-term development towards becoming an expert. It is important to understand that spontaneous variation in the level of the skill is a natural characteristic of that skill, as well as an explanation for the development of that skill. Because of spontaneous variation, the results of using a skill may

sometimes be better, sometimes be worse. The accidental better performances allow the individual to strive for the same high level result on a next occasion, and to sometimes even achieve it. Fischer (2008) refers to temporarily reaching a higher skill level, before it becomes stable at the expert level and often followed by a relapse as scalloping. In practice, it seems that Skill Theory is also applicable to explain the occurrence of variability in performance at a micro level, for instance within a single activity or lesson (Wetzels, 2015). In both cases the learning process takes place in very close interaction between learning process and context. During the training of teachers, the context consists of the two points the teacher in training faces in the didactic dynamic triangle. The context is not just the input of the learning process, but also its result. For example, the way students participate in a lesson and the experiences their teacher gains from their participation, depend on the teacher's earlier performances. According to Fischer, a dynamic skill can be compared to a dynamic system, that is, a system whose components influence each other in the long term, and that organizes itself (King, Jones & Hecke, 2006).

2.2.1.5 The Complex Dynamic Systems theory

The complex dynamic systems theory provides a framework for studying the complex learning process of the teacher in training from novice to full expert (van Geert, 1994). A complex dynamic system has various characteristics. Firstly, the dynamic system is iterative, which means that over time the learning result will become a product of the previous phase and will serve as input for the next phase (Spencer & Perone, 2008). When working on his task, a teacher in training's current actions have an influence on the teacher trainer's next action. The second characteristic of a complex dynamic system is that all components in the system influence each other mutually. A bidirectional relationship between two points of the triangle, for example the context and the teacher in training or the teacher in training and the teacher trainer, means that both affect each other. The third characteristic is the connection between different time scales. This means that what is happening here and now is the foundation for change over a longer time (the reverse, that long-term changes determine what is happening in the here and now, is also true) (Perone & Simmering, 2017). There is a bidirectional relationship between the short and long-term timescale of change. The motivation to participate in an activity now forms the basis of motivation in the long run, and these short and long-term motivations influence each other. The fourth characteristic of a complex dynamic system is that attractors are formed. An attractor is defined as a state to which the system is drawn, taking all influences and characteristics that determine the system into consideration. That state itself is self-sustaining, meaning resistant to influence to change (van Geert, 2011). The expert state itself is often a typical attractor, as the experiences that result from performing expertly preserve the expertise. For example, the establishment of an adequate level of expertise implies that an attractor state of that relatively

high level of expertise is formed, in the form of a self-maintaining process. The fifth characteristic is non-linearity and variability. Development does not follow linear growth. Someone that does not have something under control yet will subsequently learn this by trial and error, which means that someone is able to control the phenomenon in question at one time and not able to do so the next. Moreover, this development is variable, meaning that it can vary from one person to the next. The sixth characteristic of a complex dynamic system, derives from its complexity and states that the system is influenced by chance. Competence development, for example, depends partially on the quality of the teacher of the course, which is determined by the schedule. There can be no predetermined outcome when importing a particular context and task, as chance plays a role.

Based on the six characteristics described, it can be concluded that the development of an expert can be seen as a complex dynamic system in which, for example, the attractor state of expertise ensures a self-sustaining condition.

2.2.2 The role of schemata, scripts, mental models, situated cognition and the social context

An expert can recognize meaningful patterns and react effectively to them. In this section a brief overview is outlined on what is known about recognizing meaningful patterns and the way this information is stored. The description of the way these patterns are recognized and stored in the long-term memory varies from schemes (Chi, Feltovich & Glaser, 1981), scripts (Schank, 1999), mental models (Gogus, 2012) to situated cognition (Robbins & Aydede, 2009). The distinction between these four descriptions does not only consist of the level of abstraction or the knowledge it refers to, but is identified by a fundamentally different point of view regarding the nature and shape of human knowledge. A better understanding of the differences and similarities in the descriptions of these processes of recognition and memorization of meaningful patterns can contribute to the design of a dynamic didactic triangle, represented as a dynamic complex system, that optimally supports expert development.

2.2.2.1 Mental Schemas

The first concept, schemas, refers to the perception and interpretation of a particular situation and how one is expected to deal with it (de Jong & Ferguson-Hessler, 1996). These perceptions and interpretations are not separate, unconnected entities, but form typical consistent patterns or structures. These knowledge structures are also known as schemata. These schemata form a framework from which teachers choose the most viable operation for a specific situation (Brown, 2001; Hummel, 2005). By 'most viable' the best method to solve a problem or to react to a problem is meant.

A groundbreaking research, that has been principal in the further development of the term schemata, was done by De Groot (1965). In this research, he

asked chess players of various skill levels to speak their thoughts out loud and discovered that the difference in level of expertise between an average player and a key player was mainly based on the fact that a key chess player was able to recognize patterns faster. Here, patterns mean standard plays like offensive patterns, plans and combinations of moves. Based on former experience, associations and connections, a key chess player can recognize such patterns faster and thus gain a better understanding of the links between the characteristics of the chess pieces, their formation and possible moves of the adversary. The patterns in a chess player's mind are, in other words, schemata. Basing his decision on better schemata, a key chess player is able to come up with better moves. De Groot's research (1965) has demonstrated that schemata play a role in recognizing situations. The same applies for a teacher in training, who, by recognizing situations quicker, is better able to make a connection between his own actions and the actions of the class. A student can, for example, ask a question out of sheer curiosity or to purposefully disrupt the lesson. The better a teacher in training is able to distinguish between these two situations, and recognize the corresponding mental schema, the better a position he is in to react adequately.

Due to their complexity, schemata cannot be transferred to others, but are formed over time and are continuously fine-tuned. Well-developed schemata are necessary to react quickly and effectively in different situations (Borko, 2004; Putnam & Borko, 2000). Compared to an expert, a novice sees only schemata containing details, and lacks overarching schemata, which causes them to have difficulty recognizing a situation, to improvise in it and to react to problems or situations.

An initial explanation for the difference between an expert and a beginner is that an expert can recognize patterns and interpret situations faster because his schemata are better organized (Winitzky, 199; Peterson & Clarke, 1978). Consequently, experts can improvise better (Tsui, 2003), because the strategies and routines in their schemata are accessed more quickly than those held by beginners (Livingstone & Borko, 1989).

A second explanation for this difference is the fact that an expert has more experience and, in this way, has accumulated more knowledge in his schemata (Peterson & Clark, 1978; Coderre, 2003). The schemata of an expert contain more experiential knowledge, complemented with the abstract knowledge on how to develop solution methods (Peterson & Comeau, 1987). This means that experts can indicate what the underlying problem in a specific situation is and that they possess the ability to base a solution of the actual problem on the underlying problem they perceive. Because they can make use of more adequate schemata, experts are more capable than beginners at analyzing and solving problems and subsequently making decisions.

A third explanation is attributed to the fact that experts can apply abstraction from schemata to other situations. Beginners seem only able to use these actions in situations that are very similar to the situations in which the action was learned, and can only deploy the complete routine, without acknowledging the underlying abstractions (Perkins & Salomon, 1988).

A fourth explanation for the adequate actions of experts is that they are better able to select relevant information. Because beginners' schemata are still developing, they are not as skilled at selecting relevant information as experts are. Only after receiving a lot of information can they decide which action to choose to solve a problem. The operation is often less effective for this reason (Livingstone & Borko, 1989; Korthagen, 2010). Cognitive psychologists therefore presume that the schemata of experts not only have a different structure, but also consist of different connections. Experts tend to have a lot more connections.

To conclude, beginners need experiences to be able to become experts. These experiences will allow the schemata of beginners to develop, not only when they become increasingly abstract, but also increasingly concretized, meaning enriched through experience. By filling the schemata with specific information, they become richer and with these richer schemata beginners can grow into experts who can react adequately in different situations (Keller-Schneider, 2014).

2.2.2.2 Script theory

The second concept that describes how meaningful patterns are memorized, is the concept of scripts. Scripts refer to the standard thought processes on how to act in concrete situations. In that sense, scripts are plan-of-action schemata. Script theory (Schank & Abelson, 2013; Lubarsky, et al., 2015) is built on the idea that events in a situation need to be processed quickly because people know how to react in such situations, since they have some knowledge about similar situations. Scripts refer as much to general as to specific knowledge. General knowledge primarily means interpretations of the behavior of others, for example that *welcoming a class to the classroom* is an important starting point of teaching a class. Recurrences in interpersonal contacts are represented cognitively in relational schemata (Baldwin, 1982; Fletcher & Fitness, 2014). The focus is not on the specific context, but on the interaction, for example a greeting. Specific knowledge primarily means interpretations of certain situations. Many times, we have experienced situations before and as a result can recognize a particular structure, or a sequence of events, which allows us to subsequently anticipate to them. Over time, people acquire a large amount of scripts in their minds that they use to interpret situations, such as restaurant, sport and work scripts. Many teachers in training are taught during the teacher education to make a point of welcoming their students to the classroom in their role as host. They can do so by standing at the door and greeting the students as they enter. This is a script, because it involves a schema that is specifically directed at properly handling a specific situation and not a global generic framework from which many actions can be chosen. Scrips can assist in learning effective behavior but, because of their schematic design, cannot be attuned to specific situations. The use of scripts contributes to expert development, but it does not explain how full experts adjust their behavior to any situation.

2.2.2.3 Mental models

The third concept that describes the representation of meaningful patterns, mental models, is thought to play a key role in the way in which people describe and explain their surroundings. Mental models can be described as personal theories about certain phenomena (Johnson-Liard, Khemlani, & Goodwin, 2015). As personal theories about specific bits of reality, mental models play a role in generating certain types of actions in the concrete situations the mental model applies to. Such actions may be anchored in the schemata and scripts mentioned earlier that ensure somebody implements the correct action (Endsley, 1995a, 2000). Schemata and scripts can thus be seen as a component of mental models, as they are internal representations of reality, knowledge, beliefs, values and customs that grow through experience. They are stable, easily accessible and based on the perception of what they represent (Doyle & Ford, 1998). The use of mental models avoids overloading the working memory because they are a simplified version of reality. An individual who can make use of his mental models will be less cognitively loaded. This means that an experienced teacher will notice an initiating disturbance in a class earlier because the underlying pattern of that disturbance in the diffuse situation of the class will be immediately noticed by him, because this pattern fits in with the mental model in his mind. Experience with similar situations does not automatically lead to the development of mental models. Experience, however, can be beneficial to the formation of mental models which can be used to recognize these situations sooner, if the experience is enriched with relevant information about the situation. This relevant information can be obtained through direct experience, or through inductive construction, but also by obtaining information from others about similar situations. Thus, an important feature of mental models is that they are not only gained through direct experience (inductive construction) but also from information that one obtains from others about similar situations. Mental models can therefore be seen as a kind of meta-schemas, or an overarching assembly of related schemata and scripts.

2.2.2.4 Design patterns

The fourth concept that describes the way meaningful patterns are represented is the concept of design pattern. It was originally applied only to the field of architecture (Alexander et al., 1977), but has now proven its utility in the design of learning environments (Maina, Craft & Mor, 2015). A design pattern is an internalized form of educational knowledge and experiences in the form of action patterns that give direction to solving recurring problems and consists of a structure of heuristics (Goodyear et al., 2004; Zitter, Kinkhorst, Simons, & ten Cate, 2009). A design pattern focuses on correct actions in a concrete situation and has its chief links with the concept of scripts. Like a professional chess player uses schemata to come up with better moves, a design pattern helps a teacher

to act intuitively and effectively in a classroom situation. This link to action is specifically important in the diffuse and complex educational environments. A teacher in training should learn to act intuitively and adequately in a specific situation from his daily teaching practice. In order to do so, they need to have design patterns. An expert teacher will not only be able to judge a situation and determine what needs to happen in that situation, but also take appropriate action. Solving a teaching situation in a meaningful way requires correct actions and the interactions that can serve as a solution pattern for a recurring problem are what Alexander calls design patterns.

Because an experienced teacher acts effectively by intuition, such design pattern are used by him more or less unconsciously. An experienced teacher can focus his attention on any relevant actions and events related to the learning process of his pupils. He considers, for example, classroom management issues from multiple perspectives, safeguards the lesson's continuity, predicts where problems might arise and takes action before they get worse (Wolff et al., 2015). Eventually, applying a particular design pattern allows teachers in training to display intelligent behavior that is the result of previous interactions with their environment. So, design patterns are used in a particular context and are therefore situated.

Design patterns are not easily transferred (Mor & Harvey Warburton, 2014). This a direct consequence of the situated character of a design pattern, which will be explained in the following section. A result of this non-transferability is that a teacher in training does not feature a balanced set of design patterns, but is very much still developing one. To be able to transfer a design pattern to teachers in training requires descriptions of the required knowledge and heuristics. A design pattern description consists of four parts: a pattern name, a description and application of the problems, an abstract reference of the solution and a consequence that is linked to applying the pattern (Gamma, Helm, Johnson & Vlissides,1994). It should be stressed that the direct link a design pattern has to a specific practical situation is an essential part of it. Mentioning all four parts of a design pattern is insufficient when the goal is to transfer it to a teacher in training. They can only acquire it in direct interaction with their workplace, as will be detailed in the next paragraph on situated knowledge.

2.2.2.5 Situated cognition

The central feature of situated cognition is that intelligent behavior is the result of the interaction between an intelligent individual and his surroundings (Roth & Jornet, 2013), and do not just develop in the mind of that individual. Compared to the classical mental models discussed earlier, the concept of situated cognition explicitly states that learning occurs in a context and is therefore more complex than receiving information from a source like, for example, a textbook or teacher trainer, where processing of 'sent' information only occurs in the receiver's brain. The meaningful patterns are, in this way, always ground in experiences in the real world and consequently referred to as situated cognition (Anderson, 2003;

Wilson, 2002). Additionally, situated cognition is also activated when the person in question finds himself in a comparable situation. The word 'situated' indicates that these experiences take place in a particular context or world (i.e. they are embedded) and are influenced by the physical state of the person (i.e. they are embodied). In situated cognition the context (or situation) is an external yet essential constituent of the schemata (or mental model), and does not merely consist of purely internal structures. How exactly situated cognition works is explained here with the help of the terms embodied, distributed and embedded cognition. It is important to realize that the development can take place on several timelines, as it has been described in the dynamic system theory.

Embodied cognition puts the interaction between person and environment at the center and emphasizes the physical body of the person. According to this theory, mental representations of reality, like those described in previous sections are hardly usable in concrete situations, because most situations are simply too complex to be represented in the form of internal representations (Wilson & Golonka, 2013). As a solution, the theory of embodied cognition states that the task of the brain as controller of cognitive models is replaced by the body as an agent in a concrete environment. An individual will combine cognitive and physical means with the characteristics of the surroundings to reach problem-solving behavior. This person's body, as well as information from the environment (as perceived by the individual) replace the need for a mental representation. For example, walking around the classroom to check the student's homework involves an incredible amount classroom element behavior and sensory information, and this walk around could be too complex for a mental representation to be completely and effectively formed.

The theory of embodied cognition is supported further by neurological research that shows the deeply intertwined nature of what we know as cognition (language, thinking about abstract concepts) and sensory and motor neurological systems (Gallese, 2009; Lakoff, 2012). An example of such neurological research is that on mirror neurons, which clarifies that when we see people acting in a certain way (perception), the same neurons are triggered as when we were to do the same action ourselves. In other words, the difference between seeing things happen and doing things oneself is very small. In this theory, the body and the structures in the environment (artifacts, aides like maps or other man-made knowledge structures) play an active role in understanding things (Anderson, 2003).

The theory of distributed cognition, puts less emphasis on the embodied character, but emphasizes the distributed character of cognition. Distributed means that the cognition is distributed over people or the physical environment. The latter often includes tools, such as a notebook, tablet or app to support teaching. The former stresses the social character: we all know a little and as a social network we know a lot. Distributed cognition is something that for the most part happens between an individual and his environment, either social or physical, rather than inside the individual. It develops in the interaction between members of a network of collaborating people. In this perspective, the group that has the knowledge is

seen as a community of practice, where the novice is placed on the sideline and the experts in the center (Beijaard, 2016; Lave & Wenger, 1991). Furthermore, taking part in the working field is a necessary step to expertise development.

Embedded cognition is the third term that helps clarify the way situated cognition develops in practice. As mentioned before, thinking processes originate in the brain and are influenced by the condition of the body (embodied), but also by all relevant elements in the physical environment in which action takes place (embedded and distributed). This way, embedded cognition puts the emphasis on the influence of the elements in an individual's environment. The environment being activated, updated and designed by physical actions, is, in embedded cognition theory, an integral part, whereas the abovementioned representational theories view it as something that is entirely internal, in the form of a mental schema. It is evident that, in situated cognition, a mental schema is a structure containing both the person as well as the environment. Although the environment, for teachers generally the classroom, plays a far-reaching role in this form of cognition, it is important to mention that it does not replace it. The theory of situated knowledge states that thinking is a continuous loop between the embodied person and the physical environment. In the person, the brain fulfills a key role, but as important are the senses and extremities. Similarly, tools that were developed to enable interaction between the actor and the environment, fulfill important roles in the environment.

The resources someone uses to produce effective actions are distributed across the brain, the body and the environment. By means of situated cognition they are joined together into a working whole, so that the task can be subsequently completed (Wilson & Golonka, 2013). Cognition being embedded in both the context and the body implies that transferring this knowledge requires a process of effort, reflection and attunement (Lam, 1997). This requires being physically present in a situation or at least a physical confrontation with that situation, for example by using a video case. For teacher trainers, this means that the knowledge of experienced teachers cannot simply be transferred to situations with other teachers in other classrooms.

From the sections above, it can be concluded that the term situated cognition is used to indicate all thinking processes where the context in which the activity lies, the social and physical situation are inextricably linked with the cognition, even when they involve abstractions (Wilson, 2002). Here, the focus is not on the individual person: he is seen as participating in an interactive environment. Situated cognition is about the interaction between the person with others within the environment, the environment itself and abstract representations. According to Wilson (2002), the reason why we appeal to the environment is the fact that the information supply would otherwise be too large to process on time. To ensure that the information does not get lost we make use of the environment to create a representation of the situation. The next time someone finds himself in the same environment, his presence in the environment is sufficient to summon all the information that matches it. The environment helps simplify a

problem, because it poses as a model for the problem that the teacher in training needs to solve (like for example, a good start of the lesson).

Situated cognition emphasizes the interaction with the situation in which thought processes take place. This knowledge is triggered by a specific situation (contextual), contains all the relevant aspects of that situation (holistic) (Putnam & Borko, 1999), only works in that specific situation (Geerts, van der Werff, Hummel, Steenbeek & van Geert, 2015) and grows with each interaction in that situation (Kim, 2009). In this thesis, we define situated cognition as cognition that *takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place* (Roth & Jornet, 2013). It can be inferred from this definition that situated cognition has both an embedded and an embodied character: experiences with situations result in situated knowledge. By interacting with others, the teacher in training is able to build his situated knowledge. The social network of people that are interacted with, form an important part of the context in which the cognition is situated. This mean that the situated knowledge is not just situated but also socially distributed. This distribution means connections between practical situations and the broader principles of teaching. In conclusion; situated knowledge is the knowledge that results from cognition that *takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place*.

2.2.2.6 Social constructivism and the role of social context

Although Vygotsky's social constructivist theory was developed long before the emergence of the theories related to situated cognition, his theory is still relevant because he described social distribution so well. The theory can be used to put concepts such as embodiment and situatedness in the context of social interaction, which is a core feature of the teaching-learning process. Because of this his theories regarding expert development are still widely used in educational settings. Vygotsky's theory involves the development of novice to expert, in which he makes development tangible as a combination of biological and cultural possibilities and challenges. Within the cultural-historical framework of knowledge transfer that he roughly describes, internalization and the zone of proximal development are the two key concepts.

According to Vygotsky, internalization means that what at first happens on a social level, can subsequently take place at individual level. For teachers in training, internalization at the social level can for example be a classroom discussion about a situation shown on video. In this example, it is presumed that the solution to the problem shown on video is still too difficult for the teacher in training to solve by himself. In Fischer's skill theory, a 'functional level of performing' occurs without support, and an 'optimal level of performing' when support is provided, for example by an available expert (Kitchener & King, 2004). Similarly, in social constructivist theory, a good solution can be found by interacting with the group and with the help of the teacher trainer. Finding the solution is, in their view, a

team process in which the teacher in training plays an important part. The help he was offered was nevertheless essential. Thanks to the help, the next time he finds himself in a comparable situation the teacher in training will come up with a suggestion for a solution. The solving process, that occurred first in interaction with the teacher trainer, has been stored inside, or *internalized* by the teacher in training. On the one hand, this internalizing pattern assumes that it is a matter of observing with the physical body and the corresponding senses (embodied), and on the other hand that the environment plays an important role (embedded).

The fact that situated knowledge grows with each experience that involves interacting in the situation, as proposed by Kim (2009), is perhaps a simplified version of the actual course of events. Experience with situations can only be relevant when the situation corresponds to the zone of proximal development of the teacher in training, as a large group of neo-Vygotskians would describe it (Karimi-Aghdam, 2017). Vygotsky and the present-day researchers that build upon his ideas, describe this zone of proximal development as the cognitive developmental level that enables one to solve a problem independently. The zone of proximal development is consistent with this, which is the level at which one can successfully operate with adequate help. In the example provided earlier, internalization can only come about if the solving process lies within the zone of proximal development of the teacher in training.

Expert development occurs at the level of the proximal development zone which means that, as discussed in the previous section, real-world experience is essential for its development. Fischer emphasizes that both opportunity to practice as well as contextual support, for example a demonstration by an expert, are valid (Fischer & Pruyne, 2002). By looking at the bigger picture in a real-world situation, an expert can recognize the underlying principles of a problem in each situation. Expert development takes place in very close interaction with the learning process and the context. The context, for the teacher trainers, consists of the two points of the dynamic didactic triangle: the teacher trainer and the task

2.3 The teacher trainer: societal perspectives on the training of teachers

The paragraphs below discuss the societal framework in which the teacher trainer works. It can be considered the background for his role in the dynamic, didactic triangle. Within the triangle, the teacher trainer is an active agent that initiates the task and sets the learning process for the teacher in trainer in motion. The role of the teacher trainer as designer of the dynamic, didactical triangle, should not be underestimated. The way he fulfills his role largely depends on the way he interprets it. The way he interprets his role is, in turn, determined by the dominant perspective on good teaching. Paragraph 2.3.1 outlines a recent change in the public idea of good teaching in the US, Europe and Australia, while paragraph 2.3.2 does the same for the Netherlands.

2.3.1 International perspectives on the training of teachers

In the United States, Europe and Australia, the societal perspective on the interpretation of the teaching profession has been changing year after year. Such a change of perspective does not only manifest itself in the corresponding scientific research on being a teacher, but also in the conceptual learning plan of the teacher education. Cochran-Smith (2004) formulated a convenient overview of four historical perspectives throughout the years, i.e. a training problem, a learning problem, a policy problem and the promotion of student learning. Knowledge of the transition to the fourth and current perspective is especially important for understanding the value that is attached to linking theoretical to practical knowledge, which is necessary for the development to starting expert of teachers in training.

Her study is used as a guideline to give a brief description of the fourth perspective (Cochran-Smith, 2004). The shift towards the fourth perspective, government policy directed at the workplace to promote student learning, is a development that has been going on for a longer period. From the time the former Soviet Union was ahead of the US concerning the advances in space, US education emphasized student learning and progress. The other side of the coin was that there was progressively less attention for the perspective of the teacher as a developing and learning professional. A shift ensued towards a concept of the school as a learning organization for both students and teachers (Czerniawski, 2013). Teachers were not merely viewed as implementers, but also as learning individuals who are given an opportunity to work on their professional development. At the same time, the primary goal of the school as a learning environment contributing to the development of its students, was not forgotten (Murray, McNamara, & Jones, 2014). At the teacher education, the fourth perspective is recognized in the focus on learning in the field. Teachers in training grow when they reflect on the way they should design effective teaching, in their learning or work environment.

2.3.2 Perspectives on teaching in the Netherlands

Like the rest of the western world, in the current decennium the Dutch situation has seen a shift towards a government policy that is focused on training the teachers in training in the workplace, during internships. This policy is expressed in the interventions done by the Dutch government, through the HBO council. From 2008 onwards, and at the request of the ministry of education, the HBO council started to register the 'knowledge base' of a second-degree teacher (Ministerie van Onderwijs, Cultuur en Wetenschap, 2008). In the knowledge base, professionalization during the teacher education is implicitly viewed as introducing and then transferring a theoretical knowledge foundation for the teacher in training (Hoyle & John, 1995). The knowledge base consists of two parts, first, the course the teacher in training is to teach, and second, a general, professional component (hbo-raad, 2011). This indicates that teacher education in the Netherlands is often set up according to a 'theory to practice' model (Brouwer & Korthagen,

2005). Wideen, Mayer-Smith, & Moon (1998) describe this as follows: the idea at the foundation of the traditional teacher education was based on a model in which the teacher education offered theoretical knowledge, methods and skills, and the schools the setting to put this knowledge into practice. The teacher in training himself is the link between the theory and the workplace. Barone, Berliner, Blanchard, Casanova, & McGowan (1996) remark that such a teacher education is merely a collection of individual courses that present the theory without much connection to the practical world. Schön (1987) calls this way of training the 'technical-rational model of instruction', because, in a collection of courses, the necessary technical knowledge is transferred to the teachers in training. Tom (1997) even calls this the 'assembly line' model. Ben-Peretz (1995) adds to this that teacher education colleges often make use of a hidden curriculum, as the contents of the courses implicitly assume a fragmented outlook on the knowledge. Both in theory in the training itself and in practical experiences, knowledge is seen as 'given', which means without context and not problematic in nature. This assumption is implicit, because it is not formally described in the curriculum, hence the term 'hidden curriculum'. This term does have an impact on the way the teachers are trained. A curriculum like this results in a training that creates too much distance between itself and the practical world.

Since the early 2000s Brouwer and Korthagen (2005) have argued that it would be best to move away from this approach and make a paradigm shift towards a way of training teachers in which acquiring theoretical knowledge complements the practical experiences that have been made. They call this way of training, which focuses more on reflecting, 'realistic training'. In their view, the lack of practical relevance of the current curriculums, and the way they should be converted into the day-to-day reality of the schools, are the core of the training problem. A curriculum is practically relevant if the teachers in training, equipped with the knowledge they gained from it, feel more competent in their teaching practice. This means that the gap between the theory and the practice needs to be bridged.

This desired shift in paradigm, from a traditional theory-to-practice model to an increasingly contextual way of training teachers, is reflected in the report of the Dutch Educational Council (2013), which contains recommendations for the Dutch educational system. This report details how, until then, policy initiatives to professionalize teachers were mainly focused on the 'exterior' of the profession, that is, on the status and respect of the vocational group, and less on the 'personal properties' of being a teacher: the attitude and skills of individual teachers in their daily teaching practice. In their report the Dutch Educational Council promises to focus more on personal properties and lists four recommendations to be used in the public debate and the ministerial policy making:

- "knowing what you stand for as a teacher and continuing the dialogue about it with others;
- complex workplace issues demand personal, thoughtful choices;
- teachers with a mission both utilize and create professional space;
- analytical, inquisitive teachers keep developing themselves" (p. 32).

It is noteworthy that a teacher's personal professional development can never be suspended, as the teacher performs in a complex and changing work environment. Moreover, inherent to being a teacher is that complex issues and dilemmas frequently occur, for which there is no one 'best' answer. According to the Dutch Educational Council, being able to reflect critically is key to achieving increasing professional and personal development. The Council's report (2013) emphasizes the fourth perspective, which focuses on the workplace to further the education of the teacher in training. The fact that the report exclusively concentrates on the professional development of the teachers, without considering the learning results of the pupils, however, is surprising. Although it is obvious that good teachers improve their pupils' results, this link is never explicitly made in the 2013 report. In the American perspective on being a good teacher, this dilemma, that either emphasizes learning results or the teacher as a learning professional, is explicitly mentioned.

The case the Educational Council made for attention to the personal properties of the professional also resonated at policy level, as the ministry started to initiate and subsidize induction programs. Induction programs are formal activities focused on the support of teachers who have just started (Beijaard, Buitink, & Kessels, 2010). In these induction programs, the aforementioned dilemma is clearly recognizable: 'attention for the learning results of the students or the professional development of the teacher'. The current induction programs in the Netherlands are focused on guiding a starting teacher's attitudes regarding good teaching, with the intended shift being from teacher-directed education towards a more learner-driven approach (Tigelaar, Dolmans, Wolfhagen, & Van der Vleuten, 2004).

In the teacher-directed approach the learning objectives, the way of working in the classroom and the feedback on the learning activities are mainly controlled by the teacher. When the students are given more room to participate, the situation becomes learner-driven. In the learner-driven approach, the learning process of the learner is key, which means more attention for the context, for the pupils' study skills and their critical reflection. The current induction programs are focused on a conceptual change in the minds of the teachers in training during their first employment. The intended change for these teachers is to adopt the desired concept of good education.

Because the learning process of the pupil is central to the learner driven concept, there is a growing consensus about increasing attention for the personal relevance of the material. This also applies to the teacher education itself, mainly to the experiences from the internships (Wideen, Mayer-Smith, & Moon 1998; Darling-Hammond 2006; Brouwer & Korthagen 2005). Personal relevance means that the teacher education offers room for a permanent interaction between theory and the individual practical experiences, which are guided by reflection. The result is a contextual training. Guskey (2002) notes that new experiences can sometimes trigger new ways of thinking. This means that the workplace can serve as a starting point for reconsidering and reconceptualizing a teacher in training's cognition regarding learning and educating. Consequently,

the context is relevant for any changes in the teacher's concepts. This means that in the Netherlands too, there is a development towards the fourth perspective, which is characterized by more focus on context, more critical reflection and more focus on the learning process of pupils.

Within the fourth perspective, in which the role of the workplace in educating teachers is the main focus, the construction of situated knowledge in teachers in training seems to be a widely accepted learning objective. When situated knowledge is being worked on, the various aspects of a development from beginner to expert, as they have been discussed in these paragraphs, need to be taken into account. The acquisition of situated knowledge occurs within a complex dynamic system, in which the context co-determines the learning process. And the other way around, the learning process also determines the context. A context that provides a lot of support for the learning process will enable a beginner to achieve at a higher level. On the other hand, the context, teacher-directed or learner-driven, has an influence on the development of the future teachers' concept of education. The context influences the principles on good teaching that a teacher in training develops. The result of such learning processes is of course also shaped by the design of the teacher education. The next paragraph, 2.4 will describe in detail how teacher education in the Netherlands integrates practical experiences into the training of teachers.

2.4 The core task of educating teachers: principles on good teaching

The next paragraph deals mainly with the third side of the dynamic, didactic triangle: the task. The task entails not just the actual assignments, but also the underlying theoretical knowledge that teachers in training study. In general, it concerns the study material and the way the curriculum is presented. As Grossmann notes, the plethora of pedagogies used in teacher education reflects the existing conceptions of teaching practices (2005). Even so, the curriculum that focuses on building situated knowledge can be split into smaller tasks. Two elements can be discerned: what and why.

The first of these is the *what*. What are the meaningful patterns that a teacher in training needs to acquire? This is part of the educational learning objective, which can be aimed at, for example, explaining or classroom management, or giving instructions. So, the first element describes the contents of the learning objective.

The second aspect is the *why*. It focuses on the way the teacher uses the learning objective to connect with his students, and which action patterns are best suited to achieve the contents of the learning objective. Such patterns can be represented by design patterns, as was described in paragraph 2.2.2.4. Design patterns have a situated nature which means that they are acquired in an actual teaching setting. Experiences in these settings can be made part of the task of the teacher in training through reflection.

2.4.1 The importance of higher learning objectives for reflection and loop learning

According to Zeichner & Lui there is still much conceptual confusion about what the term reflection means (2010). On the one hand, reflection is described as the compliant implementation of external directives. On the other hand, if one moves beyond the mere implementation, a teacher in training could reflect not only on the technical, but also on the personal, social and political aspects of teaching. In this thesis the experiences of teachers in training on personal aspects are seen as aspects of reflection. Moreover, reflection is described here as the process that allows experiences to be turned into meaning. This can, according to Bloom, be the result of a task with higher learning objectives (Kratwohl, 2002). Bloom specifies that learning occurs on six different levels, namely, *remembering, understanding, applying, analyzing, evaluating* and *creating* (Athanassiou & McNett, 2003). The first three of these levels mainly deal with factual knowledge and are considered lower learning objectives. The other three, *analyzing, evaluating* and *creating,* are considered higher learning objectives. Beginners, like teachers in training, have yet to develop their situated knowledge on these higher levels during their training. A teacher in training promotes his situated knowledge by linking theoretical knowledge, practical experiences and relevant knowledge of the situation. This linking transpires mainly at higher levels, because by *analyzing, evaluating* or *creating,* a teacher in training associates factual knowledge with a practical situation. By creating links between this knowledge and various situations, a teacher in training can learn to be effective (Onstenk, 1997). A novice can adopt such situated knowledge, because by *analyzing, evaluating* and *creating,* he can gain insights into his own actions in practice as well as the actions of an expert. Because the teacher in training structures his way of trying to understand, analyze and give meaning to his experiences, this process is considered reflection.

In the teacher education program, higher learning objectives act as catalysts for the process of reflection. The curriculum should contain a task with a higher learning objective that focuses on reflection on the individual teaching practice. Korthagen & Vasalos (2005) state that someone is reflecting when he attempts to bring structure to, or bring new structure to an experience, problem, or existing knowledge. This emphasizes the central role of forming (new) mental structures in the individual's learning process. The 'onion-model' that Korthagen uses, which places identity on the inside and actions on the outside (of the onion), illustrates that reflection incorporates a connection between a person and a context. This illustrates that the underlying principles of good teaching that a teacher in training will acquire, have an impact on learning how to teach.

Within the teacher education, the process of reflection is often described as loop learning, according to the three orders of learning of Argyris (Argyris, 1996; Nicolaides & McCallum, 2013). According to this model, learning arises when a beginner enters a situation in which the need to learn something is felt

(Argyris, 1996). This may occur when the solution that was used until then, proves to be insufficient for solving the problem. In these situations, three kinds of processes may occur (Argyris, 1996). The first is improving the current solution, the second is gaining new insights to create a new way of approaching the problem, and the third is transforming one's identity, which allows the beginner an insight into his desires and goals (Argyris, 2002). In addition, these orders form loops: when a solution in the first of order proves inadequate, the teacher in training shifts to the second learning loop. And, in turn, when the learning result of the second loop has been put into practice and also proves inadequate, the third loop comes into play. For example, a teacher might tell a student not to drink coffee in the classroom. In doing so, the teacher might learn to better describe unwanted behavior. He might then notice that it is more effective to focus on desired rather than unwanted behavior. Here, he is using principles and therefore the second loop. In the end, he decides not to bring coffee into the classroom himself, because he realizes that leading by example is better than imposing rules. To promote teachers in training to move through these loops, the curriculum should contain learning tasks that are focused on reflection.

Learning in the first order aims at improving the actions in a familiar situation. By recognizing mistakes and correcting them, the beginner learns to improve his actions. This kind of learning will, therefore, not happen in new, unfamiliar, situations, but exclusively during routine activities in familiar situations. Likewise, the second order of learning means that a beginner reflects on his own actions, and subsequently adjusts them. This second order of learning takes place mainly when the problem in the situation is not immediately recognized, and the usual solution does not immediately work. New insights, like new educational purposes in the situation, and new actions that apply to it, come into play. The third order of learning focuses on recognizing and considering one's assumptions. The learner reflects on his own thought patterns and actions, recognizes or renovates action patterns, and analyzes his actions (Schön cited in Boonstra, 2000). Because of this, the third order of learning touches the identity of the teacher in training.

Describing reflection as learning in loops of ascending order has various advantages, in particular with regard to teacher education. First, the importance of learning skills and actions on a level that goes beyond mere first-order-learning, is recommended by several authors. For professionals in general, Knowles, Holton and Swanson (2005) state that: "the most *effective* practitioners, and learners, are those who are good at *reflection-in-action* and *double-loop learning*". This form of reflection that relates to 'the stretching of cognitive frames' has a purpose: reforming the practitioner's thoughts", according to Benammar, Van Schaik, Sparreboom, Vrolijk and Wortman (2006, p. 17). This means that the cognitive frames are expanded, using new elements. Secondly, the distinctions between various loops offer guidelines to reflect at a deeper level than merely on actions and skills (Van den Bos & Brouwer, 2014). To train effective professionals, a trainer needs to enable them to not merely reconsider their actions, but also

their principles and identity. This means that reflection in the second and third loop needs to be facilitated by the teacher education, by adding tasks to the curriculum that contain higher learning objectives. The next section discusses how video may be used to enhance the desired reflection process.

2.4.2 The potential of video within the learning task

Video is a rich medium that, for several reasons, is suitable for teachers in training to link complex real-world classroom situations to the learning tasks in the curriculum of their training (Copeland & Decker, 1996; Geerts, van Laeken & Wouda, 2010). Specifically, how can images of a practical situation encourage a teacher in training to reflect on his actions using the three loops described above? For instance, why did the teacher in the video perform the way he did in a particular situation? This reflection allows teachers in training to recognize meaningful patterns, with the aim of constructing situated knowledge.

First, the lifelike practical examples that can be seen in video cases make sure that beginners have a better understanding of the kinds of situations they can expect in the classroom (Copeland & Dakar, 1996; Geerts & van Laeken, 2006). Video cases are multi-layered because they are realistic depictions of the situation. The layers illustrate the various events that occur simultaneously in any situation (Monroe-Baillargeon, 2002). Second, video cases offer the opportunity to link the theoretical knowledge that was studied to practical situations (Carlson & Falk, 1990). Third, video cases allow beginners to be more flexible in response to unforeseen classroom situations (Kinzer & Risko, 1998). Fourth, several additional advantages besides the opportunity to see teachers in action while retaining the holistic context: a situation can be observed multiple times, so that different aspects may be paid more or less attention to on repeated viewings, and a video will record both verbal as well as non-verbal elements. Fifth, teachers in training can, through video, experience how various events influence the teacher's, as well as the pupils' behavior simultaneously. This experience arises from a combination of focusing, repeating (Perry & Talley, 2001) and being exposed to different perspectives (Monroe-Baillargeon, 2002). Video cases have a positive influence on the process of professionalizing beginners, as they create meaningful educational experiences (Fukkink, Trienekens & Kramer, 2011). In conclusion, video cases can be a powerful instrument to employ a real, complex teaching setting for learning tasks, and allows teachers in training to reflect on three learning loops.

Of course, a teacher education could arrange for a teacher in training to visit a real class as an observer. In recent years, such visits have become more common in the form of lesson studies (Dudley, 2013). Still, video cases are much more practical in use. Furthermore, a confrontation with a real-world educational situation is oftentimes simply not feasible.

Despite the potential advantages of video, there has been little knowledge about the effective use of video cases at the teacher education (Blomber, Renkl,

Sherin, Borko & Seidel, 2013). General guidelines and principles for powerful multimedia learning environments offer several suggestions, which together form a guide for organizing reflection during, for example, pedagogical or didactical courses taught at a teacher education. Most of these guidelines focus on recognizing meaningful patterns, for example in the guide made by the Cognition and Technology Group at Vanderbilt (1993a). Their seven rules are exemplary for many current guidelines for powerful multimedia learning environments focused on situated knowledge:

Rule 1 *Video-based presentation format*: video is used in the learning environment.

Rule 2 *Narrative format*: the information in the video is put into a narrative. Learners gain a better understanding when the information is narrative, which adds meaning to the context (Smeets, 1996).

Rule 3 *Generative learning format*: pupils are instructed to come up with a solution for the material themselves, which can motivate them. It is fun to cooperate while thinking of a solution. This rule also aims to involve learners in their own learning process. Learners also benefit if they generate information and solutions for a learning task (Belli, Soraci & Purdon, 1989; Slamecka & Graf, 1978; Soraci, Bransford, Franks & Chechille, 1987). The field of teacher education requires a video task to offer the teachers in training the opportunity to reflect on the deeper layers, as described in paragraph 2.4.1.

Rule 4 *Embedded data design*: an assignment setup with all the information needed for solving it is embedded in the narrative, without being explicitly being indicated as such. The problem is only posited at the end. Afterwards, the pupils go back to find the information in the narrative.

Rule 5 *Problem complexity*: pupils attempt to solve complex problems by being confronted with them. It is important to present real, complex problems, while also presenting them in different contexts so that transfer of the learned knowledge is promoted.

Rule 6 *Pairs of related adventures*: here, the material is offered in conjunction and not in loose stories or parts.

Rule 7 *Links across the curriculum*: the information contained in the stories is not limited to a single subject area, but offers possibilities to be linked to other subject areas.

Admiraal & Berry (2013) endorse the open character of these guidelines to reach, using video images and meaningful reflection. Indeed, a key point in the guidelines is recognizing meaningful patterns. The teacher trainer's challenge is to design a course with cases in a way that allows the teacher in training to have a meaningful learning experiences. In addition to the quality of the cases, the quality of the way they are taught is also relevant. One group of researchers found that the way the assignments are structured, either highly or loosely, has no effect on the learning effect (Hummel, Geerts, Slootmaker, Kuipers & Westera, 2015). Again, the

explanation for this might be that the research was not focused on situated knowledge. Calandra, Gurvitch and Lund (2008) found that teachers in training analyze cases only superficially if they had minimal guidance. In addition, the reflection process that followed it was also superficial. For example, the conclusion that "the teacher is not prepared", does not contribute to the recognition of meaningful patterns (Mansvelder, Beijaard & Verloop, 2007). In this reflection, a direct link between the various elements or processes in the case is lacking. This finding conforms to recent findings that found that guided inquiry learning works well. Inquiry learning assumes an active role of the teacher (van Vondel, Steenbeek, van Dijk & van Geert, 2017). In blended learning, a substitute for the active teacher might be a virtual teacher, or avatar, to promote thorough reflection (McGee & Reis, 2012). The kind of situated knowledge teachers in training should acquire by reflecting on video cases will be detailed in the next paragraph.

2.4.3 Situated knowledge: educational purposes and design patterns as a challenge

The pattern can only be recognized once the viewer realizes which educational purposes the teacher in the case trying to achieve with the pattern. Educational purposes are the sum of constantly changing process goals that the teacher sets for himself to have the lesson progress in a way he deems best (Copeland and D'Emidio-Caston, 1998). For example, the teacher should be aware of the level of the students' participation in the classroom, or whether the notes on the whiteboard are visible the entire class. This is different from a learning objective of a lesson, which, for example, is *learning to apply the Pythagorean theorem*. Educational purposes provide a teacher with guidelines as to why a particular action pattern is employed. This answers the second part of the question *what will I do and why*. The importance of educational purposes can be illustrated by analyzing the process of pattern recognition. Interactions in a class full of students are characterized by meaningful patterns, which are recognizable and repeatable patterns of actions and interactions. These interactions determine the progress and result of their learning process. Whether these interactions are recognized by the teacher in training depends on three components (Sherin & Van Es, 2005).

First, the foremost interaction in the classroom situation should be determined. As there are many simultaneous interactions, deciding which one to focus on is essential. To illustrate: two pupils of a secondary education Montessori school are fighting over a book, resulting in pages being ripped. If the teacher fails to pay attention to this interaction, the rest of the class will soon display similar behavior, as can be seen in the video recording of this situation.

Second, the ability to make connections between the observed classroom situation and the broader principles of teaching is the second important aspect of recognizing patterns. In the case of the torn book, near the end of the video described above, two students are shown who feel responsible for the damage to the other student's book. The teacher of the Montessori school uses the principle of personal

responsibility to find a solution and pay for the book. His does not dictate a solution but his role is mainly offering guidance. This process depends on making a link between the workplace situation at hand and theoretical knowledge on teaching.

Thirdly, noticing these interactions makes that the teacher can recognize certain interaction patterns and link them to specific classroom situations (Sherin & Van Es, 2005). In this example recorded on video, the teacher chooses not to pay any attention to the incident with the torn book, because he has experienced that the lesson's momentum is presently more important. His strategy is to revisit the incident later on, so that his pupils are given a chance to solve it among themselves.

For teachers in training to learn to recognize and verbalize educational purposes and to support their pattern recognition, it is important for them to practice. Practicing can be supported by interviewing the teachers in training about their use of the eight principles. Copeland and D'Emidio-Caston (1998) refer to them as principles because they are directive in choosing which actions to take. These principles unveil like no other which educational purposes and corresponding meaningful patterns are used by an experienced teacher intuitively and immediately in his teaching.

A teacher in training who has insufficient knowledge of these educational purposes, and is unable to recognize the underlying patterns, can learn by reflecting on the basis of these principles. The first principle here is called 'guiding principles'. Guiding principles become apparent when a teacher in training, in response to a video case, is asked what needs to happen in that situation. The second principle is 'educational goals for the student'. The teacher in training gives a statement regarding the intended learning objectives for the student. For the third principle, 'action links', the teacher in training indicates the relation between the teacher's actions and the subsequent behavior of the students. The fourth principle is 'practical generalization'. Here, the teacher in training relates the teacher's actions to didactical knowledge on teaching and learning. The actions are mainly focused on the general situation in the classroom. The fifth principle is 'theory links': the teacher in training links the practical situation with the theoretical knowledge that he studied. 'Negative value judgment' is the sixth principle. The teacher in training indicates why an action is not desirable in the situation. The seventh principle is 'justified changes'. The teacher in training makes suggestions of a course of action different from the one shown in the video case. The eighth and final principle is 'positive value judgments', where the teacher in training has positive feedback on the actions of the teacher in the video (Copeland & D'Emidio-Caston, 1998).

A study assignment that includes reflection might assist the teacher in training in recognizing what constitutes the effective actions. So, one way of making the educational purposes visible that an expert teacher chooses to have the lesson unfold in the way he deems best, is reflecting on video cases during the teacher education. By recognizing the constantly changing educational purposes, it becomes clear which meaningful patterns the experienced teacher in the video is using.

What constitutes adequate action is determined firstly by the educational purposes of the teacher and the underlying question what will I do and why? Whether he can carry out these educational purposes depends on the quality

of the design patterns that he can use. A design pattern is a solution pattern for a recurring problem, that the teacher can put into practice (Alexander et al., 1977; Goodyear et al., 2004). Design patterns are internalized forms of educational knowledge and experiences, in the form of action patterns that steer the solving of recurring problems. They consist of a structure of heuristics. Internalizing a design pattern happens in conjunction with on the one hand, what the physical body and senses experience (embodied), and on the other hand, interaction with the environment (embedded and distributed). This means that acquiring a design pattern is based on situated cognition, and the design pattern itself consists therefore of situated knowledge. A solution pattern is considered situated knowledge, because its application is tuned for a specific situation, and its execution is triggered by that situation. A design pattern offers guidelines for a teacher's actions in a particular situation: *what* will I do?

In conclusion, a teacher in training watching such videos can make the situated knowledge that is used in them, together with the associated connections between practical situations and the broader principles of good teaching, visible in his learning assignment. This assignment must contain higher learning objectives that are focused on reflection. Reflection can occur on the three levels of loop learning that were described. The reflection can be supported by asking the teacher in training about the abovementioned eight principles of Copeland & D'Emidio-Caston. A teacher in training can, of course, only interiorize the competent teacher behavior if this falls within his *zone of proximal development*.

2.5 Conclusion and research design in brief

2.5.1 Conclusion

The way teachers are taught general teaching skills to allow them to make good decisions in complex situations, often using vague information, is a complex process, and this process can be described using a dynamic, didactical triangle. It consists of the teacher trainer, the teacher in training and the task (of training the teacher in training). Interaction between these three is continuously occurring.

The development of the teacher in training can best be described as a complex dynamic system. He needs a way to recognize meaningful patterns and store information in his teaching practice to react to them effectively. He does so by making increasingly use of internalized forms of experience and educational knowledge in the form of action patterns, or design patterns. These serve as a solution pattern for a recurring problem and are linked with a specific situation. Design patters are not easily transferred because they are the result of situated cognition, which occurs in interaction with the situation in which thought processes take place. A teacher in training's cognition is situated because it is bound to the interaction between his body and the physical environment in which the interaction takes place. The design patterns that are formed as a result of this situated cognition

help the teacher carry out his lessons using his educational purposes, which are the sum of constantly changing process goals that the teacher sets for himself to have the lesson progress in a way he deems best.

The current dominant perspective on training teachers concentrates on context, critical reflection and the learning process of pupils. The teacher trainer, who designs the teacher education and sets the learning process of the teacher in training in motion, is influenced by this societal perspective on good teaching. Because of the focus on context and reflection, situated knowledge can be acquired by teachers in training.

The task of teacher education is most effective when it includes higher learning objectives and reflection on three loops. This *task* entails not just the actual assignments, but also the underlying theoretical knowledge that teachers in training study. Reflection, the way experience is turned into meaning, can be achieved by stating higher learning objectives. And the teacher in training's reflection is most fruitful when he not only considers his actions (loop one), but also his new insights (loop two) and his own identity (loop three).

Videos of real-world classroom situations are rich and detailed and can therefore be used to allow teachers in training to reflect on the three loops. By designing a learning assignment that combines such a video with educational purposes and design patterns, a teacher in training is able to recognize the situated knowledge that is used by the teacher in the video. Video cases, as has been stated before, are especially well-suited for study assignments, as they allow for reflection on real-world situations and thus contribute to the acquisition of situated knowledge in the form of educational purposes and design patterns.

Based on these views on expert development, this thesis focuses on the question whether video offers an opportunity to create a learning environment task that enables teachers in training to gain situated knowledge. How this environment, and the accompanying learning tasks, are constructed, is determined by the interplay of three actors in the dynamic, didactical triangle.

If the teacher education succeeds in implementing a curriculum that improves a teacher in training's situated knowledge, their situated knowledge will grow with each year of training. Figure 3 below shows, in a cone shape, the desired growth of situated knowledge, which includes educational purposes as well as design patterns. Growth, in each of the displayed subsequent years is symbolized by the growing dimensions of the cone. The vertical rod symbolizes a consistent amount of provided learning assignments, supported with video recordings of practical situations, from the various years of study.

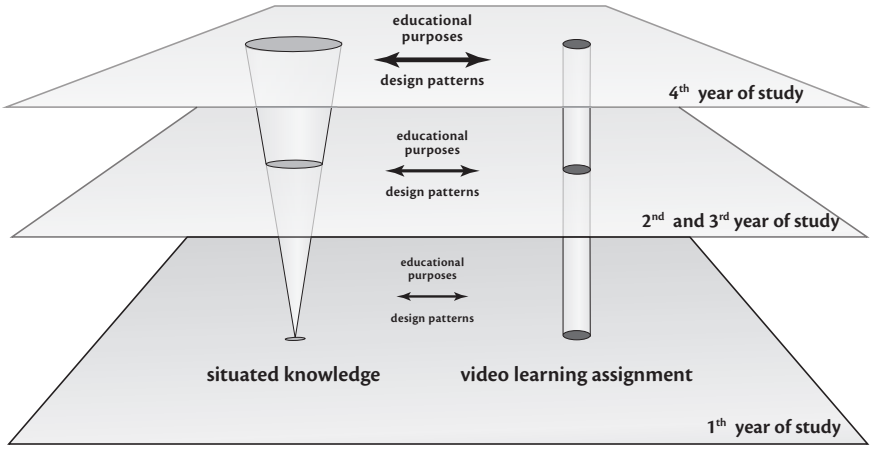


Figure 3
Optimal growth of situated knowledge in the form of educational purposes and design patterns during the teacher education.

2.5.2 Research design in brief

To further explore the potential suitability of an assignment supported by video cases, this thesis contains a literature study and three empirical studies, which are specifically focused on the second-degree teacher education.

The main question is: what role can video cases play in a teacher education study assignment aimed at building situated knowledge? In the following sections, four subquestions will be focused on:

- Are video cases used to achieve higher learning objectives when training teachers? This will be done using a literature study, more specifically by scanning internationally published articles for '*intended*' or '*achieved*' learning objectives.
- Does the second-degree teacher education offer courses that focus on acquiring situated knowledge? To determine whether this is a generally accepted learning objective, eleven accredited (NVAO) second-degree teacher education institutes' tests have been analyzed. Subsequently, whether their test questions contain higher learning objectives or authentic problems, has been determined.
- Does the use of video cases in a second-year teacher education course on classroom management contribute to the development of situated knowledge? This has been examined by comparing the results of two groups of second year teachers in training in this course, one (experimental group) having examined a case with video cases, the other a case without (control group).
- Does the situated knowledge of a fourth-year teacher in training correspond to the situated knowledge of a starting expert? This has been researched by having pairs of fourth-year teachers in training create a written advice for the main character in a video case of their choice, followed by an interview with both students and an individual interview.

The video-cases that were used in the third and fourth empirical study, were taken from the case database Didiclass, which contains authentic video fragments. Video cases such as these are suitable as a primary information source when designing learning environments. The video cases deal with a single theme from a real-world classroom, while retaining multiple perspectives. The recordings are, in this way, completely authentic. Since the Didiclass database was created in 2002, the second-degree teacher education in the Netherlands has had great interest in the use of such video cases. Despite the timestamp on the material, it is still useful and highly wanted. This interest is evidenced by the use of videos at all second-grade teacher schools, and the numbers of visitors at the then yearly Didiclass user days and the product evaluation commissioned by the Ruud de Moor Center of the Open University and published by the ITS Institute of Applied Sociology (Van Kuijk & Stéfanie, 2009). Nowadays, DvDs Didiclass are still highly requested as is shown by the weekly orders on the Didiclass website.

3

Video Cases in Teacher Education: A review study on intended and achieved learning objectives by video cases

Abstract

This literature review focuses on the use of video cases in the education of teachers in training as a means of achieving higher order learning objectives that are necessary for gaining situated knowledge. An overview of both intended and achieved learning objectives in relevant studies involving the use of video cases is provided, which shows that video cases are indeed being used with the intention of achieving learning objectives. It is found that the number of intended lower learning objectives is more or less equal to the number of intended higher learning objectives and it can therefore be concluded that video cases are used for a mix of both lower and higher learning objectives. Further, since the number of achieved learning objectives was close to the number of intended learning objectives, it can be confirmed that combined higher and lower learning objectives were achieved. The difference that was found between intended and achieved learning objectives indicates that educators are still searching for ways to achieve higher order learning objectives. Therefore, further research is needed to explore how video cases can be fit into the teacher education curriculum to achieve the highest possible yields in terms of learning objectives.

Keywords: *video case; pre-service teacher; education; learning; literature review.*

3.1 Introduction

Teachers deal with a wide array of situations in the dynamic environment of their everyday teaching practice. In order for teachers in training to be prepared for the complexity of teaching in this dynamic environment, it is essential that they acquire knowledge that helps them decide on how to act in specific situations while at

the same time properly educating their pupils (HBO-raad, 2011; Plecki, Elfers, & Nakamura, 2012; Stronge, Ward, & Grant, 2011). This kind of knowledge, which allows teachers to choose a correct way of handling specific teaching situations, is also known as situated knowledge. Situated knowledge is knowledge that results from cognition that *takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place* (Roth & Jornet, 2013). Situated knowledge contains pedagogical content knowledge and is ideally both embedded and embodied, as will be explained below.

Pedagogical content knowledge combines knowledge of the subject that is being taught and pedagogical knowledge. It enables teachers to understand how specific content is organized and how it can be presented in a way that suits the interests and abilities of their pupils (Even, 1993; Saeli, Perrenet, Jochems, & Zwaneveld, 2012; Shulman, 1987). Effective teachers are both pedagogues and experts in their subject (Keijzer & Kool, 2012; Shulman, 1987).

If the teaching context can be defined clearly, the retrieval of this knowledge is relatively simple. For instance, the teacher has to prepare a lesson for tomorrow and is able to successfully do this because the teacher knows his pupils and knows how to present the subject in a way that caters to the needs of his pupils. However, in an unforeseen and complex teaching context it is often quite difficult, if not impossible, for teachers in training to immediately reflect on previous knowledge of facts and strategies that might help them to adequately operate in this particular context. An example of such a complex teaching context is a classroom disturbance. Most experienced teachers will know how to react in an adequate way, but they do not necessarily have to retrieve an explicit strategy on how to deal with this disturbance before they start acting. Their actions are intuitive, that is to say, based on the interplay of their own teaching experience and the material resources of the current teaching context (Nonaka, Toyama, & Konno, 2000). This means that experienced teachers use their e*mbedded knowledge*, which is knowledge that is supported by and partially represented in the complex patterns of interaction with the context, for instance in the form of tools that are typical parts of the context in which a particular form of knowledge is required. Every experience with classroom disturbances, for example, helps shape the teachers' concept of the many forms of classroom disturbances and leads to a development in their embedded knowledge.

Embedded knowledge contains forms of explicit knowledge but is mostly implicit. Explicit knowledge is knowledge that can be retrieved from memory and is formulated explicitly, for instance in the form of guidelines that teachers can verbalize. *Implicit knowledge* is the ability to act a certain way in a particular context in which this behavior is functional.

In addition to developing embedded knowledge, which is mostly implicit, teachers should also ideally develop embodied knowledge. *Embodied knowledge* is gained by 'doing', by actually physically being present in the teacher context (Blumentritt & Johnston, 1999; Lam, 1997). That is why such knowledge can only be developed by contextual experiences (Blumentritt & Johnston, 1999;

Smith, 2005). Contextual means that they are experienced in real-world, that is, workplace situations. As experienced teachers deal with contextual, real-life classroom situations on a daily basis, their embodied knowledge is often far greater than that of teachers in training. However, since this kind of knowledge can only be developed by personal, physical experiences, it is quite difficult to pass on to others (Blumentritt & Johnston, 1999). Similar to implicit embedded knowledge, embodied knowledge depends on the situation and on the experience that a teacher has acquired. Embodied knowledge includes the teacher's experiences with carrying out particular strategies that have been internalized. In the case of classroom disturbances, for example, a useful strategy could be moving into the physical proximity of the troublemaker. By actually putting the strategy into action and experiencing it, the teacher in training will be able to recognize and act on such situations in the future (Clark, 1997). Recognizing disturbances at an early stage is important in order to act on them.

To conclude, experienced teachers make use of situated knowledge, which is primarily embedded, embodied and implicit but based on internalized, theoretically interpreted experiences. Teachers in training, who have limited practical experience, still need to develop this situated knowledge, which is quite a challenge. As stated earlier, situated knowledge is knowledge that results from cognition that *takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place* (Roth & Jornet, 2013).

3.1.1 The role of higher-level learning methods and objectives in the acquisition of situated knowledge

In order to teach teachers in training how to develop situated knowledge, teacher educators should set learning objectives that explicitly address the situated nature of this knowledge. Apart from determining the knowledge domain of the learning objective, educators should also clearly indicate at what level the learning objective should be mastered. The focus of the instruction for the acquisition of situated knowledge should revolve around learning objectives such as analyzing and evaluating complex teaching situations. Analyzing and evaluating are useful higher order learning methods for the development of situated knowledge in teachers in training. They provide them with an opportunity to think critically about the practice of teaching in connection with theoretical concepts and strategies, which helps them prepare for their own future teaching practice (Yung, Wong, Cheng, Hui, & Hodson, 2007). All this has to be done in the context of building knowledge that is situated, that is to say embedded, embodied and in the end implicit.

The internationally most used taxonomy for the classification of learning objectives and the related methods in teacher education is the Bloom taxonomy (Athanassiou, McNett, & Harvey, 2003; Furst, 1981) which has been revised by Krathwohl (2002). This taxonomy consists of a hierarchy of six levels at which learning objectives can be mastered in a cognitive domain: *remember, understand, apply, analyze, evaluate,* and *create*. In Table 1, examples are given for each of the learning

objectives. The hierarchal composition indicates that the lower order learning objectives *remember, understand* and *apply* are the basis for achieving the higher order learning objectives *analyze, evaluate* and *create*. Lower order learning objectives, such as the reproduction of knowledge, are therefore not separate objectives, but means of achieving higher order learning objectives as well as situated knowledge.

Determining the level of mastery of teachers in training helps teacher trainers accurately describe the behavior that teachers in training should be able to show when they have achieved the learning objective set by the teacher trainer. It is a first step in choosing the right learning methods to reach a certain learning objective. Exercises that aim to achieve these higher order learning objectives will not only help teachers in training *remember, understand* and *apply* knowledge (lower order learning levels), but will also challenge them to *analyze* and *evaluate* the situation and to come up with their own solution for the problems they are faced with (higher order learning levels) (Simons, 1999). Teachers in training need to reach higher levels of mastery in order to acquire the necessary knowledge for performing effectively in the complex teaching practice. This knowledge must become situated, that is to say, embedded, embodied and largely implicit but rational.

3.1.2 Video cases as a means of achieving higher order learning objectives

Using written cases as a means of helping students deal with complex situations, was first implemented by the Harvard Law School in 1870. By showing the students cases, they were confronted with unfamiliar, complex situations (Garner, 2000). This made Harvard the first educational institute to offer education that included case activities. The trend spread to other fields of education for which students were required to make decisions in complex situations, such as teacher education. A recent development in the area of cases in education is the use of video cases. Research is carried out in teacher training programs into the effect of video cases on learning outcomes. However, the relationship between the use of video cases in teacher education, reaching higher order learning objectives and dealing with complex situations, has not yet been clearly documented.

Video cases present information in a holistic and contextual manner. Holistic means that the filmed situation is presented as a whole, including aspects of situatedness because it gives the viewer an embedded and embodied experience, a process that will be outlined below. This way, watching a video case corresponds with the way in which real teachers are confronted with situations with situated pedagogical and didactical dilemmas and decisions that require a quick response based on events that are often vague. It has been shown that this is not possible with a written case (Blijleven, 2005). By watching video cases and making use of their own theoretical knowledge, teachers in training are able to analyze specific real-life teaching situations and discover how an experienced teacher deals with these circumstances (Blijleven, 2005; Kurz, Llama, & Savenye, 2004). By watching real life situations in which a real teacher interacts with real students, teachers in training can identify with the videotaped teacher in the class and with the videotaped situation,

which creates a form of embeddedness and vicarious embodiment that a written case is probably not capable of doing. In contrast to a real workplace, a video case allows teachers in training to step out of their role as a teacher and study the video-taped teacher activities objectively and 'from a distance' (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008; Van Es & Sherin, 2002). The analysis of video cases contributes to the students' belief that they can acquire the skills, knowledge and attitudes necessary to effectively function as a teacher as well (Shulman, 1992). This means that the use of video cases could be an excellent way of helping teachers in training develop situated knowledge, even though physical experience in the teaching context of course remains important as well.

There are a few prerequisites for the use of video cases: research indicates that video cases should be relevant to the field of expertise, but above all that the case should be carefully embedded into the curriculum (Moreno & Valdez, 2007; Van den Berg, Wallace, & Pedretti, 2008; Yung, Wong, Cheng, Hui, & Hodson, 2007). Video cases that show examples of specific teaching situations in a holistic and contextual way can help teachers in training acquire situated knowledge only if teacher educators formulate learning objectives and levels that fit the content of the case and the curriculum. It has not yet been empirically documented if and to what extent video cases are being used in teacher training classes to achieve these higher order learning objectives.

To conclude, the advantage of video cases is double: first of all, not being part of the case has an advantage in that it facilitates the achievement of higher order learning objectives by means of analysis and reflection. But second, video cases afford for a form of vicarious bodily involvement that makes them suitable replacements for the real experiences, if such real experiences are not practically feasible. So, video cases can provide possibilities for anticipating the real embodied experiences in the real embodied context as a way towards establishing embodied knowledge.

3.1.3 Aim of this study

The aim of this study is to determine whether the holistic character of video cases is being utilized to contribute to the achievement of higher order learning objectives and thereby the development of situated knowledge. The research question of this review therefore is: 'Are video cases being used for achieving higher order learning objectives for teachers in training?' Since achieving higher order learning objectives is an important part of acquiring situated knowledge, it is presumed that teacher trainers set higher order learning objectives for their students to help facilitate the acquisition of situated knowledge. The current review study focuses on whether such higher learning objectives are indeed mentioned in literature that reports on the effect of the use of video cases. Based on existing literature that demonstrates the effectiveness of video cases, the first question is: 'Are video cases used to primarily achieve intended higher learning objectives, intended lower learning objectives, or an intended mix of both?' The second question is: Have the higher, lower or combined higher and lower learning objectives that were set for use with the video cases in the literature been achieved?

3.2 Method

3.2.1 Selection of the articles

This literature review provides a selection of articles about video cases that were published between 2000 and 2012[1]. The year 2000 was chosen as a starting point because the production and use of video has become relatively simple since that time, due to technological developments. The following five criteria were used in the selection of the articles: (1) the article must be about the use of a video case; (2) the article must be about teacher education; (3) the article must contain descriptions of intended and/or achieved learning objectives; (4) the video case must be about someone other than the respondent (a teacher in training), unless the case is viewed by a group of respondents which includes the main character from the case; and (5) the article was published between 1 January 2000 and 30 April 2012. The articles were retrieved from three databases: ERIC, SpringerLink, and Sage. These databases were chosen since they are known for containing a large number of education-related articles. By using multiple databases, articles from different fields of research and various continents could be selected. The following search terms were used: 'Video case', 'Pre-service teacher', 'Education', 'Method' and 'Teacher education'. These terms are based on keywords that are commonly used in journals and articles on the use of video cases in teacher-training education. This search resulted in nineteen articles that matched the criteria described above. An overview of these articles can be found in the Appendix.

3.2.2 Categorization of Learning Objectives

Each article was assessed independently by two researchers, who ascertained the intended and achieved learning objectives mentioned or implied in the text. Consensus reached by both researchers was used to increase the reliability of this judgment.

Krathwohl's revised Bloom's Taxonomy (2002), a generally accepted taxonomy, was used to categorize the learning objectives, see Figure 1.

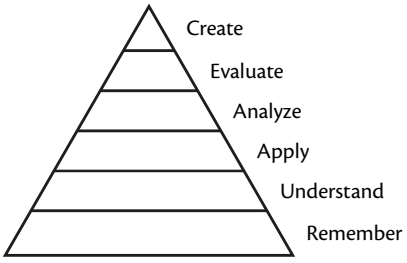


Figure 1.
Revised Bloom's taxonomy (according to Krathwohl (2002)).

[1] This article was presented on the EAPRIL 2015 in Luxembourg City. For the presentation "Assessing situated knowledge in secondary teacher training by using video cases" a sample of articles published between 2012 and June 2015 was compiled. From this sample, it was concluded that the published articles did not significantly deviate with respect to the division of reported learning objectives between 2000 and 2012.

However, the learning objectives described by the articles only contain a description of the content knowledge, and not an explicit description of the mastery levels according to the Bloom taxonomy. From the description of the learning objectives however, it became clear that the learning objectives could be traced back to the taxonomy. For example, if the verb *analyze* was mentioned in the learning objective, then it was allocated to Bloom's *analyze* level of mastery. Most studies specified the learning objectives that might be achieved by the use of video cases (intended learning objectives) in advance. The intended learning objectives were found in particular in the sections 'Introduction' and 'Method'. In contrast to the intended learning objectives, the achieved learning objectives were mostly found in the sections 'Results' and 'Conclusion'.

A pilot analysis revealed that a few learning objectives found in the articles could not be placed in Krathwohl's taxonomy. This was especially the case with learning objectives concerning *reflection* and *noticing*. For this reason, the data involving reflective learning objectives presented by these articles have been categorized into a separate category: *reflection*. A number of learning objectives explicitly identified as *noticing* could also be found within the identified learning objectives. According to Van Es and Sherin (2002), noticing consists of three parts: Determining what is important within a teaching situation; making connections between specific features of classroom interactions and the teaching and learning principles to which they belong; and thinking about classroom interactions in context, based on one's own knowledge. When it came to categorizing *noticing*, the question arose whether or not it could be placed in the revised Bloom's Taxonomy (Krathwohl, 2002). It seemed at first that *noticing* could be placed in the *analyze* category, because analyzing is about recognizing patterns, among other things. However, further examination of the articles showed that learning objectives in the area of *noticing* are described as seeing certain aspects of the lesson without drawing conclusions. It was therefore decided not to place the *noticing* learning objectives in the *analyze* category, but instead to make another separate *noticing* category in the classification scheme. However, both *reflection* and *noticing* are part of a collection of higher learning objectives without exactly matching one of the three higher learning objectives in Bloom's taxonomy. In Table 1, examples are given for each level of the revised taxonomy of Bloom, including the added reflection and noticing categories.

Level of revised Bloom Taxonomy	Example
Create	Proposing alternative strategies (article 13)
Evaluate	Critically examining teaching practice (article 9)
Analyze	Analyzing teaching from multiple perspectives (article 5)
Apply	Applying theoretical concepts in simulated classroom situations (article 3)
Understand	Understanding the theoretical principles that have been learned (article 11)
Remember	Remembering more details about the implementation of the teaching strategy (article 2)
Reflection	Learning to reflect in a more efficient way (article 5)
Noticing	Attending to important elements of teaching (article 14)

Table 1
Examples of Learning Objectives Found in Studied Articles

3.3 Results

3.3.1 Overview of the Identified Learning Objectives

In Table 2, the frequency of appearing in Bloom's taxonomy is indicated for both intended as well as achieved learning objectives.

		Intended learning objectives		Achieved learning objectives	
Category		Including underlying	Highest order	Including underlying	Highest order
Create	H	3	3	5	5
Evaluate	H	9	6	11	6
Analyze	H	18	9	23	12
Apply	L	28	10	30	7
Understand	L	36	8	50	20
Remember	L	43	7	55	5
N		137	43	174	55

Table 2
Summary of Learning Objectives in the Articles Fitting Bloom's Taxonomy

This Table 2 consists of four columns. The first and third column indicate the amount of learning objectives that have been found to fit a particular category. For instance, at the top of the table is indicated that the learning objective create appears three times in the first column for intended learning objectives, and five times in the third column for achieved learning objectives. Further, there are 18 instances of the learning objective analyze for the intended learning objectives in column 1, and 23 for the achieved learning objectives in column 3.

It is important to know that higher order learning objectives cover all underlying categories. In order to determine how many higher order learning objectives can be fit, for example, within the evaluate category, the number of learning objectives in the category at the next highest level (in this example the create category) must be inferred. This is done in column 2. Whenever something is created by an individual, he will also know, understand, apply, analyze and evaluate the material in question. So, if a teacher in training creates a lesson plan with suggestions for classroom management, he will not only be required to know the concept of classroom management, but should also be able to apply it on all the taxonomy levels in between. It can be assumed that for a learning objective in the top category, all underlying learning objectives have been achieved as well. To determine the highest number of unique learning objectives in a category, the same number of unique learning objectives for the next highest category should be deducted. Therefore, the evaluate category in the second column contains (nine minus three) six learning objectives. For example, there were three studies that involved teachers in training achieving the learning objective create. This means that the underlying objectives from evaluate to remember have also been reached, as the higher learning objectives always cover all underlying objectives. The total number of times that evaluate was achieved in the studies was nine, but it was the highest order learning objective in only six studies, since three of the achieved objectives still belong to the aforementioned three times that create was the highest order learning objective. This procedure was used for each of the six learning objectives.

Table 3 contains findings on the additional categories reflection and noticing. They are additional because they do not fit one-to-one to Bloom's taxonomy. It is clear, however, that both are part of the higher learning objectives because both reflection and noticing always require analysis, which is the lowest of the higher learning objectives on the taxonomy. Both of these will therefore be included in the total number of higher learning objectives. The reflection category contains six intended learning objectives. Four intended learning objectives could be fit into the noticing category in the first column. The second column shows the number of achieved learning objectives.

Category	Intended learning objectives	Achieved learning objectives
Reflection	6	8
Noticing	4	2
N	10	10

Table 3
Summary of Learning Objectives in the Articles Not Fitting Bloom's Taxonomy

3.3.2 Are video cases being used for achieving higher order learning objectives?

The first column in Table 2 'intended learning objectives including their underlying objectives', shows that the higher the learning objective, the lower the number of the total learning objectives. This implies that with an increase in the level of the objective, a reduction in the number of learning objectives is seen. This reduction leads, as shown in Figure 2, to a pyramid-shaped graph. For example, the observed frequency of the lowest learning objective *remember* was 43 learning objectives, while the observed frequency of highest learning objective *create* was only three learning objectives.

The highest levels of the intended learning objectives in column two in Table 3, show that most of the learning objectives (ten objectives) can be placed in the lower order learning objectives category *apply* and in the second place into the higher order learning objective category *analyze* (nine objectives). The total number of higher order learning objectives *create, evaluate* and *analyze* is 18 in Table 2, after adding *noticing* and *reflection*. However, the total number of higher learning objectives is 28, as can be seen in Table 4. The total number of lower order learning objectives *apply, understand* and *remember* is 25. With N=53, it is evident that video cases are indeed being used with the intention of achieving higher order learning objectives (53%), but to a slightly smaller extent (47%) they aim towards lower order learning objectives.

Category	Number of intended learning objectives	Percentage of intended learning objectives	Number of achieved learning objectives	Percentage of achieved learning objectives
Higher learning objectives	28 (18 + 10)	53	33 (23 +10)	51
Lower learning objectives	25	47	32	49
N	53	100	65	100

Table 4
Combined higher and lower learning objectives

3.3.3 Are higher order learning objectives reported as being achieved by the use of video cases?

While the analyzed articles report on the intended and achieved learning objectives, this paragraph focuses on the achieved learning objectives only. In the third column of Table 2 can be seen that numbers are lowest for the highest achieved learning objectives, while the lower learning objectives are more numerous. A reason for this is an overlap between higher and lower learning objectives: the lower objectives are a prerequisite for the higher ones. For this reason, the achieved learning objectives can be presented in a pyramid-shaped graph as shown in Figure 2 based on Table 5. That more achieved than intended learning objectives were found in the articles is evident when making a comparison between column one and three of Table 2, and when looking at the difference in width of the two pyramids in Figure 2.

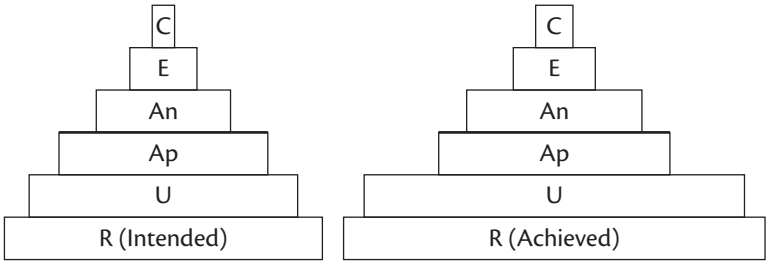


Figure 2
Chart of intended and achieved learning objectives in teacher training using video cases.

	Intended learning objectives	Achieved learning objectives
Create (C)	3	5
Evaluate (E)	9	11
Analyze (An)	18	23
Apply (Ap)	28	30
Understand (U)	36	50
Remember (R)	43	55

Table 5
Table of intended and achieved learning objectives in teacher training using video cases.

Column four in Table 2 shows that most of the learning objectives in the lower order category can be fit in the lower order learning objectives category *understand* (20 objectives). For the higher learning objectives, the higher order learning objectives category *analyze* (12 objectives) occurs most frequently. The achieved other higher learning objectives *create* and *evaluate* score five and six respectively. It is worth noting that the number of achieved learning objectives is relatively high for *understand*. Table 4 indicates the number of higher learning objectives compared to the total number of lower learning objectives, including reflection and noticing.

The total number of achieved higher order learning objectives c*reate, evaluate* and *analyze* is 33, as can be seen in Table 4. The total number of achieved lower order learning objectives *apply, understand* and *remember* is 32. With N=65, it is clear that video cases are being used to achieve higher order learning objectives (51%), and to a slightly smaller extent (49%) to achieve lower order learning objectives. It is striking that the number of achieved learning objectives (65) is higher than the number of intended learning objectives.

3.4 Conclusion and Discussion

The first question was 'Are video cases used primarily to pursue intended higher learning objectives, intended lower learning objectives, or an intended mix of both?' Because the number of intended higher learning objectives was close to the number of intended lower learning objectives, we can state that video cases are primarily used to achieve a mix of learning objectives.

The second question was: Have the higher, lower or combined higher and lower learning objectives that were set for use with the video cases in the literature been achieved? It can be confirmed that the combined higher and lower learning objectives were achieved because the number of achieved learning objectives was close to the number of intended learning objectives.

The use of video cases helped teachers in training achieve a mix of learning objectives and therefore also the higher order learning objectives *analyze, evaluate* and *create*. These findings are in accordance with the theoretical framework of this study that the advantage of video cases is that it facilitates the achievement of higher order learning objectives. Video cases provide a real-time, recognizable context for teachers in training, which helps them develop the situated knowledge they need to become effective teachers. However, this review reveals that the development of situated knowledge of teachers in training using video cases is not being done optimally yet, due to the fact that the studies focused more or less equally on lower learning objectives (both intended and achieved) and higher learning objectives. Because the number of achieved lower learning objectives was slightly lower (49%) than the number of achieved higher order learning objectives (51%), including the underlying learning objectives, the pyramid shape that can be seen in Figure 2, will take the shape of a rectangle.

Looking at the results, it is worth noticing that the number of achieved higher

order learning objectives (33) is higher than the number of intended (28). These results suggest that not all achieved higher order learning objectives were intentional, as not all of them were the actual intended learning objectives of the concerning studies. The reason that not all achieved learning objectives were intended, and therefore formulated as such, fell outside of the scope of this research. A common educational phenomenon could serve as an explanation: frequently, during the design and execution of the educational program it is unclear to the teacher which learning objectives are worked on. Alternatively, the explanation might come from the domain of the teacher training: teacher education is actually focused more on achieving lower rather than higher order learning objectives. Lower learning objectives are usually easy to assess. It is also possible that teacher-educators are still searching for ways of achieving higher order learning objectives or are even still unaware of recognizing the importance of doing this. As this study shows, teacher trainers should be aware of the promising possibilities of using video cases for achieving higher order learning objectives. There is currently considerable attention for the use of video, this is evident in the fact that the articles that have been reviewed in this study mainly report on the use of video case methods that have recently been developed. This means that the development of video cases and the use of video cases as an integral part of the curriculum are still in development. However, this review study shows promising results concerning the use of video cases as a learning method to facilitate the teachers in training's mastery of higher level learning objectives. It is worth noticing that more achieved than intended learning objectives were reported in the articles. This has probably to do with the exploratory nature of the articles; many articles focused on the process of developing the video materials, rather than considering the intended learning objectives. Therefore, achieved learning objectives, that were not intended, can be frequently reported.

If video cases are to be used for achieving higher order learning objectives, attention needs to be paid to the development of relevant assignments for the video cases. Quantifying the effects of video cases is a necessary prerequisite for assessing whether the intended higher order learning objectives are actually being achieved by the use of video cases. Future research could focus on methods for the quantification of learning outcomes with the use of video cases. Suitable assignments should be developed to evaluate the effects in terms of learning outcomes with or without the use of video cases in specific areas of teacher-training education, such as classroom management.

Further research is needed to explore how video cases can be fit into the curriculum to achieve the highest possible yields in terms of learning objectives, particularly since the difference between intended and achieved learning objectives gives rise to the assumption that educators are still searching for ways to achieve higher order learning objectives.

Acknowledgments

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Appendix 1

Overview of Analized articles

1 Bencze, L., Hewitt, J., & Pedretti, E. (2001). Multi-media Case Methods in Pre-service Science Education: Enabling an Apprenticeship for Praxis. *Research in Science Education, 31*(2), 191-209.

2 Dieker, L. A., Lane, H. B., Allsopp, D. H., O'Brien, C., Butler, T. W., Kyger, M., et al. (2009). Evaluating Video Models of Evidence-Based Instructional Practices to Enhance Teacher Learning. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 32*(2), 180-196.

3 Koc, M. (2011). Let's make a movie: Investigating pre-service teachers' reflections on using video-recorded role playing cases in Turkey. [DOI: 10.1016/j.tate.2010.07.006]. *Teaching and Teacher Education, 27*(1), 95-106.

4 Koc, Y., Peker, D., & Osmanoglu, A. (2009). Supporting teacher professional development through online video case study discussions: An assemblage of preservice and inservice teachers and the case teacher. [DOI: 10.1016/j.tate.2009.02.020]. *Teaching and Teacher Education, 25*(8), 1158-1168

5 Lin, P. J. (2005). Using Research-Based Video-cases to Help Pre-service Primary Teachers Conceptualize a Contemporary View of Mathematics Teaching. *International Journal of Science and Mathematics Education, 3*(3), 351-377.

6 Llinares, S., & Valls, J. (2009). The building of pre-service primary teachers' knowledge of mathematics teaching: interaction and online video case studies. *Instructional Science, 37*(3), 247-271.

7 Masats, D., & Dooly, M. (2011). Rethinking the use of video in teacher education: A holistic approach. *Teaching and Teacher Education, 27*(7), 1151-1162.

8 Masingila, J. O., & Doerr, H. M. (2002). Understanding Pre-Service Teachers' Emerging Practices Through Their Analyses of a Multimedia Case Study of Practice. *Journal of Mathematics Teacher Education, 5*(3), 235-263.

9 McGraw, R., Lynch, K., Koc, Y., Budak, A., & Brown, C. (2007). The multimedia case as a tool for professional development: an analysis of online and face-to-face interaction among mathematics pre-service teachers, in-service teachers, mathematicians, and mathematics teacher educators. *Journal of Mathematics Teacher Education, 10*(2), 95-121.

10 Mitchem, K., Koury, K., Fitzgerald, G., Hollingsead, C., Miller, K., Tsai, H. H., et al. (2009). The Effects of Instructional Implementation on Learning With Interactive Multimedia Case-Based Instruction. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 32*(4), 297-318.

11 Moreno, R., & Ortegano-Layne, L. (2008). Do classroom exemplars promote the application of principles in teacher education? A comparison of videos, animations, and narratives. *Educational Technology Research and Development, 56*(4), 449-465.

12 O'Connor, E. A. (2009). Initial Study of Pre-Service Teachers' Comments on a Reality-Based, Urban-Student Video Streamed within an Online Course. *Journal of Educational Technology Systems, 37*(2), 139-157.
13 Santagata, R., & Angelici, G. (2010). Studying the Impact of the Lesson Analysis Framework on Preservice Teachers' Abilities to Reflect on Videos of Classroom Teaching. *Journal of Teacher Education, 61*(4), 339-349
14 Santagata, R., & Guarino, J. (2011). Using video to teach future teachers to learn from teaching. *ZDM, 43*(1), 133-145
15 Santagata, R., Zannoni, C., & Stigler, J. (2007). The role of lesson analysis in pre-service teacher education: an empirical investigation of teacher learning from a virtual video-based field experience. *Journal of Mathematics Teacher Education, 10*(2), 123-140.
16 Schrader, P. G., Leu, D. J., Kinzer, C. K., Ataya, R., Teale, W. H., Labbo, L. D., et al. (2003). Using Internet delivered video cases, to support pre-service teachers' understanding of effective early literacy instruction: An exploratory study. *Instructional Science, 31*(4), 317-340.
17 Star, J., & Strickland, S. (2008). Learning to observe: using video to improve pre-service mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education, 11*(2), 107-125
18 Stockero, S. (2008). Using a video-based curriculum to develop a reflective stance in prospective mathematics teachers. *Journal of Mathematics Teacher Education, 11*(5), 373-394.
19 Yung, B., Wong, S., Cheng, M., Hui, C., & Hodson, D. (2007). Tracking Pre-Teachers' Changing Conceptions of Good Science Teaching: The Role of Progressive Reflection with the Same Video. *Research in Science Education, 37*(3), 239-259.

4

Assessing Situated Knowledge[1]

Abstract

Experienced teachers subconsciously make use of situated knowledge. Situated knowledge is knowledge that arises from, and is connected to, the interactions between a material body and the physical environment where the action takes place, to solve incidents in everyday teaching. Situated knowledge is important in teaching and should therefore be taught in teacher training courses. This learning objective should consequently be tested in the test at the end of such a course. Situated knowledge can be assessed by using cases and by setting higher learning objectives, on condition that both explicitly address the situated nature of this knowledge. The main question in this study is: Do teacher trainers use cases that are aimed at acquiring situated knowledge? Empirical research carried out in eleven Dutch secondary teacher-training programs revealed that only one of these programs indeed assessed situated knowledge. However, considering its importance, it is crucial that all secondary teacher-training programs include it. To help institutions achieve this goal, this article provides suggestions for the construction of tests with cases to assess the acquired situated knowledge.

Keywords: Video cases, teacher training, knowledge development, learning objectives, tests.

4.1 Introduction

Experienced teachers subconsciously make use of situated knowledge, which is knowledge that is the result of cognition that is established through, and is linked with, the interactions between the individual's body and the physical environment in which the actions take place (Roth & Jornet, 2013). It has both an embedded and an embodied character: experiences with situations result in

[1] Based on:
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situated knowledge. This knowledge is readily available, holistic, contextual and linked to specific situations, in order to solve incidents and use opportunities in everyday teaching. This situated knowledge is generated by a direct interaction between previous experiences and the current context in daily teaching practice (Borko, 2004; Putnam & Borko, 2000). Situated knowledge differs from declarative cognitive knowledge by taking a wider view of the teaching process: when undergoing teacher training, it is not just important to acquire knowledge, but also to learn to function in a continuously changing, complex environment involving other people and materials. To do so, situated knowledge is required. The value of situated knowledge has been understood for several decades (Brown, Collins, & Duguid, 1989; Greeno, 1997; Opfer & Pedder, 2011; Putnam & Borko, 2000). Teachers who are being trained to teach in secondary schools, who have limited practical experience, need to develop situated knowledge in order to be able to teach in varying contexts. In order to help teachers in training learn to develop situated knowledge, teacher trainers set learning objectives for their courses that explicitly address the situated nature of this knowledge. Wherever possible, this study aims to provide teacher trainers with practical advice related to this process.

This article describes research into the suitability of the curriculum of the teacher training for acquiring situated knowledge by students. First, the way analyzing video cases contributes to the acquisition of situated knowledge, is outlined. Then, we examine whether video cases are used in the teacher training curriculum, by checking whether the summative tests used at vocational teacher education at Dutch Universities of Applied Sciences[1] focus on learning objectives that support acquiring situated knowledge. This way, we can elucidate to what extent situated knowledge is strived for.

Situated knowledge can be acquired by setting higher learning objectives, working towards these objectives in lessons, and testing them in the summative assessment. The most commonly used taxonomy, internationally, for the levels of learning objectives in teacher training programs is Bloom's taxonomy (Athanassiou, McNett, & Harvey, 2003; Furst, 1981; Krathwohl, 2002). This taxonomy consists of a hierarchy of six cognitive levels at which learning objectives can be mastered: remember, understand, apply, analyze, evaluate, and create. The first three levels are known as the lower learning objectives, and the final three as higher learning objectives[2].

The various levels can be linked to various kinds of knowledge that have to be mastered during a course. The lower levels apply to factual knowledge and knowledge of procedures (Momsen, Long, Wyse, & Ebert-May, 2010). Higher

[1] The Netherlands has a binary system of higher education, with two types of programmes: research-oriented education (wetenschappelijk onderwijs, WO), offered by Research Universities, and applied sciences [hoger beroepsonderwijs, HBO], offered by Hogescholen, or Universities of Applied Sciences.

[2] Here, the classic taxonomy according to Bloom is used, leaving out the two extra objectives that were adopted in the previous chapter.

learning objectives are, for instance, applied to the ability to analyze and evaluate complex teaching situations. These higher learning objectives aim to have teachers in training think critically about the practice of teaching in connection with theoretical concepts and strategies, which helps them prepare for their own future teaching practice. Because they need to be able to act effectively, as an embedded as well as embodied agent in complex situations, higher learning objectives need to be transferred in the form of situated knowledge. Higher learning objectives can be attained by using cases that foster the development of situated knowledge, which includes both holistic and contextual knowledge. By studying written or filmed cases, teachers in training can link theoretical knowledge to unfamiliar, complex situations. The drawback of written cases is that the holistic character of real situations is mostly lost in the description (Geerts, Van der Werff, Hummel, & Van Geert, 2015). Video cases present information in a holistic and contextual manner, which corresponds to the way in which teachers are confronted with pedagogical and didactical problems in daily practice (Blijleven, 2005) and can contribute to the acquisition of situated knowledge. The consequence is that teachers in training have to be able to distinguish between important and unimportant aspects in order to make sense of the case. It has been shown that this is not possible with written cases, because such cases are often already structured by the author (Blijleven, 2005). By watching video cases and applying their own theoretical knowledge, teachers in training are able to analyze specific real-life teaching situations and discover how experienced teachers deal with these circumstances (Blijleven, 2005; Kurz, Llama, & Savenye, 2004). By analyzing real-life situations through video, students step out of their role as a teacher and are able to observe a teaching situation objectively and 'from a distance' (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008; Van Es & Sherin, 2002). Video analysis contributes to the students' belief that they can acquire the skills, knowledge and attitudes necessary to function effectively as a teacher (Shulman, 1992). This means that the use of video cases is an excellent way of helping teachers in training pursue higher learning objectives which results in the development of situated knowledge, although it goes without saying that practical experience in the classroom remains important as well.

If a teacher-training course aims to help teachers in training achieve higher learning objectives in a situated context, these learning objectives should also be reflected in the corresponding assessment. Biggs & So-kum Tang (2011) uses the term constructive alignment for the fact that learning objectives, tests and the contents of a course should all be consistent with one another. The learning objectives of a course should therefore guide the construction of a test. A summative test with content validity should reflect the contents of the course. If the course is built on higher learning objectives, then these must be addressed in the summative test (Hamp-Lyons, 1997; Spratt, 2005). If the objectives of the test do not correspond with the objectives of the course, there is a risk that students will not achieve the course objectives, because they may focus solely on the objectives of the test instead (Hamp-Lyons, 1997). A representative summative

test should adhere to several rules in order to assess situated knowledge and be valid. Several views will now be considered to determine a balanced set of requirements.

An authentic assessment is the best way to assess situated knowledge. Such an authentic assessment would require teachers in training to solve a realistic, life-like problem (Brush & Saye, 2014; Gulikers, Kester, Kirschner, & Bastiaens, 2008). However, testing teachers in training by placing them in a classroom and waiting for a situation suitable to test their knowledge, is virtually impossible. Therefore, for efficiency reasons, an authentic assessment is often simulated by means of a test with an authentic (video) case. This is because tests with (video) cases are readily available, which allows teacher trainers to plan and implement tests efficiently. When confronted with summative tests with authentic cases that contain realistic situations, teachers in training are able to apply what they have learned during the course in a practical way (Brush & Saye, 2014; Wiggins, 1998).

A case is authentic when (Darling-Hammond & Snyder, 2000; Gulikers et al., 2008; Ploegman & De Bie, 2008; Wiggins, 1998):

- it is a realistic problem;
- it requires teachers in training to evaluate the situation and come up with a solution of their own (innovation);
- it requires teachers in training to actively deal with a given situation;
- it has a realistic context that professionals would deal with on a regular basis;
- it tests how efficiently and effectively teachers in training can complete a complex task by making use of a large repertoire of knowledge and skills;
- it gives teachers in training the possibility to repeat and to practice, enabling them to use resources and to receive feedback to improve their performance and achieve better learning outcomes.

A case does not need to be long to be authentic. Short cases have the added advantage of having a greater reliability and validity than longer cases (Van Berkel & Bax, 2006). In order to answer questions related to a case, teachers in training will need to make use of their situated knowledge, which consists, among other things, of a wide array of context-specific knowledge and the ability to solve incidents in everyday teaching practice. In an hour of testing time, several short cases can be used, which increases the validity of the summative test. Additionally, cases illustrate that experts can differ greatly in the way they deal with complex situations, even though the outcomes are the same. This is also known as idiosyncrasy: Experts develop individual ways of dealing with problems (Adams & Wieman, 2011; Regehr & Norman, 1996), based on their own specific situated knowledge. Furthermore, experts are often more efficient than non-experts, which allows them to skip steps in the problem solving (Regehr & Norman, 1996). Therefore, the first guideline that can be noted is that the case needs to contain an authentic problem.

In order to account for the wide variety in effective problem-solving processes of experts, students should be exposed to a representative variety of cases. That way, it is possible to test whether teachers in training can flexibly make use of

their problem-solving skills. This leads to a second requirement for testing with cases, that the test contains multiple short cases to increase the validity.

When considering tests, a written test is often the first thing that comes to mind. The written test is also the most common test in Dutch teacher-training education. However, oral tests are far more realistic and authentic when it comes to testing situated knowledge. Moreover, an oral answer offers a more complete and accurate picture of the teacher in training (Huxham, Campbell, & Westwood, 2012). Because an oral answer comes about in a conversation, an immediate reaction can also be given, which allows for the answer to be added to and clarified. To assess situated knowledge, it is therefore advisable that the test contains only oral questions or a combination of oral and written questions to increase the reliability of the test.

Solving a problem related to a case requires situated knowledge. An example of a problem could be a classroom situation in which there is a certain amount of disorder. To test the situated knowledge, the test questions need to focus on key feature decisions, that is to say, the essential decisions that need to be made to solve the problem (Farmer & Page, 2005; Opfer & Pedder, 2011; Van Berkel & Bax, 2006). In this example, dealing with a disorderly classroom situation, the student needs to answer the following questions: 1) Is the disorder caused by the pupils or the teacher? 2) Is the disorder caused by classroom management or the layout of the lesson? 3) Is the disorder caused by the strategy chosen by the teacher or by the way the teacher implements this strategy? 4) Should the teacher interfere straight away or wait? We can summarize by stating the fourth requirement for testing with cases: The test questions are constructed by means of key features.

In order to formulate suitable test questions for testing key features and situated knowledge, verbs should be used that reflect the higher learning objectives. The verbs that are used in a test question indicate whether a question focuses on analysis, evaluation or creation (Van Berkel & Bax, 2006). Testing analysis can be done using verbs such as 'distinguish', 'relate' and 'clarify'. For evaluation, verbs such as 'interpret', 'justify' or 'appreciate' can be used. Finally, for creation, questions can include verbs such as 'revise' or 'design'. These verbs should be used in test questions that reflect the situated character of higher learning objectives. A test with questions aimed at higher learning objectives is better suited to assess situated knowledge. To make sure that the test questions that focus on higher learning objectives cover the majority of the test, the fifth requirement is that test questions are focused on higher learning objectives. This requirement is expanded with 6 additions as stated by Wiggins (1998). He suggests that higher learning objective test questions should be formulated in such a way that they:

- can assess whether students have understood the full situation;
- can assess whether students have understood the actual goals of the skills, actions and knowledge, instead of simply implementing an action plan;
- require students to change perspectives;
- can assess the completeness and accuracy of the knowledge independently

from understanding;
- test the student's self-knowledge;
- are focused on creating, analyzing and evaluating.

As a side note, although the test questions should be based on higher learning objectives when assessing situated knowledge, it is important not to focus all of the questions on them, because lower learning objectives (such as factual knowledge) require independent test questions (Wiggins, 1998). In summation, higher learning objectives do not just pertain to a single test question, but also to of the test as a whole. The fifth requirement for testing with cases is: The majority of the test questions focus on higher learning objectives.

Finally, the presence of so-called 'overarching questions' will be considered. Overarching questions are central to the course and offer students insight into the practical application of the course for their future teaching practice (Wiggins, 1998). These broad questions enable students to use various elements of their knowledge to fully understand the subject matter and to enlarge their situated knowledge. Examples of overarching questions are "How can you define good teaching?" or "Are there any recent developments in education?". Therefore, the final requirement for a good test, containing a case, is that overarching questions are included in case tests.

In summary, the current introduction underlines the importance of assessing higher learning objectives that aim at situated knowledge. This assessment is best done with (video) cases. For the construction of assessment tests with cases and for the formulation of suitable test questions, the following six requirements were derived from literature:

1 The case needs to contain an authentic problem.
2 The test contains multiple short cases to increase the validity.
3 The test contains only oral questions or a combination of oral and written questions to increase the reliability of the test.
4 The test questions are constructed by means of key features.
5 The majority of the test questions focus on higher learning objectives.
6 Overarching questions are included in case tests.

4.1.1 Aim of this study

The preceding section argues that developing situated knowledge is an important feature of adequate teacher training, meaning that if the acquisition of situated knowledge is aimed for in teacher training curricula, this should be reflected in the course content. Do teacher trainers use cases that are aimed at acquiring situated knowledge? To elucidate whether teacher trainers use such cases in their courses, we investigate whether they use them in their tests. The course content should be reflected in its tests. The test format is derived from teacher-educator practice. If teachers in training are aware of the format and content of the summative test for that course while it is proceeding, their learning processes are likely

to be determined by the content and format of that test. This is why a relatively easy way of determining whether the acquisition of situated knowledge is indeed facilitated by the course content, is to examine the test format. Thus, the main question in this study is: Do teacher trainers use summative case tests that are aimed at acquiring situated knowledge?

In order to answer the main question, we investigate whether summative case tests used at the end of a course at an accredited teacher-training meet the six requirements for testing situated knowledge. The fifth requirement plays a particularly important role, as a case test can only be aimed at testing situated knowledge if the corresponding test questions test higher learning objectives. Therefore, the first step in our research is to investigate whether test questions are testing higher learning objectives. The first hypothesis is that the majority of the test questions do focus on higher learning objectives that define situated knowledge. If requirement five is not met (and thus the first hypothesis is wrong), the case test cannot be considered to be testing situated knowledge. The remaining five requirements can only have meaning if the questions are actually aimed at higher learning objectives. Finding that hypothesis one is correct, however, is not enough to establish whether the test in question is aimed at testing situated knowledge. That can only be established if most of the five remaining requirements are also met. Hypothesis two is, therefore, that tests are generally constructed in accordance with the six requirements for tests with cases.

4.2 Method

4.2.1 Sample survey and response

For this study, all 11 accredited secondary-teacher-education institutes in the Netherlands were asked to send in a copy of a summative test used at the end of a course in vocational training. These institutes have been accredited by the independent Dutch and Flemish accreditation organization (NVAO), which has established that these courses meet the quality requirements. Of these institutes, ten submitted a test which they expected to pay attention to situated knowledge acquisition, and these were included in this study. The request for a test included the term higher learning objectives. The tests are aimed at higher learning objectives that teachers in training need to achieve. The tests were used in the academic years 2011-2012 or 2012-2013 and were all in Dutch. All tests were used as a formal evaluation of course results (summative assessment) in vocational training. Only one institute submitted a test that included a video case. All others used written cases. The test with the video case consisted of one video case and five written cases. The cases vary considerably, both in length and subject. An example of a written case and the corresponding test questions, that is representative of the cases used in the study in terms of length, level and amount of detail, can be found below.

It is late October, and Johnny from class 1C is a difficult pupil, according to several teachers. The team leader is getting complaints about him from colleagues, and Johnny has been sent out of the class on several occasions, which is more than usual for a first-year pupil.
The team leader decides, after consulting the mentor, to set up a protocol. Johnny is given a separate desk, and is first given a warning if he shows disruptive behavior. If that doesn't help, he is moved to the front of the class and put to work copying lines. If he is still difficult, he has to leave the class and report to the office. If he behaves well, he is complimented, and it is noted in the class ledger.
The team leader and mentor have created the protocol together, and sent it to the teachers of 1C. The email began with 'Due to Johnny's behavior, we have come to the following agreements', followed by the description given above.
Unfortunately, these measures have not worked

A At what point in the process concerning Johnny do you think it went wrong? Give three explanations for the failure of the team leader and mentor's measures (3 points).
B As Johnny's mentor, how would you tackle the problem? Explain your choice (2 points).
(From 'Test 7' in this study)

4.2.2 Materials

To assess the way in which the summative tests measure higher learning objectives, a custom-made assessment form was developed, based on the above-mentioned six requirements for tests with cases. One aspect, namely that an authentic case must "[give] teachers in training the possibility of repeating and practicing, using resources and gaining feedback to enhance their performance and get better learning outcomes" (Wiggins, 1998), was not included on the form. This was done because this requirement mostly applies to the procedure of completing a course and does not really apply to test construction. The assessment form was originally written in Dutch. As can be concluded from the literature studied in the introduction, the previously described six requirements vary in nature. A sole question can sometimes suffice to determine whether some requirements are met by the test. For other requirements, multiple questions need to be asked to assess whether all aspects of the requirements are met. To determine whether a requirement was met, a list of criteria was used that is detailed in Table 1. The order of the criteria has been optimized for the scoring procedure.

	Requirement	Number of aspects on the assessment form	Requirement is met if:
1	The case must contain an authentic problem;	5	≥ 3 aspects
2	The test contains several short cases in order to increase validity;	1	≥ 3 cases
3	The test consists of just oral questions, or both oral and written questions, in order to increase its reliability;	2	≥1 oral question and ≥ 1 written question
4	The test questions have been formulated using key;	1	≥ 3 key terms for at least half the number of cases
5	The majority of the questions focus test higher learning objectives;	6	A positive score on ≥ 5 of the 6 aspects
6	The test with cases includes overarching questions.	1	≥ 1 overarching question

Table 1
Overview of the requirements in the assessment form

4.2.3 Procedure

Senior learning plan experts working at Dutch Universities of Applied Sciences selected a summative test used at their institutions to examine whether a test meets the requirements for a test with cases. The following instructions for selecting the test were given to the learning plan experts: 1) Select a summative test on vocational training that includes a video case. Are there two or more summative tests with a video case? Then select the summative test that contains most questions on the case. 2) Are there no summative tests on vocational training that include a video case? In that case, select a summative test with a written case according to the instructions. 3) Are there no summative tests on vocational training that include a video case or a written case? In that case, do not submit a test.

The tests with cases obtained were assessed by experienced teacher trainers, using the newly developed assessment form. Two teacher trainers were selected from each of the three departments of the teacher trainer education at the NHL University of Applied Sciences (Social Sciences, Science and Languages). These six teacher trainers were informed that they would be evaluating the tests using an assessment form. The form only allowed for them to answer with yes or no. The tests were randomly assigned to the teacher trainers. The teacher trainers were given forty minutes for the evaluation of each test, and a random sample

measurement previously showed that this was a sufficient amount of time. The two teacher trainers from the different departments all evaluated five tests individually. This made it possible for all tests to be evaluated three times, each by a teacher trainer from a different department. This was done to prevent the teacher trainers' backgrounds from influencing their evaluation of the tests and to increase the reliability of the data. An interrater reliability analysis was carried out to determine the consistency between the assessors by calculating Fleiss's Kappa (Fleiss, 1971). Because the number of assessors was fixed at 6, this particular measure was used. Because there were two groups of three assessors, the Kappa was calculated separately for the two groups. The interrater reliability analysis was carried out on the items that made use of answer categories (25 in each group). The first group consisted of three assessors who assessed the first five tests. The percentage of agreement was 51,6%. Fleiss's Kappa was determined at κ=.395 (95% CI, .352 to .438), p< .0.005, which means there was fair agreement between the three assessors. This fair agreement means that the assumption can be made that these three assessors made a sufficiently equal assessment. The second group consisted of three assessors who assessed the remaining five tests. The percentage of agreement between these three assessors was 48,1%. The agreement between these assessors was also fair, Fleiss's κ=.352 (95% CI, .310 to .395), p< .005. These results indicate that the assessment form is suitable for a uniform assessment. The results of the teacher trainers' assessments of the tests are the input for accepting or rejecting the hypotheses mentioned earlier.

In order to ascertain whether teacher trainers set higher learning objectives for their tests (hypothesis 1), requirement 5 on higher learning objectives for constructing tests with cases was used. Higher learning objectives such as analyzing, evaluating and creating cannot be achieved without self-knowledge, perspective changes, overview and awareness of the relevance of the subject material, as can be seen in Table 2. Table shows that a test can adequately assess higher learning objectives once it meets all six of these aspects. Practically, however, we consider this condition to have been met when at least five of these aspects are found in the test. Consequently, the test met requirement 5 if it complied with two conditions: a) The test questions include at least five of the six aspects of higher learning objectives, and b) the majority of the test consists of test questions on higher learning objectives, which means that it is possible to get at least 51% of the points by answering these questions correctly. This last condition was established by adding together the number of available points for questions testing higher learning objectives. The first condition was assessed by the teacher trainers to get the best possible judgment. The second condition was determined by the researchers as this involved merely adding up question points. The first hypothesis is accepted if a majority of the tests examined complies with the two aforementioned conditions.

The second hypothesis in this research is that the tests were constructed in accordance with the six requirements for tests with cases. Only tests that met the requirements of the first hypothesis were tested for the second hypothesis. A test with cases is evaluated as being "sufficient" if it meets five out of the six

requirements for tests with cases. Moreover, it was determined that the following two requirements should at least be met: The problem in the case should be authentic (requirement 1) and the test questions are aimed at the higher learning objectives (requirement 5). Requirement 5 was tested in hypothesis 1.

After analyzing the completed assessment form, brief discussions were held with the assessors. During these discussions, the researchers asked the assessors about their experiences with the form, possible gained insights and possible resolutions for developing their own tests with cases for their own courses. These analyses and discussions were the basis for developing teacher trainer requirements for constructing tests with cases.

4.3 Results

4.3.1 Hypothesis 1

The Majority of the Test Questions Concerns Higher Learning Objectives That Define Situated Knowledge.

The fifth requirement for constructing tests with cases consists of six aspects that together determine whether the tests of secondary school teacher training courses contain questions on higher learning objectives. It can be concluded from the assessment of the tests that four out of ten tests contain higher learning objectives (comply with the fifth requirement) (see Table 2).

Aspects of first condition 5:	**Test**									
Questions on...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1 Overview of complete situation	1	1	1	1	1	1	1	1	1	1
2 Perspective changes	1	0	1	0	1	0	0	0	0	0
3 Awareness of the relevance of the subject material	1	0	1	1	1	1	1	1	1	1
4 Knowledge independent from comprehension	1	1	1	1	1	1	1	0	1	1
5 Self-knowledge	0	0	0	1	1	0	0	1	0	0
6 Analyze, evaluate, create	1	1	1	1	1	1	1	1	1	1
Total number of aspects found	**5**	**3**	**5**	**5**	**6**	**4**	**4**	**4**	**4**	**4**
Assessment: "sufficient" if ≥5 aspects found	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**

Table 2

First conditional requirement 5: Test questions that test higher learning objectives; number of achieved aspects per test.

Table 2 shows that two aspects were found in all tests, namely questions that ask for an overview of the whole situation and questions focused on analysis, evaluation, and creation. Questions about changing perspectives and self-knowledge were found in only three tests out of ten.

Points could be scored for test questions aimed at higher learning objectives and these scores were added up to assess the second condition of requirement 5 (a focus on higher learning objectives). An overview of the total number of points and corresponding percentages can be found in Table 3.

Points in the test	Test									
	1	2	3	4	5	6	7	8	9	10
Total points	20	50	80	50	60	25	35	100	76	38
Number of points for higher learning objectives	8,85	35	28	25	60	23	27	79	54	18
Percentage of points for higher learning objectives	44	70	35	50	100	92	77	79	71	47

Table 3
Second conditional requirement 5: Percentage of questions on higher learning objectives

It is striking that tests in Table 3 scored either quite high (70% or higher) or quite low (50% or less). The tests that met five or more criteria for test questions centered on higher learning objectives, as shown in Table 3, are tests 1, 3, 4, and 5. Three of these tests scored lower than 50% on the number of points available for questions related to higher learning objectives, and thus did not meet the requirements for hypothesis 1. This means that such tests might include a number of questions that focus on higher learning objectives, but that these questions play a minor role in the test as a whole. Out of these four tests, only test 5 scored over 50%. This means that test 5 alone meets both conditions of requirement 5 and thus hypothesis 1 (The test questions are aimed at achieving higher learning objectives and these questions yield most of the points that can be obtained).

4.3.2 Hypothesis 2

Tests Are Constructed in Accordance With the Six Requirements for Tests With Cases.

As test 5 is the only test that met the requirements of hypothesis 1, it is the only test that was assessed for hypothesis 2. Table 4 provides an overview of the requirements for hypothesis 2 that the test met.

Requirement	Test
	5
1 Authentic problem	1
2 Several short cases	0
3 Oral and written questions	0
4 Three or more key terms	1
5 Questions testing higher learning objectives	1
6 Overarching questions	1
Total number of requirements met	**4**

Table 4
Overview of the requirements met by test 5

When a case test meets at least four requirements, among which requirement 1 and 5, the test is considered sufficient. Table 4 shows that test 5 does not meet two of the requirements for a case test. The test only includes one case, instead of various short cases, as stated in requirement 2. The test also does not meet requirement 3. The test exclusively consists of written questions. Test 5 does meet the remaining four requirements, including requirements 1 and 5. It can therefore be concluded that test 5 meets the postulated requirements concerning constructing tests with cases and thus matches hypothesis 2.

4.3.3 Support for the Use of Tests With Cases

In this study, the tests were assessed by six experienced teacher trainers. The process led to discussions about testing using cases. From discussions with these experienced teacher trainers, it was concluded that evaluating the tests with the assessment form yielded new insights about tests with cases. For instance, one teacher trainer stated that the instrument helped him realize at which level of mastery the questions should be formulated. The use of the assessment form encouraged the teacher trainers to reconsider the construction of tests aimed at higher learning objectives. They had all stated that they were already currently doing so, but that the assessment form would help them keep the higher learning objectives in mind. Reformulating the assessment criteria as instructions has turned the assessment form into a practical instrument that can be used when constructing tests with cases aimed at higher learning objectives that help develop situated knowledge. That is why the assessment form has been transformed into a list of instructions that can easily be used by teacher trainers for secondary education. This list of instructions is enclosed in Appendix 1.

4.4 Conclusion and discussion

Ten out of eleven secondary teacher education programs in the Netherlands are currently working with summative tests with cases. We can conclude from the fact that ten of the institutes sent us summative tests with cases that there is an intention to test situated knowledge. This intention was also expressed to the researchers when they requested the tests. The ten submitted summative tests with cases were evaluated by means of a newly developed assessment form with six requirements for such tests. The first hypothesis was that the majority of the test questions do focus on achieving higher learning objectives and therefore do adequately facilitate the development of students' situated knowledge. This hypothesis was not confirmed; only one test included five out of the six aspects for testing higher learning objectives, and this same single summative test allocated more than 50% of the points that could be scored on the test to questions leading to higher learning objectives. The second hypothesis, that the summative tests are constructed in accordance with the requirements for tests with cases, cannot be confirmed either based on these results. As only one test confirmed hypothesis 1, only that test was used to test hypothesis 2. The test did confirm hypothesis 2. However, because only one test confirmed it, hypothesis 2 was also rejected. Because both hypotheses were rejected, the main conclusion should be that teacher trainers scarcely set higher learning objectives for their tests with cases that explicitly address situated knowledge. Additionally, this means that summative tests with cases are not being used to their full capacity. This outcome is supported by previous research (Geerts et al., 2015) that has shown that higher learning objectives are currently not optimally being achieved through the use of summative tests with cases in teacher education.

Even though both hypotheses were rejected, ten out of eleven teacher education institutions sent in a test with cases. An analysis of these tests revealed that they were unsuitable for evaluating situated knowledge, but nevertheless did focus on it. This means that teacher trainers are, in fact, looking for possibilities to assess the situated knowledge of their students. Teacher trainer didactics are just starting to address the testing of situated knowledge, due to their history of focusing on factual knowledge.

The requirements are intended to support testing with cases that focus on higher learning objectives and support teacher trainers in the process of designing such tests. A summative test is the conclusion of a course with learning objectives. It is to be expected that improvements to the quality and content of summative tests will lead to improvements in the quality of the course (Biggs, 2003). The suggested improvement focuses on gaining situated knowledge. Gaining situated knowledge contributes to becoming a better teacher. Better teachers improve the education at secondary schools.

The results from this chapter show that it is possible to improve the quality of summative tests. Moreover, the study has led to instructions for the construction of tests with cases aimed at testing situated knowledge. It is recommended

that the adapted assessment form containing the list of instructions for the construction of summative tests with cases is made available for use by all secondary teacher training education institutes, in order to encourage attention for situated knowledge in tests. Further research could focus on how to raise teacher trainers' consciousness about the importance of these requirements for summative tests with cases, so they can facilitate their students to develop themselves optimally. Hopefully, this will lead to situated knowledge gaining a permanent place in the teacher training curriculum and tests.

Appendix 1
Instructions for the Creation of a summative Test with Cases

The questions on this first page are only about questions that accompany cases.

Instruction: Multiple cases in a summative test

Does your test contain at least three cases? Better three short cases than one long one.	

Instruction: The case should concern an authentic problem

Are the situation descriptions in the cases realistic? (In other words, is it a situation that a teacher in training is likely to face in practice?)				
If a test contains more than one case, answer the following questions for each case in turn. You can give the score for a second case in the second column, and any further cases in the remaining columns.				
	Case 1	Case 2	Case 3	Case 4
Does the case contain realistic tasks that the student will encounter in this manner in practice? Answer 'yes' if: 1 the case is meant for all subjects in your teacher education, **or** 2 the case is meant for your own subject.				
Does the student have to think of their own solution, for each case, based on their assessment of the situation?				
Does each case have a question that asks how the student would act?				
Does each case have a question about a complex task in the case, and does the student need acquired knowledge and skills in order to answer it?				

Instruction: The questions about the case are made using key features

Do most of the cases have at least three corresponding questions about the most important decisions needed to solve the case? (Key features: The essential decisions that the student must make in order to solve the case)				

Instruction: The test questions test higher learning objectives

Does each case have at least one question that tests whether the student grasps the situation as a whole?				
Does each case have at least one question that requires the student to shift perspective?				

The following questions concern all questions in the test

Does your test contain at least two questions that lead the student to understand why they must master the subject matter? (In other words, they must apply theory in practice.)	
Does your test contain at least two questions that test whether the student's knowledge is complete and correct, independently from the student's level of understanding? (For example, first test knowledge and then comprehension, even if it is within the same question.)	
Does your test contain at least one question that tests the student's self-knowledge (the knowledge they have about themselves)?	
Does your test contain at least two questions that test comprehension? (It should contain verbs such as criticize, conclude, contrast, deduce, illustrate, interpret, distinguish, support, analyze, justify, relate, sketch, explain, validate, defend, compare, or judge.)	

Instruction: The test contains overarching questions

Does your test contain at least one overarching question? These questions have the following characteristics: They concern the core of being a teacher, don't have just one correct answer, test the higher learning objectives in Bloom's taxonomy, recur throughout the program (with a constantly developing answer), are formulated in such a manner that they challenge and interest the student, and are connected to other essential questions.	

Instruction: The test contains oral and written questions

Does your test contain at least one oral question?	
Does your test contain at least one written question?	

5

The effect of video cases on the acquisition of situated knowledge by pre-service secondary school teachers[1]

Abstract

This study focuses on the influence of the use of video cases on the development of situated knowledge of teachers in training. Situated knowledge is the result of cognition that takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place. Experienced teachers use this knowledge to shape their actions in accordance with their educational purposes. Situated knowledge consists, among other things, of design patterns: patterns to resolve recurring problems. Various design patterns form a network, which is called a pattern language. Teachers in training must acquire this situated knowledge. The current chapter discusses the effect of including video cases in a course on classroom management skills on the development of situated knowledge in teachers in training. The results indicate that second-year teachers in training, when it comes to their educational purposes, do not benefit from the video cases. However, when it comes to the pattern language 'classroom management', they do benefit. The use of video cases also had a positive effect on the development of the applicability of the design pattern 'dealing with disorder'. These results show that focused efforts using video cases in teacher education are promising.

[1] Based on:
Geerts W., Steenbeek H. W., & van Geert, P. L. (2018). Effect of video-cases on the acquisition of situated knowledge of teachers. *International Education Studies, 11*, (1), *100-101*.

5.1 Introduction

5.1.1 The expert teacher

Experienced teachers are experts who instinctively know how to act in the dynamic environment that is their daily workplace. Being effective in the classroom has to do with both the contents of the course the teacher is teaching, as well as managing the classroom. An expert teacher can recognize meaningful patterns in practice and knows how to react to them (Boshuizen, 2009; Lesgold, Greeno, Glaser, Pellegrino, & Chase, 1988). Although experts know how to react effectively to their surroundings, this does not mean they explicitly form strategies before they act. Their actions are tied to the professional situation that presents itself and are formed by the expert's perception of that situation: their actions are domain-specific (Sheridan & Reingold, 2011). But what does this mean? It is important to note that this domain-specific knowledge is *situated*.

Situated knowledge is the knowledge that results from cognition that takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place (Roth & Jornet, 2013). The situated aspect of this knowledge becomes apparent from the fact that it is triggered by this situation, contains all relevant aspects of that situation (holistic) (Putnam & Borko, 1999), applies only to that specific situation (Geerts, Van der Werff, Hummel, Steenbeek, & Van Geert, 2015) and grows with every interaction in that situation (Kim, 2011). The connection between situated knowledge and the context means that its elements are inextricably connected to the situations, interactions and activities in which they occurred (Brown, Collins, & Duguid, 1989). Every new experience with that situation, interaction or activity adds something to the situated knowledge. For example, when teaching a high school class, a teacher might use a certain strategy to contain a disruption. As he is doing this, he relies on his situated knowledge. Relevant information about the situation is stored, irrelevant information is discarded. Because of this selection process, experienced teachers have access to an increasing amount of situated knowledge which allows them to act effectively in situations (Haider & Frensch, 1996; van Meeuwen et al., 2014).

It should be emphasized that not only experience with a situation, but also the perception of that situation and the way it is mentally projected, affect the way the teacher is effective (Wolff, van den Bogert, Jarodzka, & Boshuizen, 2015). A novice teacher will only see superficial elements in his classroom, but the expert teacher will notice crucial details. His experience allows him to see specific things to base his actions on in that situation. He uses this skill to focus on the most important aspects of the educational situation at hand. In other words, by using his situated knowledge, his mental representation of it will be more accurate (Carter & Doyle, 1987).

From the above example, it is clear that an experienced teacher's knowledge is largely implicit and linked to (or embedded in) a particular context. This means that this knowledge, in addition to being situated, is also embedded. The embedded

character stresses the connection between the experienced teacher and the social environment. Transfer of this knowledge is difficult, as the expert's knowledge is implicit and embedded in the social context of the classroom. Transfer can only occur when the knowledge is joined with the situation it is embedded in. This process requires effort, reflection and coordination (Lam, 1997).

5.1.2 Classroom management

Being effective in the classroom not only follows from mastering the contents of the course, but also for a large part from the associated skill of classroom management. Classroom management is defined by Brophy (2006; 1988) as "actions undertaken to create and maintain an environment to successfully give instructions in: setting up rules and procedures, arranging the physical space, holding the pupils' attention and managing activities (2006, p. 17)". To successfully carry out these actions, the teacher needs to recognize the relevant signals and events in the classroom. Because any classroom has a wide variety of signals and events, recognizing them is a complex cognitive process (Berliner, 2001; Copeland et al., 1994; Van Es & Sherin, 2002). The above shows that an experienced teacher uses situated knowledge for every situation. The nature of this knowledge depends on the context and part of it is embedded in the situation as embedded knowledge, because it is influenced by all relevant elements in the physical environment in which action takes place.

So, the embedded situated knowledge provides the experience necessary to know what to focus the attention on and which pieces of information are relevant. Two variables are particularly important here: alertness to identify an event and the ability to choose the right action in the form of productive interactions. How both are used by the teacher determines how he can effectively create a learning environment. Both these variables are explained further in the coming paragraph. First, how alertness to identify an event in the classroom can be used to form educational purposes is explained. Those can then be used to adjust the course of the lesson. Next, the explanation will focus on the way in which general models, or design patterns, can be employed to alter the course of events, and prevent disorder in the classroom using productive interactions: the ability to choose the right actions.

Alertness as an example of an educational purpose

Alertness is the teacher's ability to be constantly aware of what is going on in the classroom (Kounin, 1970; Christofferson & Sullivan, 2015). Part of alertness is not only the way this is perceived, but also the way these perceptions are interpreted, how signals are received and how problems are anticipated. A teacher bases his decisions regarding the actions he will take to protect the productive climate in the classroom on his alertness. Actions like these are called *alert responses* during teacher training.

In general, Copeland & D'Emidio-Caston (1998) call a choice for an action in a specific situation an educational purpose. Educational purposes are the

constantly changing process goals which a teacher determines for himself and allow him to direct the lesson in a way he decides is best. They are based on the principles the teacher acquires during his training (Copeland & D'Emidio-Caston, 1998). For classroom management the teacher realizes, for example, that he must be alert to be able to take corrective action, that he is responsible for a lesson's momentum, and has to be in charge to successfully manage the group. It is important to note that an educational purpose is not a lesson goal or objective, but a process goal a teacher sets for himself while performing the lesson.

Educational purposes determine what a teacher pays attention to and what his alertness is focused on. Specific educational purposes arise depending on the underlying principles a teacher holds. These are his ideas on what makes a good lesson, his previous experiences with teaching situations and the connections with the theory that he establishes. A teacher in training can therefore only direct his alertness once he has acquired educational purposes regarding classroom management. It is important to note that such educational purposes are both situated and embedded. This means that once acquired, educational purposes are used intuitively, are implicit and linked to a particular context. It also means that an experienced teacher has already, intuitively, carried out his actions before he can make his reasoning behind them explicit. Both the experienced teacher, as the one in training can, however, be made aware of his educational purposes by asking him about them. This allows him to translate this broad, theoretical concept into less abstract terms. The questions developed by Copeland and D'Emidio-Caston (1998) are particularly useful in this regard. They operationalized educational purposes by asking about:

- purpose statements;
- practical generalizations;
- guiding principles;
- theory links;
- action links;
- justified changes;
- positive evaluative statements;
- negative value judgments.

'Dealing with disorder': an example of a design pattern

A teacher's ability to be alert to his surroundings only becomes productive once his reactions are alert as well. And his reactions, together with the interactions that are based on them, become productive only once they are combined with the goal the teacher intended. The teacher uses his 'educational purposes' to determine what actions can contribute to achieving the goal. In case a teacher sets 'teaching a lesson that flows smoothly' as a process goal, this goal decides which actions he will then take. Having the actions correspond to the process goal does not mean these interactions will be effective. Whether a teacher can employ such interactions productively and efficiently depends on his previously acquired situated knowledge.

Alexander calls a series of efficient interactions that are used as a solution to a recurring problem a *design pattern* (Alexander et al., 1977). Such a solution consists of a structure of heuristics (Goodyear et al., 2004). Because a teacher acts practically and intuitively, he applies such a design pattern more or less automatically. For example, an experienced teacher focuses his attention on the proceedings in the classroom that surround the pupils' learning process. He might, for example, look at classroom management issues from different perspectives, keep an eye on continuity and act before these hurt the lesson (Wolff, Jarodzka, van den Bogert, & Boshuizen, 2016). This means that design patterns are not internally represented potential actions that are free of context, but instead, instances of situated knowledge.

To explicate design patterns further an example that concentrates on dealing with disorder will be given. The context, in this case, is a group of pupils that keeps disturbing the teacher's instruction, even when they have been given a warning. The group is part of a class of first-year secondary school pupils, and the lesson is taught on a late Friday afternoon. The design pattern 'dealing with disorder' is used to put an end to repeated chitchatting or disturbances of the productive climate. One way of doing this is by making the instruction more exciting. The teacher in training can achieve this by doing a written preparation of the instruction, or by practicing with the execution of the lesson. In conclusion, one of the elements of the design pattern 'dealing with disorder' can be used: communicating effectively, handling conflict, continuous signal, alertness, overlapping, the ability to keep pupils paying attention and pupil responsibility (Geerts & Van Kralingen, 2016).

5.1.3 Pattern language

Another characteristic of design patterns is that they exist in groups, which together form pattern languages. A pattern language is a cluster of design patterns, used for a specific domain (Powell, Millwood & Tindal, 2008). In case of the above example, when a teacher engages the disorderly class by using a more exciting instruction, the teacher not only uses the design pattern 'dealing with disorder', but also the design pattern 'instruction'. The design pattern 'dealing with disorder', is tied in with the overarching pattern language 'teaching', which in turn consists of subordinate design patterns like 'pedagogical action', 'dealing with personal characteristics', 'reflecting', 'giving instructions' and 'guiding the learning process'.

Developing a design pattern is, just like other forms of situated knowledge, a long-term process. For the teacher, the process of learning how to apply a design pattern is iterative (Rusman et al., 2009). It starts with an analysis of the current situation, individually figuring out a solution to the problem and then evaluating its results. The result of this cycle forms the input and starting point for the next cycle. Increasingly better solutions are reached by repeating this process, because for each domain multiple design pattern based solutions are possible (Kolfschoten, Lukosch, Verbraeck, Valentin, & de Vreede, 2010). The teacher judges his actions in the situation by determining to what extent they have

contributed to reaching the desired goal. In this way, the teacher gradually accumulates increasingly refined design patterns, which form pattern languages. And in this process, his expertise grows. This network of interconnected design patterns is concentrated on a specific domain. Further, the information contained in the design patterns is situated, as it is constructed over a series of real situations which directly deal with that domain. This means that for the execution, the teacher depends on the context. After all, the knowledge is intrinsically connected to the situation, and parts of it are embedded in the situation.

Design patterns at the teacher training

The teacher education's task is to support teachers in acquiring the situated knowledge they need to function effectively in the complex environment that is the classroom (Carter & Doyle, 1987; Bowe & Gore, 2016). A teacher in training can be viewed as a novice, who has a long way to go before he reaches the level of a starting expert. After his initial education, he can grow to become an experienced teacher by gaining an increasingly rich aggregation of educational purposes and design patterns.

Recent studies of competence acquisition increasingly focus on the contrast between the way expert and novice teachers experience events in the classroom (van den Bogert, van Bruggen, Kostons & Jochems, 2014), and the difference between the ways in which both are alert to classroom management issues. Echoes of this research at the teacher education lead to an increased attention to possible ways of transferring the necessary knowledge and heuristics (The Netherlands Association of Universities of Applied Sciences, 2011). Heuristics deal mainly with the way interactions can occur in the classroom. The report by the Association defines heuristics as context-specific rules of thumb to deal with a specific kind of problem. As shown in the previous section, this description of heuristics is conceptually consistent with the definitions of situated knowledge. In addition, the fact that heuristics are, in fact, good examples of situated knowledge, means that acquiring them is a long-term iterative process, for which the context is a crucial element. And because the practical experience of individual teachers in training is limited, it is no surprise that acquiring design patterns is a challenging task for them.

The use of written design patterns

There is a disparity between the way an expert teacher acts effectively by intuition, and the relative inability of novice teachers to be effective in the dynamic classroom that is their daily environment. As he is starting out, the novice teacher can only employ his explicit and self-moderated knowledge, which becomes increasingly automated and internalized, and in this way, situated knowledge. This acquisition model corresponds to several other theories on knowledge becoming internalized, in particular Vygotsky's concept of the zone of proximal development and Gal'perin's theory on the internalization of knowledge (Derry, 2013). Gal'perin posits that the process of internalizing knowledge starts out with explicit knowledge that is used with the support of a competent partner, for

example the teacher trainer who supports the novice in his learning. To support this internalization process, the educational publications that are used at the teacher education schools often contain written solutions to problems (Geerts & Van Kralingen, 2016). These are educational situations that have been written down in full and contain the following elements:

- an example that is characteristic of the design pattern;
- an introductory description of the context and its place within a pattern language;
- examples of solutions, described in practical steps;
- a conclusion, including a description of this design pattern and how it is related to other design patterns (Borchers, 2008; Kolfschoten, Lukosch, Verbraeck, Valentin, & de Vreede, 2010; Powell, Millwood, & Tindal, 2008).

However, such a theoretical description can only become part of a teacher in training's situated knowledge once he links it to his real-world experiences. Without this link, all he has is a memorized, strongly simplified and formalized version of reality, which cannot be implicitly and instinctively used. The theoretical description can serve as a starting point for an improved way of training teachers: one that focuses on internalizing design patterns. Starting with explicitly written design patterns is presumably the most effective way to start creating situated knowledge effectively.

5.1.4 Higher learning objectives

The teacher in training who wants to improve his classroom management can do so by looking up what to pay attention to in a library. The list of tips he reads in the book will only challenge him to memorize that specific list. But, as shown, if he wants to act productively and manage his classes adequately, he needs to focus his alertness. The teacher in training needs 'educational purposes' regarding classroom management if he wants to focus his alertness on the functional aspects of the situation and develop design patterns. This requires a processing that is more thorough than merely remembering. For instance, the situation needs to be analyzed, or his actions evaluated. Support can come from a more competent other, for example a teacher trainer or supervisor. In this situation, there is explicitly formulated knowledge that is supported by the social environment. This means that when training new teachers, the educational facility needs to work with higher order learning objectives.

Higher order learning objectives are learning objectives that require higher order thinking skills, such as analyzing, evaluating or creating study materials. These skills require more cognitive skills than lower order objectives like remembering, understanding and applying (Jensen, MacDaniel, Woodard, & Kummer, 2014; Bloom, 1984). This proposed recommended way of teaching design patters means that, even before a teacher can act in an educational setting, he must be able to understand or give meaning to what is going on in that setting (Blanton, Blanton & Cross, 1994). To achieve this, he should be challenged to reflect on his practical experiences, including his 'educational purposes' and evaluating the

results of his new design patterns. This evaluation requires higher cognitive functions, so this way of learning ranks higher in the taxonomy of learning objectives. A teacher in training must be able to distinguish important aspects of the situation he is presented with (Masats & Dooly, 2011). The comprehensive nature of a video makes it more suitable for assignments like this when compared to a written case study, whose features are essentially poorer and lack the fullness of the situation. On top of this, written cases are often influenced by the authors' views and ideas (Blijleven, 2005). It is important to show the educational situation in its entirety because situational knowledge cannot be viewed separately from the situation, and indeed is partially embedded in that situation. For these reasons, video recordings are particularly suitable for showing the diffuse dynamic environment of daily classroom proceedings.

5.1.5 Video cases

A teacher trainer that employs higher order learning objectives to impart design patterns and pattern language as situated knowledge in his students can make use of video cases in achieving those objectives (Geerts, Van der Werff, Hummel, Steenbeek, & Van Geert, 2015).

Using video cases comes with several advantages that will be discussed here briefly. Video cases contain a great deal of explicit details of the recorded situation, which are presented contextually and holistically. Information and scenarios are shown in a way that corresponds to the way real teachers encounter didactical and pedagogical problems (Blijleven, 2005; Geerts, Van der Werff, Hummel, & Van Geert, 2015). Video cases allow teachers in training to apply their theoretical knowledge by analyzing a specific, authentic educational situation.

By examining the actual behavior of a teacher handling a certain situation on video, they can explore how he deals with that situation (Blijleven, 2005; Kurz, Llama, & Savenye, 2004). In comparison, a written case study contains a textual interpretation that steers the reader towards a particular reading of the situation. Instead, a video case allows that viewer to consider the educational situation objectively and at a distance (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008; Van Es & Sherin, 2002).

Of course, a video is also recorded from a distinct visual perspective. But in the production process, the producers might choose to record using several visual perspectives, as was the case with Didiclass, whose video database is used in the current research (www.didiclass.nl). The Didiclass team explicitly stated their intention to produce realistic videos that capture a multilayered reality and keep the corresponding pluri-interpretability intact.

By taking multiple perspectives, for example both the pupils' and teachers' perspectives, the viewer can form a fuller picture of the real world educational situation. The first example of authenticity of video is that both the situated and embedded aspects of the recorded situation are captured by the camera. The second advantage is that teachers in training, by analyzing educational videos,

can become convinced that they will be able to obtain the skills, knowledge and attitudes that are necessary to function effectively as a teacher (Shulman, 1992). A third benefit is that these video cases can be looked at in the relative peace of the training institute's environment. Because the viewer has time to react, he is challenged to put into words his own ideas, feelings and interpretations. All of these advantages make that video cases are particularly well-suited to have a teacher in training analyze the scene presented in the video, make the 'educational purposes' their own and come up with solutions to reach the process goals he set by applying a design pattern.

5.1.6 Aim of this study

The current research aims to study whether the proposed use of video cases based on optimized authenticity as it was set out in the introduction can indeed contribute to the acquisition of design patterns and 'educational purposes' by teachers in training. Specifically, this study will look at the use of video cases in a classroom management course during the 2nd year of the teacher education, and what it can contribute to the acquisition of higher learning objectives, in the form of reflecting on design patterns and 'educational purposes'. The use of video cases can facilitate a teacher in training reaching these goals by reflecting on the real-world situation presented in the video.

The main research question is: to what extent does the use of video cases in a course in classroom management contribute to 1. Situated knowledge in the form of educational purposes, specifically 2. The design pattern 'dealing with disorder' and 3. The overarching pattern language 'teaching'. The following predictions have been formulated:

Hypothesis 1
Teachers in training who are taking a course that uses video cases can connect more 'educational purposes' to the real-world situation presented in the video compared to teachers in training who are taking the same course without video cases.

Hypothesis 2
Teachers in training who are taking a course that uses video cases can connect more components of the pattern language 'teaching' to the real-world situation presented in the video than teachers in training who are taking the course without video cases.

Hypothesis 3
Teachers in training who are taking a course that uses video cases show a more developed applicability of the design pattern 'dealing with disorder', compared to teachers in training who are taking the same course without video cases.

5.2 Method

5.2.1 Participants

In this research, 41 teachers in training from two parallel groups of second-year English teachers in training (full-time) at the NHL University of Applied Sciences have been examined in the academic year 2012-2013. The participants were randomly divided into either the control group or the experimental group. The control group attended the regular course with written or verbalized cases, as it had been taught at the school before. The experimental group attended the experimental version of the course which included lessons with video cases. The duration of the course was two months and a measurement was done at the beginning as well as the end of the course. At the start of the course, the experimental group consisted of 21 teachers in training. However, seven of them quit immediately after the beginning of the course and five students left the course at a later point. For that reason, the experimental group eventually consisted of 3 males and 6 females (N=9) with an average age of 21.78 (SD=1.20). Initially, there were 20 teachers in training in the control group, of whom six quit immediately after the start of the course. Six others dropped out as the course progressed. Consequently, one male and seven females were in the control group with an average age of 22.25 (SD=2.38). The drop-out rate, as well as composition of the groups reflect the nature of the student body at the English teacher education. Most of the teachers in training who dropped out have left the educational program. The high rate of drop-out is in line with nation-wide data of seconddegree teacher educational programs (Inspectie van het Onderwijs, 2014). Therefore, the remaining groups correspond in terms of age, pre-education, number of obtained credits, underlying motivation for the profession and largely regarding gender distribution.

5.2.2 Materials

For the pre- and post-test, a measuring instrument has been developed (see Appendix 1), which measures the educational purposes, the pattern language 'Teaching' and the design pattern 'Dealing with disorder', with which hypothesis 1, 2, and 3 can be answered. The instrument consists of three assignments: creating a Written Advice for the main character 'Olga' in the viewed video case, writing an oral Observation Report using the participants' educational purposes and a structured Interview about the design pattern 'Dealing with disorder'. The instrument can be found in appendix 1. Both the Observation Report and the Interview were recorded with a videorecorder, after which a transcription was made from the recording. All the components of the measuring instrument were completed by the participants in above stated identical order.

Hypothesis 1 was tested using Observation Report to explore which educational purposes are present (Copeland & D'Emidio-Caston, 1998). Eight cards were used to operationalize the existence of educational purposes and by using them the respondent is challenged to connect educational purposes to the viewed video case. The Observation Report is thus aimed at hypothesis 1: educational purposes.

Hypothesis 2 was tested by using Written Advice. This instrument measures what advice the respondent would give in the situation portrayed in the video through a number of questions. From the recorded answers, it can be inferred how many components of the pattern language 'Teaching' are used in the advice. Following the professional requirements used in The Netherlands, the pattern language 'Teaching' had initially been defined as pedagogical action for this research, dealing with human characteristics, reflection, providing instruction, guiding the learning processes, and dealing with disorder. This classification has been secondarily validated by several experienced teacher trainers. This validation took place in 2012, at the annual congress for the occupational group of teacher trainers from The Netherlands and Belgium that took place in Antwerp (Velon, 2012). At the congress, during a workshop the entire survey was done by thirty teacher trainers, highly experienced in teaching secondary education classes. From the answers of these experienced teacher trainers, high conformity was apparent regarding the mentioned components of the pattern language 'Teaching'.

To obtain a better insight in the given answers, it has been examined which components of the pattern language 'Teaching' have been used the most in the Observation Report. The Written Advice and Observation Report are thus both aimed at hypothesis 2: pattern language 'Teaching'.

Hypothesis 3 was tested by using the answers to the questions from the Interview, it was determined to what extent the design pattern 'Dealing with disorder' has been mastered. The questions in the Interview are based on ideas on dealing with disorder from the Handbook for Teachers (Geerts & Van Kralingen, 2016). In summary, the following applicable components of the design pattern 'Dealing with disorder' are considered: communication, fluent lesson progression, reacting alertly, multi-tasking, 'pay attention' signals, pupil responsibility and conflict handling.

The sequence of conducting the measuring instrument deviates from the sequence describe above. It was used to prevent the respondents from falling back on theoretical knowledge from a course book, which is not connected to the situation. A choice was made to first off use the Written Advice, which is aimed at, the overall picture that the respondent has of the situation. Only with the second instrument, Observation Report, the respondent was invited to connect situated knowledge to the situation at a more detailed level. Finally, because of the importance of a uniform way of conducting, the choice was made to have all instruments conducted by a student-assistant.

The video case that was used as a trigger to initiate reactions from the participants (casus 'Olga') is part of Didiclass (Geerts, Van Laeken & Mitzschke, 2007),

which comprises a series of cases widely used in the Dutch teacher education programs. The subjects of the cases are engaging for teachers in training as they offer real-world situations and feature a wide variety of central figures teaching (male, female, young and old). The case illustrates all components of the design pattern 'Dealing with disorder' and consists of three short videotaped clips. In the first clip Olga is shown as she tells something about her functioning. In the second, four-minute clip, parts of her lesson are shown in chronological order: Olga teaches German in a second year VMBO-T-class. At the beginning of the lesson she teaches, she loses the flow in the way the lesson progresses (momentum), which results in the lesson getting a rough start. She has difficulty regaining the attention of the pupils. Only halfway through the lesson, she is finally able to begin the lesson she prepared. The third clip lasts almost three minutes and is a report by two pupils who have been removed from the lesson by Olga. The pupils' reflections in the clip are supported by lesson fragments.

5.2.3 Procedure

The candidates all attended a classroom management course, consisting of eight weekly meetings of one and a half hours. The control group attended the regular course with written or oral cases, the experimental group attended an experimental version of this course, designed by using various other video cases from the case database Didiclass (Ruud de Moor Centrum, 2007). More details on the discussed cases can be found in appendix 2. In this experimental group, the emphasis of the course was therefore on the situated nature of acquiring educational purposes and design patterns. At the beginning and end of the course, a pre- and post-test was conducted by employing the measuring instrument mentioned above. The respondents were obligated to take part in these. The Olga case outlined previously is used in both the pre- and the post-test, but not during the course. Since the pre-test was conducted with both the experimental and the control group, and feedback was not provided, it is expected that a possible learning effect for the experimental group is equivalent to that of the control group.

5.2.4 Analysis of the Variables

Educational purposes

The Observation Report that was made after the participants had watched the video case 'Olga' was used to map out the development of their educational purposes. An example is: "*I can see that you give out warnings, but that you don't follow up these warning with consequences. After a second warning you should act, otherwise pupils become aware that all you do is threaten*".

In terms of educational purposes, this quote is ranked as 'justified change', because a motivation is given for the advice. This motivation is linked to what the teacher in training has seen in the video.

Pattern language

To determine the size of the pattern language, it was measured in the Written Advice and Observation Report how many of the design patterns are present: pedagogical action, dealing with human characteristics, reflecting, performing instructions, guiding the learning process, and dealing with disorder. Whenever a given answer could be attributed to two different design patterns, the context of the complete answer to the question was judged to determine what the correct coding should be. Field coding is the process of categorizing open ended responses in predetermined response options (Lavrakas, 2008). More examples of field coding and the instruments used for scoring the quotes of the participants can be found in appendix 3. These kinds of encodings have been recorded to perfect the instructions used for encoding. This way, an accurate comparison between the groups of respondents is possible, while the respondents do have the ability to answer the questions in their own words and without much guidance (Gibb, 2008).

Design pattern 'Dealing with disorder'

In the Interview, the quality of the design pattern 'dealing with disorder' is determined by questioning the teacher in training about different applicable steps that are part of this design pattern, that is: communicating effectively, handling conflict, continuous signal, alertness, overlapping, the ability to keep pupils paying attention, pupil responsibility (Geerts & Van Kralingen, 2016).

Every applicable step has been questioned separately. For each correct part of the answer the teacher in training could receive a point. He could be awarded a point for expressing each of the following elements: a) a good observation of the viewed video case, b) a connection between theory and daily practice, c) a personal practical experience, d) an applicable suggestion for improvement of the appropriate action. In sum, a total of 4 points can be scored. Provided that a teacher in training has scored three points or higher, it can be stated that he has the situated knowledge to exercise this design pattern in a practical situation. The following quantitative evaluation has been used: insufficient for zero points, weak for one point, beginner for two points, and applicable for three or more points.

Because of the small sample size, a Monte Carlo Simulation (Todman & Dugard, 2001) was subsequently performed on both the results of the control and the experimental group. This was done to be able to make assumptions with regards to the probability distribution based on these simulations. These simulations consist of random permutations of the observed outcomes. By randomly shuffling the observations 10.000 times, randomly shuffled sets are formed, each of which is an operationalization of the possible outcome under the zero hypothesis. Whether the empirically detected variances, for example those between the experimental and control condition, under the zero hypothesis, can be expected on the bases of coincidence, can be determined in this way. The result of this collection of simulations is a distribution function that shows the total range of

possible outcomes (Landau & Binder, 2015). During the analysis, any significant statistical differences were observed, both in terms of the pre- and post-test and the control and experimental group.

To gain a better understanding of the effect size of the difference found between the groups, Cohen's *d* has been calculated where possible. The effect size can be expressed in both a positive and a negative value. In this case, a positive effect size value indicates that learning had occurred, whereas a negative value indicates a learning loss. Following the guidelines set by Cohen (1977), a Cohen's d value between 0.000 and (-)0.200 cannot be called an effect. A value between (-)0.200 and (-)0.500 means a small effect occurred and there is a moderate effect when the value is between (-)0.500 and (-)0.700. A value over (-)0.700 indicates a consequential or large effect.

The results are reported using a combination of Cohen's *d* for effect size and an exact *p*-value. The *p*-value is reported to indicate the probability of the result that was observed. A *p*-value smaller than 0.1 but over 0.05, for instance, indicates that it is probable that the observed values are not the product of random chance (Cumming, 2014; Kline, 2013). A *p*-value smaller than 0.05 indicates that it is very unlikely the product of random chance, and a *p*-value smaller than 0.001 means it is extremely unlikely. A result like this, combined with a significantly large effect means that the empirical proof for the effect is strong.

5.3 Results

5.3.1 Hypothesis 1: Number of educational purposes

During the pre- and post-test, the participants used cards to link 'educational purposes' to the video case they watched. Table 1 shows the number of 'educational purposes', out of a maximum of 8, that were linked by the participants. It shows that the experimental group scores lower both on the pre-test (M= 6.4, *SD*=1.33) and the post-test (M=6.4, SD=1.33), than the control group has on the pre-test (M=7.75, SD=0.7) and the post-test (M=7.25, SD=0.89). The effect size stated as a difference between the pre-test and the post-test is d=-0.668, p<0.001 for the control group. In the experimental group, there is no difference between the pre- and post-test, and consequentially there is no effect at all in this group. For the control group, there even appears to be a moderately sized learning loss. A significant difference was observed between the experimental group and the control group in the post-measure (d=0.537, p=0.038). This is contrary to our expectation that the experimental group is able to list more 'educational purposes'. The observed learning loss is more pronounced in the control group compared to the experimental group, however.

Ptc.	Experimental group						Control group					
	Pre	M	SD	Post	M	SD	Pre	M	SD	Post	M	SD
1	8	6.4	1.33	8	6.4	1.33	8	7.75	0.70	8	7.25	0.89
2	8			7			8			6		
3	8			7			8			8		
4	5			7			8			8		
5	6			6			8			7		
6	5			6			8			8		
7	7			7			8			7		
8	6			6			6			6		
9	5			4								

Table 1
Number of 'educational purposes' linked to the video case for each participant

5.3.2 Hypothesis 2: Elements of pattern language 'Teaching'

Pattern language 'Teaching' in written advice

In order to compare pattern languages, it was determined which clusters of design patterns they consist of. The quantities of the design patterns that were mentioned by the participants in both the experimental and the control group during the pre- and post-test were compared. The results are presented in Table 2 (experimental group) and 3 (control group).

Participant	Pre-test							Post-test						
Question	1	2	3	a	b	M	SD	1	2	3	a	b	M	SD
1	1	2	2	2	3	2	0,71	2	2	1	2	2	1,8	0,45
2	2	3	2	2	0	1,8	1,10	1	2	2	1	1	1,4	0,55
3	1	2	2	2	0	1,4	0,89	1	2	1	1	1	1,2	0,45
4	1	2	2	2	0	1,4	0,89	1	3	3	3	1	2,2	1,10
5	1	1	2	1	1	1,2	0,45	3	3	3	2	2	2,6	0,55
6	2	2	1	4	1	2	1,22	1	2	1	1	1	1,2	0,45
7	1	2	1	1	1	1,2	0,45	2	2	1	2	1	1,6	0,55
8	1	2	1	1	1	1,2	0,45	3	3	2	2	2	2,4	0,55
9	2	2	1	1	0	1,2	0,83	2	2	2	2	0	1,6	0,89

Table 2
Number of design patterns mentioned in the written advice – Experimental group

Participant	Pre-test							Post-test						
Question	1	2	3	a	b	M	SD	1	2	3	a	b	M	SD
1	3	3	3	2	0	22	1,30	3	4	3	3	1	2,8	1,10
2	2	1	1	1	1	1,2	0,45	1	2	2	2	1	1,6	0,55
3	2	2	3	2	2	2,2	0,45	2	2	3	2	2	2,2	0,45
4	1	3	3	3	2	2,4	0,89	1	2	1	1	1	1,2	0,45
5	2	3	2	2	2	2,2	0,45	1	3	2	2	2	2	0,71
6	2	2	3	2	2	2,2	0,45	1	4	3	3	2	2,6	1,14
7	2	3	2	2	2	2,2	0,45	1	2	1	1	1	1,2	0,45
8	3	2	2	2	2	2,2	0,45	3	4	3	3	3	3,2	0,45

Table 3

Number of design patterns per question mentioned in the written advice – Control group

The values of the experimental group indicate progress between the pre- (M=1.49, SD=0.39) and post-test (M=1.78, SD=0.51). The control group shows no such progress between the pre- (M=2.1, SD=0.37) and post-test (M=2.1, SD=0.74). This suggests that the experimental group has made more progress than the control group. The observed difference between the pre- and post-test is significant for the experimental group (d=0.698, p<.001). According to Cohen's guidelines, this is a moderate effect.

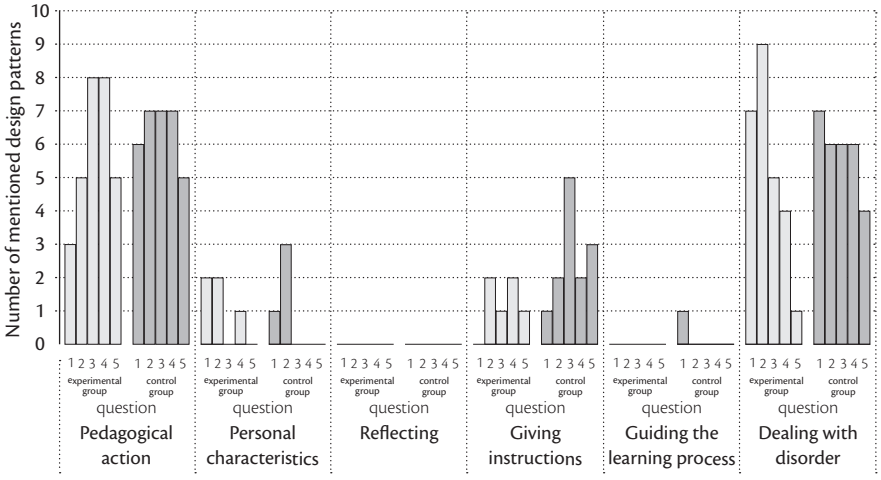

Figure 1

Design patterns mentioned per questions (pre-test)

In order to explore the design patterns that were mentioned for each question in the Written Advice, these have first been summarized in Figure 1. The results of the pre-test displayed here illustrate the distribution of the responses. This distribution was not tested: as the second hypothesis is used to investigate the number of design patterns, just the total number of design patterns mentioned.

The most frequently mentioned design patterns were 'pedagogical action' and 'dealing with disorder'. They were mentioned at each question, but mainly when sharing the advice and when composing concrete, applicable advice. During the pre-test, participants in the control group more often mention the design pattern 'instruction', compared to the experimental group. The design patterns that were named in the post-test are slightly more spread out (Figure 2), but 'pedagogical action', 'instruction' and 'dealing with disorder' still come up most frequently. Here, 'instruction' is mentioned more often by the experimental group than the control group.

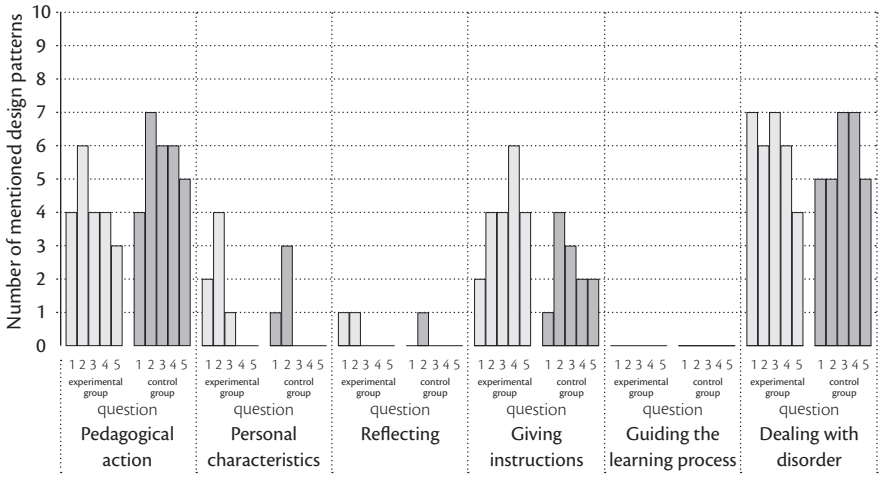

Figure 2
Design patterns mentioned per questions (post-test)

Pattern language 'Teaching' in 'the Observation Report'

Hypothesis 2 is unique in that it was examined using two elements of the measuring instrument. The results of the additional analysis, using the Observation Report, reveals that participants were able to link most of the educational purposes to the video case. To get a better understanding of these answers, the number of design patterns of the pattern language 'teaching' that was found in the answers was investigated.

Ptc.	Experimental group						Control group					
	Pre	M	SD	Post	M	SD	Pre	M	SD	Post	M	SD
1	13	10.44	3.0	11	11.33	2.65	22	13.13	4.45	16	11.38	3.34
2	15			15			16			9		
3	14			10			11			10		
4	7			14			13			15		
5	9			13			13			9		
6	10			12			13			15		
7	11			10			10			8		
8	8			11			7			9		
9	7			6								

Table 4
Number of design patterns – 'Observation Report'

The number of design patterns that each participant mentioned is provided in Table 4. Fewer design patterns were mentioned during the pre-test by the experimental group (M=10.44, SD=3.0) compared to the control group (M=13.13, SD=4.45). During the post-test, the difference between the experimental (M=11.33, SD=2.65) and control group (M=11.38, SD=3.34) shrank.

The effect size as a difference between the pre-test compared to the post-test is, for the control group d=–0.476, $p < 0.001$ and for the experimental group d=0.334, $p< 0.001$. There is a small positive effect in the experimental group, and in the control group there is a small negative effect. It was determined, based on comparing the differences in scores in the post-test of both the experimental and the control group, that there is a large effect (d=0.867, p=0.049). This indicates that the experimental group performs substantially better during the post-test compared to the pre-test, whereas this increase is less pronounced for the control group. Thus, the learning gains in the experimental group are significantly greater than those in the control group; in the control group, there is even a learning loss. Further, it has been assessed for each educational purpose how many design patterns the group could come up with (Table 5). A differentiation had been made between the total number of mentioned design patterns, number of unique

design patterns (maximum 6) and the number of design patterns that were mentioned at least five times by the participants.

	Experimental group						Control group					
Ed. purpose	Pre-test			Post-test			Pre-test			Post-test		
	Total	Unique	≥5 times	Total	Unique	≥5 times	Total	Unique	≥5 times	Total	Unique	≥5 times
1	12	4	1	20	5	3	15	3	2	14	3	1
2	6	2	0	6	2	0	12	4	1	9	3	0
3	10	4	1	11	4	1	10	4	1	8	1	1
4	15	5	2	12	5	1	15	5	1	14	3	1
5	7	3	0	9	3	0	13	3	1	10	3	1
6	16	5	2	18	4	2	12	4	1	10	3	1
7	15	5	0	14	4	1	16	4	3	15	2	2
8	13	5	1	12	4	1	12	4	0	11	3	1
M	11.75	4.13	.88	12.75	3.88	1.13	13.13	3.88	1.25	11.38	2.63	1
SD	3.77	1.13	.83	4.56	.99	.99	2.03	.64	.89	2.62	.74	.53

Table 5
Number of mentioned design patterns – 'Observation Report', per card

The number of design patterns mentioned by the experimental group (Table 5) is, on average, higher in the pre-test (M=12.75, SD=4.56) compared to the post-test (M=11.75, SD=3.77). This contrasts with the control group, which on average mentions less design patterns in the post-test (M=11.38, SD=2.62) compared to the pre-test (M=13.13, SD=2.03). Cohen's effect size value d=-0.798, p<0.001 suggests a moderately large learning loss between the pre- and post-test for the control group. Cohen's effect size value d=0.256, p<0.001 for the experimental group suggests a small positive effect: the experimental group performs better during the post-test compared to the pre-test. The experimental group learned more than the control group did. The Monte Carlo simulation demonstrates that the chance of these differences in scores being accidental is less than 10% (p=0.096).

From the post-test sections of Table 5, it could be concluded that the group can name more (M=3.88, SD=0.99) unique design patterns than the control group (M=2.63, SD=0.74). When the attention is shifted from the total number of design patterns mentioned to the number of unique design patterns, both groups show a decline between the pre-test and the post-test (p=0.001).

Using the Monte Carlo simulation (10,000 simulations), it was determined that there is a difference in learning gains of the control group on the one hand, and the experimental group on the other (d=0.907, p=0.096). This means that it is likely (p=0.096) that there was a pronounced learning gain in the experimental group, while the control group most likely did not progress at all, and even displays a learning loss regarding the total number of mentioned design patterns.

5.3.3 Hypothesis 3: Applicability of the design pattern 'Dealing with disorder'.

In order to analyze the design pattern 'dealing with disorder', the answers to the question in the 'interview' have been used. The participants in the experimental group have mastered more design patterns on level 2 (beginning) and level 3 (applicable) at the end of the course then in the beginning(Figure 3).

The control group also shows growth, but not as strongly as the experimental group (see Figure 4). The difference between the pre-test relative to the post-test is for the control group d=1.757, p<0.001 and for the experimental group d=3.473, p<0.001). The effect sizes are big for both groups, but for the experimental group the effect is particularly big. The effect size expressed as a difference between effect sizes in both the experimental and the control group is also large (d=2.198). The empirically determined way the experimental and control group differ in their pre- and post-test results was tested using the Monte Carlo-simulation (10,000 simulations). The results of this simulation show that the probability of this difference occurring by chance is just over 5% (p=0.056). The experimental group's increase in performance between the pre-test the post-test, is much larger than the control group's increase in performance. This means that the learning gains of the experimental group are larger than the learning gains of the control group.

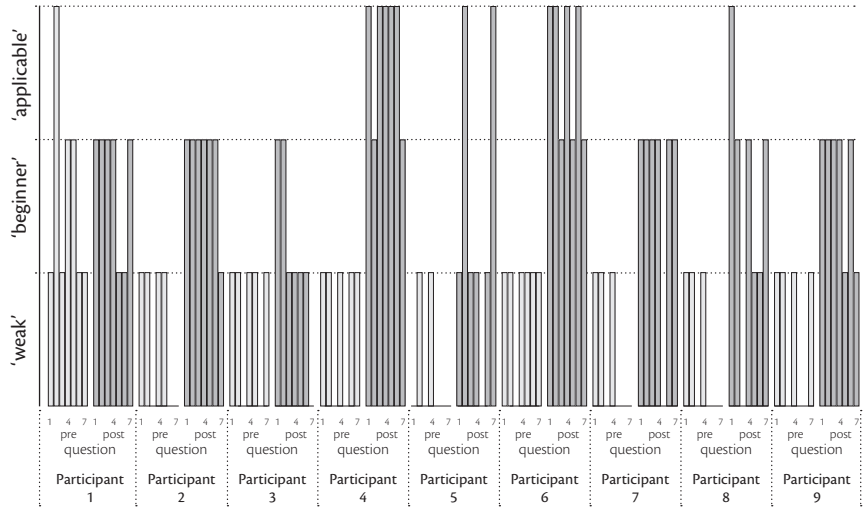

Figure 3
Applicability of the design pattern 'dealing with disorder' as reported in the pre- and post-test interview - experimental group

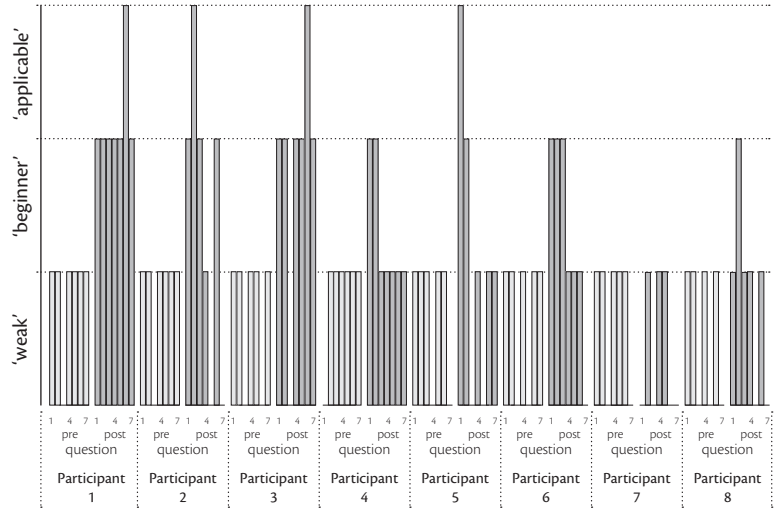

Figure 4
Applicability of the design pattern 'dealing with disorder' as reported in the pre- and post-test interview - control group

5.4 Conclusions and discussion

In this study, three hypotheses have been used to test whether the use of video cases in a classroom management course in the second year of the teacher training contributed to the acquisition of situated knowledge in teachers in training.

Using the first hypothesis, it was investigated to which degree participants linked educational purposes to a real-world situation as they viewed it in a video case. Teachers in training who attended a course that included the use of video cases could link, on average, an equal amount of educational purposes to the video case both before (pre-test) and after (post-test) the course. Teachers in training attending a course that did not use video cases linked fewer educational purposes to the video case in the post-test compared to the pre-test. So, for both groups, the gain in measured number of educational purposes was lower than expected.

The number of elements of the pattern language 'teaching' that teachers in training linked to a video case was investigated using the second hypothesis. Teachers in training who attended a course that included video cases could link more design patterns in the post-test compared to the pre-test. The teachers in training who attended the same course without video cases could also link more design patterns in the post-test, but the change was less pronounced. Additional analysis (Figure 1 and 2) revealed that the design patterns that were mentioned mostly dealt with pedagogical action, giving instructions and dealing with disorder. Watching videos thus contributes to the development of the pattern language 'teaching' in teachers in training.

Thirdly, it was hypothesized that the applicability of the design pattern 'Dealing with disorder' would be more developed in teachers in training who take a course that uses video cases, compared to their fellow students taking the same course without video cases. Both groups show progress in the applicability of this design pattern. For the group attending the course without video cases this progress was less strong. So, the development of the design pattern 'Dealing with disorder' is stimulated more by a course that includes video cases compared to one without video.

What could be the explanation of the results of our test of hypothesis 1? An improvement in the number of educational purposes linked to the case was not found, but a relapse in this number in the control group has in fact been found, which means a learning loss. An obvious explanation would be that the results are sound and that the hypothesis can be rejected. But, since the teachers in training who are attending the course are also experiencing their first time being in front of a class, the challenge of thinking about their own process goals while teaching will only start once their internship has begun. The intervention, supported with video cases might have come too soon, because the intended learning experience can only take shape in the long term. This experience can be described as a U-shaped learning pattern, which indicates that reflecting on a strategy can lead to a temporary decline in the use of that strategy before it starts to improve

(Gershkoff-Stowe & Thelen, 2004). Creating new frameworks for educational purposes will have to have been preceded by a lengthy process of reflection on the teacher in training's own workplace experiences.

An alternative, speculative explanation could be that the number of educational purposes was incorrectly mapped. The instrument that was used, which is based on Copeland and D'Emidio-Caston's (1998), helped us to find more than 7 of a total of 8 operationalizations of educational purposes on average. It is possible that there is a ceiling effect, reducing the possible width of variation in the answers. Several respondents scored the maximum score on the observed variables. Because of this, discrimination between the respondents in the top end of the scale became impossible. This can often be related to the design of the instrument: in this case, they may have come about because the video clip that was used to measure the outcome was too long. Questions about more than eight educational purposes should have been included.

How can the results of the testing of hypothesis 2 be explained? Here, an increase in the number of elements of the pattern language 'teaching' was found in the experimental group, and this increase was more pronounced than the one found in the control group. Both groups feature a pattern language, but the number of elements contained within them is limited. This is the reason the answers are spread out mainly over three out of the six possible elements of the pattern language 'teaching'. From the additional analysis it became clear that one of these, 'pedagogic action' is featured prominently. This prominent presence might be explained with the experiences that participants had as a pupil, which form the base of their choice of becoming a teacher themselves (Padhy, Emo, Djira, & Deokar, 2015). It is possible that a teacher in training, who, as a pupil, witnessed pedagogic successes, but also pedagogic failures in their teachers, formed a wish to do better themselves. It makes sense that 'instruction' and 'dealing with disorder' are frequently mentioned, as they are important parts of the course and because the teachers are confronted right away with giving instructions and keeping order themselves. To teach quality lessons, the teachers need to show improvement in all the elements of the pattern language 'teaching'. It is possible that the course in classroom management is too little focused on the rest, or too much on dealing with disorder.

The results of hypothesis 3, regarding the applicability of the design pattern 'dealing with disorder', are least ambiguous, in the sense that the experimental group does better during the post-test compared to the pre-test, and this improvement is more pronounced compared with the control group. The most likely reason for this is that the use of video cases contributed to this learning growth.

In summation, the notable outcome of hypothesis 1 is that there is a learning loss in the control group and an unchanging level of educational purposes in the experimental group. Then, in hypothesis 2 there is a partial learning loss in the control group. It is possible that the decline that was found can be explained as random fluctuation. However, because the Monte Carlo simulation showed

that the chance of that occurring is very small, it could also be possible that the deterioration is not a random fluctuation, but that for a number of teachers in training an actual decline in their number of educational purposes and elements of the pattern language 'teaching' occurs. Such a decline is not uncommon when people reflect on issues that were previously obvious to them. In these cases, the realization that not enough thought has been put into the matter leads to doubt (Barden & Tomala, 2014). A restructuring of knowledge is occurring, and the learning process is U-shaped. But there is a learning experience: the video case they watched gave the participants food for thought regarding those aspects of being a teacher, which until then were undeniably true to them. Their doubts are the results that have been found, which were measured during a short course. This would mean that the underlying learning experience can only be mapped in the long term.

Because a teacher in training's growth towards becoming an expert is a process that takes time, a suggestion for future research is to investigate the changes in educational purposes and design patterns between students. Measurements should be taken both of students' progress over time as well as in two cohorts, for example in current second and fourth year students of the teacher training. Either way, to increase generalizability, a higher number of participants should be strived for. Using these findings, the way a teacher in training thinks about his own actions and the development of his underlying principles and identity can be outlined. Education seeks to bridge the gap between their students' identity, the theoretical framework the education offers and the classroom their future teachers experience during their internship. To understand the way situated knowledge is accumulated through reflection, supported by video cases, should be a priority.

Appendix 1

'Interview' assignment classroom management

'Observation Report' and 'Interview' assignments
This assignment from the classroom management course file consists of three parts (Note: language students receive a different assignment). All three are carried out at the start of the first term and are then repeated, unchanged, at the end of the second term. You start out by taking the Observation Report of another student who, like you, watched the Olga case during class. Make sure the student explains what he saw in the Didiclass case. You will then interview the student, again regarding the Didiclass case that you watched. You will then carefully listen to what they have said, by typing out both the Interview and Observation Report. The second time you do this assignment, it is the interviewee's turn to write out the answers. On the final page of this booklet there is room to indicate what you learned from the student.

Good luck!

Tools
You need a set of eight cards for 'the oral observation report'. Your teacher will provide them. You will also need a voice recorder. Use either your own, a smartphone or a voice recorder provided by the AVC. You will have to provide the audio file you recorded when you hand in your materials.

'Observation Report' – explained
You are recording an Observation Report of another student. In this report, the student will react to statements that can be found on the set of eight cards and that you will pose to them.
You present the cards to your fellow students and tell them to sort them in any way they see fit. Next, the student will tell you, using the cards, what comes to mind regarding the Didiclass case that they watched. He or she is allowed to skip cards. You are the interviewer and adopt a listening attitude:
You can 'hum' and nod.
Try to elicit full replies. Full means different things to different people, but an answer you feel is incomplete needs to be added to by asking content-free questions like:

- Can you elaborate on that?
- What do you mean?
- Please explain!

You are not allowed to suggest (partial) answers. When the student does not understand the card, you can give a synonym (in English). The synonyms can be found on the backside of the cards. Other than that, no explanations or elaborations are allowed.

'Interview' – explained

You will then interview the other student. The questions you will ask, have already been put in the right order. Please stick to these questions for scientific purposes. Don't skip any questions. When a student answers 'no' to, for example, question 2, stick to the list and ask the follow up question 'Why?'.
The same goes for the question 'Would you do things differently?' Even when the answer is 'no', ask the follow-up question 'why?'. You adopt a listening attitude and ask the provided questions. Hum and nod to encourage the other to answer in full. Full means different things to different people, but an answer you feel is incomplete needs to be added to by asking content-free questions like:

- Can you elaborate on that?
- What do you mean?
- Please explain!

You are not allowed to suggest (partial) answers. When the student does not understand the card, you can give a synonym (in English). The synonyms can be found on the backside of the cards. Other than that, no explanations or elaborations are allowed.

'The interview'

1 What should the teacher do to keep order?

2 Does Olga make use of the Rose of Leary
(Synonyms: interpersonal circle, or attitude towards pupils)
a Why?
b Would you do things differently? Why?

3 Does Olga handle classroom conflicts with the pupils effectively? And between pupils? (conflict synonyms: difference of opinion)
a Do you see things differently?
b Would you do things differently? Why?

4 Can you identify a continuous signal in Olga's lesson?
(synonym: momentum)
a Do you see things differently?
b Would you do things differently? Why?

5 Is Olga alert when she's in front of a class? (synonym: perceptive)
a Why?
b Would you do things differently? Why?

6 Does Olga make use of overlapping?
(synonym: doing more things at once)
a How can you tell?
b Would you do things differently? Why?

7 Is Olga able to keep all the pupils engaged?
(synonym: pupil participation)
   a How can you tell?
   b Would you do things differently? Why?

8 Does Olga give her pupils responsibilities?
(synonym: pupil responsibility)
   a How can you tell?
   b Would you do things differently? Why?

9 Would you like to teach as Olga does?
   a Why?

10 What would you like to ask Olga?

Appendix 2

Concise description of the video cases used in the experimental group

Other cases used in the course have of course been discussed during the course to reach a maximum learning effect. These other cases contain the following authentic problems:

- The teacher does not respond to small disruption signals and this leads to the escalation of a small conflict.
- The teacher wants to use a motivating introduction to energize his pupils for the course.
- The teacher tries to find the right way to use basic communication in several settings to create a safe learning environment for the pupils.
- The teacher notices that the pupils have trouble grasping the material and tries to make the lessons more fun, while making sure that each pupil is able to gain something from it at their own level by confirming issues and offering help.
- The teacher tries to employ humor to reach didactic goals, but this humor is appraised as offensive by colleagues and pupils. This strategy also lacks a sound didactical plan. This leads to the teacher doubting his skills and identity as a teacher.

Appendix 3

Examples field coding

Examples field coding 'oral observation report': pattern language 'teaching'

Fieldcode	Example (verbatim quote from student)
Pedagogical action	"Emphasizing things that are going well" (exp., student 12; post-test cards).
Dealing with personal characteristics	"Her voice is very stern" (control, student 1; Post-test cards).
Reflecting	"I can understand it, as I find it challenging myself" (exp., student 5; post-test cards).
Giving instructions	"She is linking it to what the pupils learned last week" (exp., student 12; post-test cards).
Guiding the learning process	"She wants her pupils to learn something. I think she did some vocabulary in her class. She wants her pupils to learn German" (control, student 12; post-test cards).
Dealing with disorder	"What I'm missing is individual accountability, the fact that every pupil feels like they can be called upon" (exp., student 4, post-test cards).

6

Mapping the development of a teacher in training into a beginning expert[1]

Abstract

Teachers use situated knowledge to deal with the complex and diffuse educational contexts they operate in. To be able to take deliberate action, based on the situated knowledge, reflection is necessary during teacher training. Video cases with common, real world situations are suitable for reflection because of their holistic and diffuse character. Reflection concerns learning experiences with increasing complexity: single-loop (reflecting on a current action), double-loop (reflecting in order to gain new insights) and triple-loop (reflecting in order to adjust individual identity) learning. The knowledge gained from loop learning is of a situated nature. The current chapter operationalizes situated knowledge as educational purposes and design patterns. Educational purposes determine which course of action (design pattern) is the best option.

Using this distinction, it was investigated whether the reflection as done by fourth-year teachers in training corresponds to what can be expected of a starting expert, namely, reflection on all three levels. The results indicate that three out of four teachers in training can be characterized as starting experts, based on their answers on a video case. They experience learning on all three loop levels, and these experiences contribute to a variety of educational purposes and design patterns. It is the teacher trainers' challenge to have their students reflect using video cases, so students can use loop-learning to build their situated knowledge. This knowledge will allow them to adequately respond to the complex and diffuse situations in their educational practice.

[1] Based on:
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6.1 Introduction

Hattie (2003) has stated that a key component of high quality education is the teacher who is teaching the lessons. Students are expected to reach educational goals, among others goals, in the form of specific cognitive levels, but for them to do so requires high quality teachers to be giving the lessons that can take them to that level (Dean, Lauer, & Urquhart, 2005). The process that makes one a high-quality teacher starts at the teacher training. At the end of the teacher training, the teacher in training should attain the level of beginning expert as a basic qualification.

Van der Grift (2010) states that a teacher who is a starting expert is able to adequately handle the most common situations in a classroom, which are mostly of a diffuse nature. He further specifies this description by stating that a starting expert should be able to create a safe learning environment, employ an efficient organization of his lessons and use clear instructions. In this chapter a purely pragmatic definition of a starting expert is used, namely a final year student of the teacher training. Starting experts can become full experts, who are generally experienced and act intuitively and effectively in the dynamic environment that is their daily educational workspace (Markauskaite & Goodyear, 2014). Acting intuitively means to know, either consciously or automatically, which goals are to be reached and how this can be done. Effective means that their actions contribute to the goal they have set. The setting or situation of the intuitive, effective action is inseparably linked to the necessary knowledge that is acquired, created or used to deal with that situation. In short, the necessary knowledge is of a *situated* nature. This study focuses on the question to what extent the situated knowledge of a teacher in the fourth year of his training corresponds to the situated knowledge of a starting expert.

6.1.1 Situated knowledge

Situated knowledge is contextual and holistic and arises from the interaction between previous experiences and the theoretical knowledge linked to those experiences. Its components are inseparably linked to the interaction and situation it was created in. Situated knowledge is defined as the knowledge that results of cognition that takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place (Roth & Jornet, 2013). Physical environments, or workplace situations, often demand immediate, quick or intuitive actions by the teacher. For example, when a teacher at work observes that the physical distance he puts between himself and his students affects their behavior, he will conclude that he can make his students aware that their participation in lesson is being monitored (Miller, 2011). A teacher in training has not yet internalized the situated knowledge that will allow him to act quickly and intuitively in situations like these. To be able to deal with the constantly changing educational practice, teachers in training need

to learn how to link the theory they studied in their training with what goes on in their workplace (Geerts, Van der Werff, Hummel, Steenbeek, & Van Geert, 2015; Ching, 2014). Situated actions are created from this link. They are built on previous teaching experiences, linking those situations with appropriate theoretical concepts and the underlying principles that originated in this process.

The principles that a teacher created this way are, for example, the realization that it is the teacher's job to take corrective action when necessary, to be responsible for the continuity of the lesson (or *momentum*, in teaching terminology, to keep the lesson constantly moving forward) and to be a group leader. Copeland and D'Emidio-Caston (1998) call these principles, which underpin a teacher's actions, *educational purposes*: the constantly changing process goals a teacher sets for himself to conduct the lesson in the way that seems best to him. The educational purposes guide the choices he makes regarding his actions. Indeed, the goal determines the actions and decisions that might benefit reaching that goal. Every educational purpose, for example watching over the lesson's momentum, guides what the teacher does in his workplace.

Once a teacher in training knows what he wants to achieve with his actions, he still needs to solve problems during the execution of his plans and actions. Many of these problems will be recurring. These recurring problems require actions which are called design patterns (Alexander et al., 1977). A design pattern is a pattern of solutions for a recurring problem that a teacher can use in his teaching practice. A design pattern can only be called as such if it is transferable. However, before it can be transferred, it needs to be very clear what the design pattern is about. This can become apparent by writing out the necessary knowledge and heuristics on paper (Maina, Craft & Mor, 2015). An experienced teacher trainer might be able to completely describe a design pattern on paper. This does not mean, however, that it is easily transferred from one teacher to another. Since the knowledge contained in the design pattern is situated, the pattern can only be learned by interacting with a real-world teaching situation. Furthermore, an experienced teacher will apply a design pattern more or less unconsciously, because of the intuitive nature of the knowledge contained in it. In this case, the knowledge that was at first explicit, controlled and discursive to the teacher, has become automatic. Summarizing, it can be said that an experienced teacher is an expert in his field, who can act intuitively and effectively by using his situated knowledge, which consists of educational purposes and design patterns.

6.1.2 Reflecting on video cases

Collecting this type of situated knowledge is encouraged in the teacher training's curriculum, both by offering real-world experience as well as theoretical knowledge. Practical experiences, mostly internships, are momentary by nature, however. Showing video cases at their regular classes on the educational theories allows teachers in training to reflect on the practical experience they gained during their internship. Because this allows the teacher in training to use reflection

to integrate his theoretical knowledge and his practical experiences, using video cases is a useful didacticism for future teachers to acquire situated knowledge.

Reflection can contribute to the way a beginner develops into an expert. Fischer (1980) developed a framework to understand this process. His *skill theory* posits that beginners make connections between what they have recently learned and what they already knew. They connect the old knowledge with the new, or give new meaning to the old knowledge. According to Fischer, skills are a dynamic process. The features of dynamic skills are deeply rooted in the actual content (Van Geert & Fischer, 2009), which very closely resembles the definition of situated knowledge. The skill theory also implies that cognitive frameworks are used to solve problems and that solving the problems leads to new learning by, for example, placing different elements of the skill 'classroom management' into the appropriate framework. The fact that momentum in a lesson can also have a positive effect on classroom management has a place in that framework.

According to Fischer's skill theory, once the earliest stages of development have been completed, the ways in which individuals develop can be split into two levels: representative and abstract. An individual who mentally manipulates concrete representations of people, events and objects, is operating on the representational level. Once this person starts doing the same with abstractions like values or assumptions, the focus shifts to the second level: development on the abstract level (Kitchener & King, 2004). At the teacher training facilities in the Netherlands, Fischer's theory and the accompanying term 'reflection' are not often used. Instead, Argyris' loop learning theory is prevalent. As skill theory explicates the basic notions underlying loop learning, it offers a useful theoretical underpinning of the concepts used in loop learning.

6.1.3 Loop learning

Like Fischer's skill theory, loop learning is about cognitive development (Argyris, 2002). When beginners, while progressing towards expertness, encounter situations in which they do not know how to react adequately, cognitive development occurs (Ericsson, 2008). Using the responses, they got in that situation, combined with the help they received from other experts, they will actively try to fix the problem in similar situations. Once it has been tried out, the effectiveness of the new solution is appraised by reflecting on their behavior in the situation. In case it was not effective, new possibilities will be tried out, and this cyclical movement is the reason for the name loop learning. To Argyris, learning involves discovering and correcting mistakes, so learning also includes reflecting. The central part reflection plays is entirely consistent with Piaget's theory. Reflection, according to Piaget, serves to cognitively view action characteristics as separate from their form. This allows them to be combined with characteristics of different actions (Piaget, 1972; Dubinsky, 1991; Abrahamson & Sánchez-García, 2016).

These new combinations are constructed at a higher mental abstraction level, and in this way new knowledge is created. For both Argyris as Piaget and clearly

also for Fischer, reflection is a fundamental developmental mechanism and is therefore seen as the driving force behind learning experiences.

The result of the learning process, according to Argyris (2002), occurs on three different reflection levels, i.e. single-loop with 'what do I do', double-loop with 'what new insights have I gained' and triple-loop with 'what kind of teacher do I want to be'. Single-loop learning deals with improving existing action patterns that a teacher in training uses to reach the underlying goal. Double-loop learning occurs when the teacher in training becomes aware of new insights that underpin his teaching. Such new insights can change the way he behaves as a teacher. Triple-loop learning, finally, means that the teacher in training uses reflection to get a better view of the principles he has. Those principles stem from the identity of the teacher and indicate what the teacher thinks is important. Identity, in turn, reflects the character or the person's self. From this self, he will question the higher goal that he strives for. This not only depends on his current identity, but also on the outcome of this reflection that further determines his development.

These three levels can be related to the way Fischer's skill theory describes cognitive development. The way activities and actions are reflected on and subsequently adjusted, is described in Skill Theory in the first level (actions tier), while Argyris refers to this as single-loop learning. Both theories place the process in which objects, people and events are the subject of reflective thinking, in the first level.

Double loop learning, however, not only deals with adjusting actions but with reconsidering, for example, norms, goals or policies. This can, to a certain extent, be compared to Fischer's first level, because it concerns reflecting on mental representations of objects, people and events (Kitchener & King, 2004). However, it also deals with a higher level, because it concerns a reconsideration that can only come about when the person in question realizes that his concrete actions are part of abstract concepts.

In both models, the top level is reserved for thinking at a meta-cognitive level. Triple-loop learning occurs when learning about learning occurs, for example following an earlier loop by reflecting on the learning process itself and what the role of the reflecting person was. At the highest level of his skill theory, as with Argyris' triple-loop learning, Fischer talks about integrating or manipulating abstract concepts, for example by reflecting on them (Kitchener & King, 2004). The way both models work is illustrated here using the example below of a teacher in training who is unable to capture his students' attention during the lesson.

A teacher in training who is on his way to become a teacher uses feedback loops, just like anyone who undergoes a cognitive development. Whenever something does not work for this person, something else will be tried, evaluated and the information gained from the process is saved for the future. The three loops in Argyris model represent three distinct levels of complexity in this process.

Loop learning on the first level concerns, for example, perfecting the art of attracting the attention of a distracted student. When the teacher in training notices that the student responds better when his name is used instead of general instructions, he will try to use a student's name when calling them to order. When

the student immediately responds and pays attention, the action has proven to be effective, and the loop is completed. However, when the action proves to be ineffective, he can, for example, choose to take punitive action, which he may have learned at the teacher training, and which starts a new loop.

Double-loop learning, for example, describes a teacher in training who realizes that smooth, uninterrupted transitions between lesson components are more important than correcting students. Gaining this insight concerns double-loop learning, as this insight into his norms only came to be after the unsuccessful attempts to mechanically perfect the art of attracting the attention of a distracted student, as described in the first loop.

The third loop can be elucidated using an elaboration of the previously mentioned example of a teacher who is unable to capture the students' attention, no matter the way he manipulates his actions or applies new insights. Finally, he realizes that he needs to take his responsibility and fulfill the role of group leader, which is unnatural to him. His reflection has led him beyond changing his actions or norms, but instead to developing a new identity, and therefore triple loop-learning.

Thus, reflecting occurs on various levels of complexity: single-loop, double-loop and triple-loop learning. The various problems in the above described examples, as they might occur in any teacher's workplace, ask for reflecting at all the levels. In order to develop into a starting expert, teachers in training need to go through a process that improves their actions, enriches their way of looking at their practice and further develops their identity. This means that learning objectives need to be set during their education, to support the process of loop learning.

To enable teachers in training to practice with a range of loops, Bloom stresses the importance of facilitating higher learning objectives (Bloom, 1979; Kratwohl, 2002). According to Bloom, learning occurs at six levels: *remembering, understanding, applying, analyzing, evaluating* and *creating* (Athanassiou & McNett, 2003). While the first three of these deal mainly with factual knowledge, a*nalyzing, evaluating* and *creating* are considered higher learning objectives.

Because higher learning objectives are more complex by nature, and therefore focused on, for example, evaluations and analysis carried out by the learner (Jideani & Jideani, 2012), they are particularly suitable to stimulate teachers in training to link theoretical knowledge to a practical situation. These real-world experiences can be linked to the theoretical part of the teacher training by showing video cases during the courses (Geerts, Van der Werff, Hummel, Steenbeek, & van Geert, 2015; van Es, Stockero, Sherin, Van Zoest, & Dyer, 2015).

Video cases are holistic and contextual, which is why they stand close to the real-world workplace of a teacher. This similarity is a first requirement for video cases to serve as an adequate replacement of reflecting on practical real-world experiences. An added advantage of video-cases is that they can be used at any moment during the course. Waiting for practical experience from an internship, and the presence of a mentor or supervisor is a time-consuming and therefore costly affair. By watching video cases, a teacher in training is able to use his

theoretical knowledge to reflect on the educational situation that is shown in the video by analyzing and exploring how an experienced teacher deals with those particular circumstances (Blijleven, 2005; Kurz, Llama, & Savenye, 2008). This way, the teacher in training is challenged to develop an increasingly rich combination of design patterns and educational purposes, or situated knowledge. Situated also means that the context is essential, not just for developing the knowledge, but also for applying it.

6.1.4 Aim of this study

The current study is explorative in nature and focuses on the development of a teacher in training to a starting expert. The central question of this study is: Does the situated knowledge of a fourth-year teacher in training match that of a starting expert? Based on the theoretical framework outlined above, a teacher in the final year of his training can be expected to have reached the level of a starting expert. A starting expert possesses a wide range of situated knowledge to deal with the most common situations in a classroom. The process that is used to acquire this situated knowledge is fed by reflection on the theoretical knowledge he has studied, combined with his practical experiences, and may or may not be supported by video cases. A starting expert, therefore, is in possession of learning outcomes based on single-, double-, and triple-loop learning (Argyris, 2002). *The first expectation of this study is that a teacher in training, in the final year of his training, goes through all three levels of loop learning, and therefore goes through the reflection process in its entirety*. The situated knowledge thus obtained by him includes a variety of both educational purposes and design patterns. This situated knowledge is reflected in his analysis of a video case. *Secondly, it is expected that a substantial number of design patterns and educational purposes can be identified in the teacher in training's analysis of the video case.*

6.2 Method

6.2.1 Respondents

All 33 fourth-year teachers in training at the language department of the NHL Hogeschool were asked to take part in this study in pairs in the academic year 2014-2015. Working partially in pairs is representative of the approach of the studied training which, in its educational didactics, regularly works in pairs. For instance, most internships are organized in pairs. The respondents received one EC for their participation. They gave permission for the use of their advice in the study. Because of the division in pairs and the uneven number of participants, one respondent was not included in the study, as he could not be matched with another respondent. The remaining 32 respondents were allowed to each choose which case they wanted to study, from a collection of 26 cases. An initial analysis

revealed that all cases, save for one, were suitable for drafting an advice with enough substance for further analysis. Because the study was set up in a way that is focused on detailed reporting, the number of respondents was cut further. Only two cases were selected by multiple dyads, that is, both of them were selected by two dyads. Because of the desired spread over the characteristics of the entire group of respondents outlined below, the respondents that worked with the case of Olga were selected. From the respondents whose data was finally used, none had to repeat a grade year. It concerns three female students and one male, in the ages of 25 to 27. Because the average student completes the training in 5.5 years, these ages are representative for students in the fourth year of their training. The percentage of male students that enrolls for this training nationwide is around 40% (CBS, 2016), but compared to the numbers of men and women enrolled at teacher training at the NHL, the gender ratio in the two selected student pairs is representative.

6.2.2 Case study

In the following study, the term case is used in two meanings. The first meaning refers to the nature of one of the materials being used in this study, that is, a video case, which involves the teacher in training giving an advice to the main character of the video clip representing a real-life situation. However, the second meaning of case concerns our study methodology, because the study is limited to a particular exemplary case. The exemplary case concerns the reactions of the two student pairs to the video case that have been selected for further study. Such a case indicates a particular situation, example or event. Although case study is often regarded as a means to tell something about a single, specific, situation, this method can also provide general knowledge when the case is exemplary and is meeting a set of specific requirements (Flyvbjerg, 2006). Yin (2009) describes four requirements which must be met for a case to provide scientifically relevant information.

First of all, a case must be representative of the situated knowledge that fourth-year teachers in training have acquired. This requirement is met when the situated knowledge, as described through educational purposes and design patterns, is actually observable in the advice the students give as a reaction to the video. An authentic problem, which the video case focuses on, invites teachers in training to name certain elements of good classroom management. The authentic problem concerns the main character in the video clip having difficulties with carrying out her role of teacher in terms of classroom management. The associated higher order learning objective is understanding the relationship between the reactions of students and the way the role of teacher is carried out. The teacher in training is aware of this once she recognizes the link between her actions and the students' reaction to those actions. When it comes to personal identity, the central question is whether the teacher is feeling responsible for the order in the classroom.

The second requirement, which requires the case to be complete, is met when the key features necessary to give good advice consist of a full array of class management skills: a continuous signal, a continuous line in carrying out the lesson; reflection; teacher role; student responsibility; communication and keeping order.

Thirdly, a case, as a means of study, must also offer alternative perspectives on the situation. A video case is ideally suited to give alternative perspectives on the situation, because the viewer is allowed to construct his own reality from the images which have a contextual and holistic nature. To reflect on the situation in the video, the viewer must possess a certain amount of knowledge. An absolute beginner probably lacks the theoretical knowledge to come to an adequate reaction. Provided he does possess this theoretical knowledge, he still misses the situated knowledge to create a link with the practical situation shown in the video. On the other hand, an expert can fully express his expertise. After all, not only does he give advice about the cases shown, he also answers questions about the underlying principle of his advice. By justifying his advice on the basis of underlying principles, an expert explicitly demonstrates how he has come to his advice and what kind of reflection has been used. The video cases that are shown encourage the fourth-year teachers in training to express alternative explanations.

The best way to meet the fourth requirement, the requirement of sufficient evidence, is to observe repeatedly. That is why the assignment related to the video case consists of three instruments. The first instrument is aimed at defining the core of the dilemma shown in the case. The second instrument consists of putting forward an advice for the main character in the case. The third instrument is an individual interview with the respondents. Because converging evidence is collected from different sources, the risk of basing the finding on chance alone is reduced. To determine the reliability of the measurement method, some thirty teacher trainers at the Velon Congress of 6 February 2012, with more than five years of experience in the vocational preparation, were presented the case (Velon, 2012). The answers of five pairs of these experts form the framework for the set of criteria for the quality of the answers of the starting experts: number of reflective loops, design patterns and educational purposes. This way, the case allows for discrimination between the answer of a beginner and the answer of an expert.

These instruments are further validated by means of the authentic evaluations of the students at issue. This additional information gives an indication of the fact that the respondents, in terms of both the results of the written test and the results of the internship, are recognized as starting experts.

6.2.3 Testing in pairs

Since the instruments will be used to describe a knowledge acquisition process, two out of three tests will be done in pairs. It is difficult to study the knowledge acquisition or reflection processes of a single individual (Fischer & Grannot, 1995). The person being examined will not, for instance, be thinking out loud and will show little of his internal thoughts in his behavior. In addition, a researcher

who forces his research object to think out loud during his activity, will not be able to observe a natural behavioral process. In daily activities, the interaction with other members of the group can be an important mechanism for learning (Anderson & Soden, 2001). Moreover, it is natural for humans to learn or solve something in collaboration with others (Bahrami, et al., 2010). In fact, there is consensus that cooperation between two individuals enables them both to reach higher order learning levels (Kerr & Tindale, 2004).

The yield of the knowledge acquisition process depends on the type of interaction occurring between the individuals as a pair. There are situations in which a pair does not perform better than the individual, for instance, when communication between the two is not possible, or when there is inequality of contribution, because one of the members displays more confidence, without there being a good reason for it (Kerr & Tindale, 2004). To reduce potential inequality in the interaction, an individual post-test will be performed.

6.2.4 Procedure

All fourth-year students gave a simulated advice to the virtual main character of a video case of their choice (Geerts, Van Laeken, & Mitzschke, 2008). The case base consists of a variety of authentic recordings which portray a dilemma of a teacher in training. One of the authors of this study also co-authored the video clip library called Didiclass from which these dilemmas were selected. For this study, a video case combined with an assignment composed of three parts, has been used.

The first part of the assignment was given a pair of students and focuses on describing the essence of the dilemma featured in the video case. The second part consists of writing an advice to the main character in the chosen Didiclass case, suitable for the person, their practice (or practical situation) and the theoretical knowledge related to the case. With these questions, respondents could show how many design patterns and educational purposes they were able to recognize in the video, and furthermore, which level of loop learning they had used. Their advices were drawn up by the collaborating students during a course of vocational preparation at the NHL. Watching the video and writing the advice took approximately thirty minutes.

The third part of the assignment, a semi-structured interview was subsequently carried out with each individual student, consisting of the following questions:

1 Why have you chosen this case?
2 Which questions would you like to ask the main character?
3 What vision of teaching is at the root of your advice?
4 Have you used a theoretical basis? If so, which one?
5 Did you use your own experiences when you put together your advice? If so, which one?
6 What can you learn from this case?

Through this individual interview, possible inequalities in the interaction that arise from a group effect, can be determined and considerably reduced, if the individual answers correspond with the advice they gave as a pair.

Since a thorough analysis of the answers to the two video cases watched by the respondents would exceed the scope of the current article, it was decided to focus on the answers to one particular case only. This case was randomly selected, and features a teacher called Nienke. The authentic problem which is central in this case is the novice teacher having difficulty defining her role as a teacher. The higher order learning objective that may well be reached is that a teacher in training gains insight in the relationship between the reactions of students and the way the role of the teacher is fulfilled.

Key features in this case are: a continuous signal, reflection, teacher role, student responsibility, communication and keeping order. These key features are the properties of the design patterns that need to be used to solve the case. Of course, these can also be found in the set of criteria for the quality of the answers as established during the Velon conference described above.

Based on knowledge of the abovementioned procedure and the corresponding possible answers, the expectations defined in advance can be made more concrete. The first expectation, reflecting on the level of a starting expert, is met if there are at least two detailed specifications per reflection level for the applied case. The second expectation, situated knowledge at the level of a beginning expert, is met when at least four different design patterns and educational purposes can be identified, in the answers of the teachers in training.

6.2.5 Data analysis procedures

To determine the degree of loop learning and the number of educational purposes, the advice given by the student pairs, as well as the individual interviews in response to the video case, have been analyzed by a pair of education experts. This analysis can be summarized below, in rating Table 1.

Note	Loop learning single	double	triple	Educational purposes	Design pattern
Advice					
Reply 1					
Reply 2					
Reply 3					

Table 1
Rating table for loop levels, educational purposes and design patterns

The first part of the table is used to determine, per given answer or advice, if there is single-loop, double-loop of triple-loop learning. To be able to rate this in a uniform way, Table 2 has been used. In this table, loops are defined in the column 'explanation'. The column 'signal words' shows examples of concepts that indicate that reflection takes place on, for instance, actions (single-loop). The final column shows examples of the answers from the advices of the respondents for every loop. "I will stand by the door" contains the signal words "I will stand" and is thus a reflection on an action, i.e. single-loop learning. Because triple-loop learning involves all subjacent learning loops, the scoring also involves a loop procedure. If the signal words for single-loop learning are found, a possible extension to double- or even triple-loop needs to be explored. Therefore, a quote on triple-loop learning is frequently much longer than a quote on single-loop learning.

Loops of Argyris	Explanation	Signal words	Answer given
Single-loop	Improving the existing action procedure that is applied to reach the underlying objective	I'm doing, I'm going to, I will, I'm making, I'm making sure that, I'm acting	For example: *I'm going to stand by the door, which enables me to have a better overview.*
Double-loop	New insights, that can lead to changes in behavior	I think, I know, I understand, I have discovered	For example: *I have discovered that, when I'm standing by the door, I have a better overview*
Triple-loop	Perception of personal principles and higher order goals that are considered important	I want to, I am, I would like to be	For example: *I value contact with people, that's why I want to greet people by the door.*

Table 2
Rating procedure single-, double-, and triple-loop learning

Subsequently, it was determined under which educational purpose or design pattern a particular answer falls. The fact that educational purposes occur in the answers becomes clear from the occurrence of guiding principles, statements of educational purposes, 'action link' between cause and effect, practical generalizations that the respondent uses, relationship with educational theories, negative value judgments about certain actions, justified changes and positive value judgments (Copeland & D'Emidio-Caston, 1998). Table 3 below shows two examples how educational purposes can be scored. The entire table is included in appendix 1.

Indicators educational purposes	Explanation	Example
Negative value judgment	Extracts that give negative value judgments, about an event in the video (including justifications)	*"She doesn't know her weaknesses" and "because of that, she falls into traps" (about the teacher's performance in the video case)*
Positive value judgment	Extracts that give positive value judgments about an event in the video (including justifications)	*"She is motivated to bring the lesson to a good end."*

Table 3
Rating procedure educational purposes

Finally, to determine the design pattern, it was checked which design pattern is leading in the answer provided. For the categorization into design patterns, field coding from a previous study (of second year students), has been used (Geerts, van der Werff, Hummel, Steenbeek, & van Geert, 2015). The following main categories of design patterns have been applied: 'pedagogical action', 'dealing with human characteristics', 'interaction with the environment', 'instruction', 'learning process', 'dealing with disorder', 'self-management', 'coaching', 'learning in practice' and 'reflection'. In general, the answer can be easily categorized. If, for example, the answer involves the learning process, it should be categorized in the design pattern 'learning process', and not in the design pattern 'instruction'. Sometimes, however, categorization is more difficult, for example with the following two answers which both involve the teacher planning to stand at the door of the classroom. When the teacher notes that it is better to stand at the door to welcome the students, that remark is categorized in the design pattern 'pedagogical action'. On the other hand, if the answer describes that the teacher is standing at the door to prevent disorder, it is categorized in the design pattern 'dealing with disorder'. These answers demonstrate that, using the assessor's expertise, a sound categorization could be ensured. Additionally, two further examples of the scoring of design patterns have been provided in Table 4.

Design pattern	Explanation	Example
Providing instruction	Extracts focused on the design pattern giving instruction, emphasizing the presentation.	*"She references the things they (the students) did last week."*
Guiding the learning process	Extracts focused on the design pattern guiding learning processes, that emphasize the way pupils learn.	*"She wants her students to learn something: I think she covered some words, vocabulary, and wants them to know them in German".*

Table 4
Scoring procedure design patterns

The entire abovementioned procedure was repeated by another pair of educational experts who were not part of the study group. Subsequently, an inter-rater reliability analysis was conducted, to determine the consistency between assessors, by means of calculating Cohen's Kappa (Landis & Koch, 1977). For the inter-assessors-reliability regarding loop learning, a Kappa of 0.94 (p<0.001) was obtained. The inter-assessors-reliability regarding design patterns, yields a Kappa of 0.93 (p<0.001). This means that there is a high inter-assessors-reliability. It is likely that this results from working in pairs. Because they regularly consult each other during the assessment process, the assessors in an assessor pair converge towards similar, well-considered assessments. To support the qualitative data, which analyzed the given answers on the levels of reflection, educational purposes and design patterns, the results section also contains the qualitative data: the answers as they have been given by the respondents.

6.3 Results

In order to answer the question as to what extent the fourth-year teachers in training behave as beginning experts, i.e. reflect on all three loops of Argyris and demonstrated various educational purposes and design patterns, firstly a selection of the answers of Respondent D., who was randomly selected, is provided in Table 5. The complete overview can be found in appendix 2.

Answers	Reflection loop learning			Educational purposes	Design pattern
9	Single			Theory link	Pedagogical action
10		Double		Guiding principle	Reflection
11		Double		Action link	Instruction
12			Triple	Justified change	Dealing with disorder

Table 5
Answers Respondent D. to case Bonte

What stands out in the first column of Table 5, which contains four answers of Respondent D., is the fact that a spread over single-loop, double-loop, and triple-loop learning concerning the provided individual answers can be discerned. Respondent D., therefore lives up to the first expectation: a minimum of two examples of loop learning at all three levels. The following columns show which design pattern the loop represents, and what the underlying educational purpose is.
Secondly, Table 6 summarizes, per teacher in training, if the loops in the reflection process are supported by a minimum of two different answers per loop like the first expectation specifies. It can be seen that the unique educational purposes and the unique design patterns usually add up to four or more. This observation largely

confirms the second expectation. When the difference between the respondents is taken into account as shown in Table 6, it is noteworthy that Respondents D. and T. evidently show more loop learning than Respondent P. and M. Besides a larger number of loops, D. and T. also seem to possess a greater diversity of unique design patterns.

Respondent	Loop learning			Loop learning (total number)	Unique educational purposes	Unique design patterns	Evaluation internship	Evaluation test
	Single	Double	Triple					
D	9	9	4	22	7	9	V	G
T	6	8	2	16	4	6	V	G
P	6	3	3	12	4	2	V	G
M	6	3	4	13	5	4	V	G

Table 6
Overview of scores of the respondents

The maximum number of unique educational purposes has been limited to eight, because there are only eight educational purposes. Respondent D. reported 22 educational purposes, 7 of which were unique. This is a typical type-token ratio, namely seven types over 22 tokens. The educational purposes 'guiding principle' and 'justified change' were mentioned most frequently, as shown by the bar chart in Figure 1.

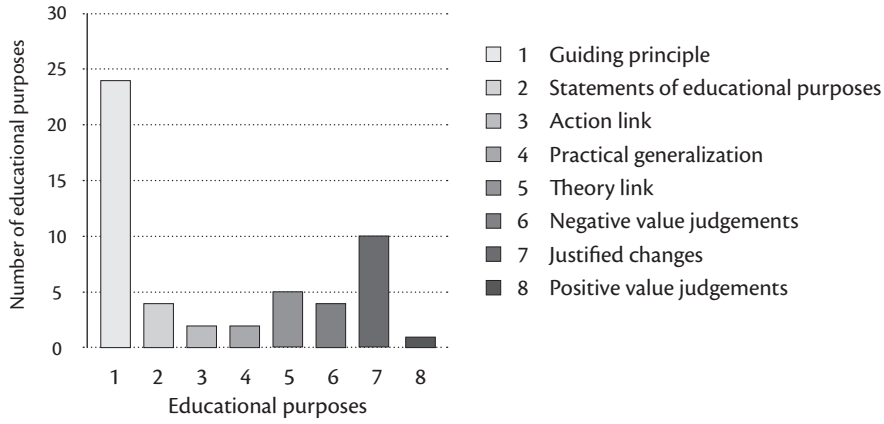


Figure 1
Number of educational purposes

Regarding the reported design patterns, the answers of all respondents together prove that 'reflection' and 'dealing with disorder' are the predominant design patterns, as Figure 2 shows. Despite the emphasis on these two design patterns, this bar chart demonstrates a spread amongst all ten scoreable design patterns

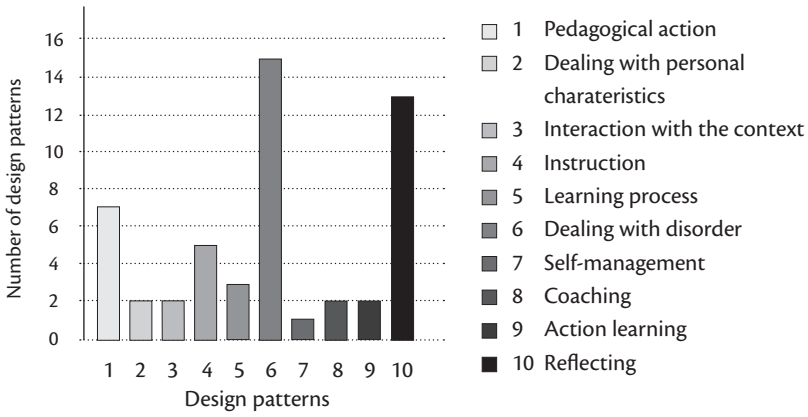


Figure 2
Number of design patterns

It had been concluded already that all respondents meet the first expectation, namely a minimum of two instances of loop learning on all three levels. To illustrate how the respondents express these orders of learning, a few examples follow below. The first quote is derived from the advice that was given to the main character of the case.
Quote 1: '*We have seen that you do issue warnings, but that you don't connect consequences to these warnings. Take action sooner.*'
This quote is rated as being a reflection on single-loop learning, because the clues are presented to the main character in the video case about the way she must employ an action procedure in order to achieve the underlying goal. The educational purpose is rated as 'justified change', because a motivation is given for the advice. This motivation is linked to what has been seen in the video. In terms of design pattern, it concerns 'dealing with disorder'.

The second quote came as a reply to a question regarding what the student wants to employ in his own teaching practice.
Quote 2: '*I often sit on the table, which basically is not very different from sitting behind your desk. I saw Nienke sitting behind her desk often and I, myself sit still a lot, so I started walking through class more often, making more use of space. Doing so has been a conscious decision. Sitting on tables is basically the same as behind a desk, because you're static in one place, except that you are a little more visible. I notice that I speak to someone more quickly: How are things here? When I'm in a different spot, I have a view on some other things.*'

This quote indicates that the student has received a new insight, which can be characterized as reflection on double-loop learning. The underlying educational purpose is identified as a 'guiding principle', because the description defines what a teacher is supposed to do in a comparable situation. The accompanying design pattern is 'pedagogical action'.

The third quote individually answers the question which vision on teaching is at the root of the advice given to the main character of the case.
Quote 3: '*Currently I work at a vmbo[*] school, at the lowest levels, and I can picture myself in the role that I stepped into earlier, as a coach. I'm the one who guides the learning process, I'm there for the questions, for the information. I want to work with a class to reach a situation where things can be accomplished. But that is not primarily what it's about. It's also about the development of the child and that is not solely oriented at teaching English, and this is especially true for the vmbo. There are a lot of other things involved, which are often slightly more important than that: How do I learn for a test? And what about this whole list of words? How do I make sure that I know all of them by heart? In that sense, it is different from teaching at havo/vwo[*]. It's all a bit more didactical I would say. And it's not that there's too little focus on my subject, it quite suits me. But sure, I'm less focused on my subject than my fellow students who are at havo/vwo. They can put more focus on their subject. With me, it's about learning skills, processing strategies, but also social skills: How do we treat each other, how come we don't live by the rules and where does it go wrong? And that is often just a bit more important than the actual curriculum.*'
The quote above encompasses reflection that is expressed through triple-loop learning, because the student demonstrates that she is obtaining more perspective on her own principles and higher goals: the things she thinks are important. The underlying educational purpose is 'guiding principle', because she outlines what a coaching teacher is supposed to do. Substantively, it encompasses the design pattern 'coaching'.

6.4 Conclusion and discussion

In this study, two expectations have been formulated regarding the similarities between the behavior of a fourth-year teacher in training and that of a beginning expert. The first expectation is that fourth-year teachers in training complete their reflection process, and thus go through loop learning on all three levels of Argyris. The second expectation is that they will be able to recognize a variety of educational

[*] In the Netherlands there are three types of secondary education, each one with its own level and duration:
- Vmbo (Pre-vocational education) lasts four years;
- Havo (Higher general secondary education) lasts five years;
- Vwo (Preparatory academic education) lasts six years.

purposes and design patterns in a practical situation, as shown on video.

The given answers indicate that with the four students, reflection on all three loops can be identified. The reflection on these three loops occurs at least two times in their answers, either in the individual answer, or in the answers they gave as a pair. With that, all respondents meet the first expectation, that is, they demonstrate comprehension of reflection. This indicates that in four years' time, they go through a learning process that concerns the improvement of pre-existing action, new insights and personal identity. The second expectation, four unique educational purposes and design patterns, is met by three out of four respondents. Respondent P. mentions only two unique design patterns in total. In summary, based on the case test, three out of four teachers in training can be characterized as beginning experts, because they met both expectations.

The conclusion demonstrates that the reflection and situated knowledge of fourth-year students largely corresponds to what may be expected of a starting expert. The spread over the different loops of Argyris (2002) can be explained with the underlying learning process of the teacher in training, concerning improvement of pre-existing action, new insights and personal identity. The fact that this situated knowledge also consists of a diversity of educational purposes and design patterns is supported by the given answers. The answers given by the experts turned out to contain the maximum number of both unique educational purposes and unique design patterns. This can be explained using the increase in situated knowledge in a fully developed expert compared to a starting expert. Finally, it should be noted that this development is not linear in character (Fischer, 1980).

Looking back, the fact that 'dealing with disorder' is the most frequently mentioned design pattern is not surprising, because this design pattern is conditional for proper teaching. The fact that this design pattern scores this high, however, may be worrying, as it is an indication that the teacher in training is preoccupied with dealing with disorder, which might have an impeding effect on acquiring other design patterns. After all, in the final year of the education it may be expected that the teacher in training has already mastered this pattern sufficiently. The fact that 'reflection' is the other most commonly named design pattern could be part of a normal development of a teacher in training. However, it cannot be ruled out that the training is excessively focused on this aspect. If the curriculum at the teacher training mainly consists of 'dealing with disorder', then it is, of course, logical that the teachers in training apply this design pattern frequently on the video cases that were used.

The fact that 'guiding principles' is by far the most often named educational purpose, has possibly to do with limitations of the study. With a guiding principle, the respondent indicates, 'That's the way it's supposed to be'. The strong emphasis on this guiding principle likely implies that other motivations will be far less frequently given. On the one hand, this could be caused by a limited diversity of educational purposes. On the other hand, the cause could be found in the fact that the study is insufficiently able to map the available diversity of educational purposes.

Finally, regarding the possible limitations of the study, the individual contribution of each respondent could be questioned because part of the answers emerged from working together in pairs. The results of the individually conducted interview, however, suggest that the responses are in line with the results from the pairs.

From the above it follows that further study on the preoccupation of teachers in training with the design pattern 'dealing with disorder' is necessary, as this preoccupation might interfere with obtaining other design patterns. If the high percentage of reported guiding principles is taken into consideration, it cannot be excluded that this finding is the result of a limitation of the current study. New research might rule out that the choice of this particular video case was the reason other principles were less frequently mentioned. The reactions of the experienced teacher trainers indicate that there is an equal distribution of educational purposes.

Based on the results of this study, the advice to teacher trainers is to find a place in their curriculum for situated knowledge. The curriculum should challenge teachers in training to link theoretical knowledge with their own teaching practice. When combined with higher learning goals, authentic video clips are appropriate means for stimulating reflection on their experiences teaching.

It should be noted that the teacher trainer is focused on helping the teachers in training to consistently reflect on all three different loops of Argyris. Full reflection is, after all, spread over all of them. This way, a learning process emerges that involves improving existing action patterns, new insights and personal identity. The situated knowledge that is built in this way consists of a diversity of educational purposes and design patterns. This means that a teacher trainer needs to include work forms in his didactical approach that contribute to the situated knowledge in his students. On top of that, his testing needs to be in line with the learning objectives of the courses he teaches. Teacher in training D. expresses this idea in her case test: "*The case test made me think: 'Let me just make a video of this class, just to see how things are.' It's nice to start recognizing the way you behave in front of the class. In the beginning, it's very much a directed affair and very thought through. Near the end of the year, it all begins to run smoothly and you find yourself thinking: 'I am myself in front of the class… and it works!'*"

This quote illustrates the most important conclusion of this study: the reflection and situated knowledge of the respondents, fourth-year teachers in training, are equivalent to what can be expected of a starting expert. A shortcoming of this study is the sole focus on the design pattern 'dealing with disorder'. This design pattern is necessary to adequately function in the most common situations. There are, however, numerous other situations that call for the use of other design patterns. Their mechanics and the extent to which they have been acquired by teachers in training, have not been studied here. Future research needs to systematically pay attention to mapping the distribution of educational purposes and design patterns. Finally, from the results as a whole, and especially this quote, it could be said that using video, in combination with higher learning goals, is an important ingredient of effective teacher education.

Appendix 1

Indicators of the educational purposes

Indicators of the educational purposes	Explanation Copeland en D'Emidio-Caston (1998)	Example
Negative value judgment	Extracts that express something that happened in the video (including justifications)	*"I also think it's wrong, the way she addresses her pupils"*
Theory links	Two or more extracts, one containing a practical generalization and one containing a guiding principle, which are linked because of the way they are expressed by the respondent.	*"Classroom management: how one behaves in front of the class, how order is maintained, all of it is apparent in the video"*
Guiding principles	Statements on how things are supposed to be. These statements suggest that the respondent believes these things are 'correct' and should be used by all teachers or students.	*"I think every teacher should- well I can see her starting the lesson, and tries to do so in a positive way, but it doesn't work."*
Learning objectives for the pupils	Extracts that describe educational objectives for the pupils, which the teachers work towards	*"She wants her students to learn something, I think she covered some words, vocabulary, and wants them to know them in German".*
Practical generalizations	Extracts that express the possibility of a general condition, that, according to the respondent, can be found in multiple classes	*"And the pupils don't seem to be listening to her, which gives off a little bit of an impression of what she is like."*
Action links between cause and effect	Extracts that express a causal relation between a particular action of the teacher in the video and the observed pupil behavior	*"Olga addresses her pupils in a negative way, which causes her pupils to react negatively. And because they don't want to cooperate, this has an effect on Olga, because she wants them to cooperate, and tries her best to get them to, but not in the right way. It doesn't appeal to the students."*

Justified change	Changes are suggestions the respondent makes for adjusting the lesson that is seen in the video. They are justified with reasons for the changes.	*"She started her lesson by talking about the grades of the latest test, which caused a lot of unrest in the classroom. I would make sure to save something like that for the end of the class. Using it to start the lesson with, means a bad start, which will only stress you out."*
Positive value judgments	Extracts which express value judgments about something that happened in the video (including justifications)	*"She is motivated to bring the lesson to a good end."*

Appendix 2

Complete scoring table

Answer	Loop learning			Educational purpose	Design pattern
Advice (in pairs, D & T)					
1	Single			Negative value judgments	Reflecting
2	Single			Justified change	Pedagogical action
3	Single			Justified change	Dealing with disorder
4	Single			Justified change	Instruction
5	Single			Guiding principle	Reflecting
Advice (in pairs P & M)					
1	Single			Guiding principle	Dealing with disorder
2	Single			Guiding principle	Dealing with disorder
3	Single			Statement of educational purposes	Dealing with disorder
4	Single			Guiding principle	Dealing with disorder
5	Single			Statement of educational purposes	Dealing with disorder
6	Single			Guiding principle	Dealing with disorder
D					
1		Double		Justified change	Reflecting
2	Single			Positive value judgments	Dealing with personal characteristics
3	Single			Negative value judgment	Dealing with personal characteristics
4	Single			Guiding principle	Reflecting
5		Double		Guiding principle	Action learning
6			Triple	Guiding principle	Action learning
7			Triple	Guiding principle	Coaching
8			Triple	Theory link	Coaching
9	Single			Theory link	Pedagogical action
10		Double		Guiding principle	Reflecting
11		Double		Action link	Instruction
12			Triple	Justified change	Dealing with disorder
13		Double		Justified change	Self-management

14		Double		Statement of educational purposes	Learning process
15		Double		Guiding principle	Reflecting
16		Double		Guiding principle	Reflecting
17		Double		Guiding principle	Pedagogical action
T					
1		Double		Negative value judgment	Reflecting
2		Double		Negative value judgment	Interaction with the context
3		Double		Theory link	Pedagogical action
4		Double		Guiding principle	Learning process
5	Single			Guiding principle	Instruction
6		Double		Guiding principle	Instruction
7		Double		Guiding principle	Instruction
8			Triple	Guiding principle	Reflecting
9		Double		Justified change	Interaction with the context
10			Triple	Theory link	Dealing with disorder
11		Double		Justified change	Reflecting
P					
1		Double		Guiding principle	Dealing with disorder
2			Triple	Guiding principle	Dealing with disorder
3		Double		Statement of educational purposes	Pedagogical action
4			Triple	Theory link	Dealing with disorder
5			Triple	Guiding principle	Dealing with disorder
6		Double		Justified change	Pedagogical action
M					
1		Double		Action link	Reflecting
2			Triple	Guiding principle	Learning process
3			Triple	Justified change	Pedagogical action
4			Triple	Guiding principle	Dealing with disorder
5		Double		Practical generalization	Reflecting
6			Triple	Guiding principle	Reflecting
7		Double		Practical generalization	Dealing with disorder

7

Summary, General Conclusion and Discussion

7.1 The theoretical framework in brief

7.1.1 The expert development of teachers

Chapter 1 describes how this thesis aims to contribute to the scientific knowledge on ways to use video cases for training teachers, as the subsequent implementation of video cases can contribute to improving teacher education. In short, better trained teachers may lead to better teaching, and thus to better learning of students. Video cases can contribute to the situated knowledge that teachers need to function in the educational context. The main question in this thesis therefore is: what role can video cases play in study assignments aimed at building situated knowledge in teacher education? In Chapter 2, the three elements that are key to a better education are highlighted using the three sides of the dynamic, didactic triangle: the teacher in training, the teacher trainer, and the task (Figure 1). The task, in this case, refers to study assignments that the teacher in training works on during his studies. They vary from preparing lessons and study questions to mandatory reflection assignments.

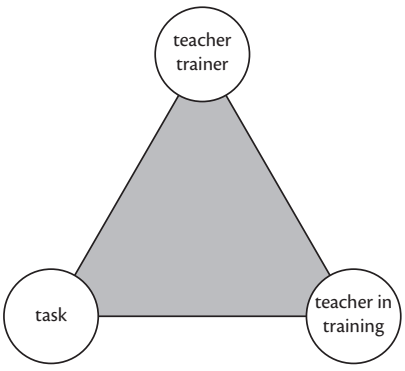


Figure 1
The dynamic, didactic triangle

Before discussing the educational opportunities of learning tasks supported with video, it is important to recall the main features of a teacher's acting in a classroom, namely that the acts are intuitive but effective and that the classroom situation is diffuse. The situation is diffuse, because many processes are occurring simultaneously as well as sequentially. This complicates the way a teacher distinguishes between a situation that calls for a particular reaction and a situation that calls for no, or a different reaction. An example of the diffuse nature, are students who are working on assignments in groups. Where one group might be working on the assignment while verbally conferring, another might simultaneously abuse this freedom to discuss the events of their weekend. The situation is also diffuse because processes are happening in rapid succession. In the example, one group might be working on the assignment at present, while moments later gets distracted and also begins to discuss weekend events. Therefore, the teacher must develop a series of skills for immediate, intuitive and effective action in diffuse situations, and these skills rely on a lot of highly varied knowledge and experiences.

To be able to make the right choice, a lot of knowledge needs to be assimilated by the teacher during his training. This thesis is limited to general teacher skills that all teachers should possess regardless of the specific course they are teaching. Safe for these general teaching skills, a teacher should also possess specific teaching skills. Specific teaching skills are often indicated as Pedagogical Content Knowledge (PCK) (Shulman, 1987; Geveke, 2016), which means knowledge of a particular subject and didactical knowledge about teaching it. A great deal of this didactical knowledge is not specific for its subject and generally concerns general teaching skills. A beginning teacher should acquire the basics of these general teacher skills to be able to function as a teacher. For teachers in training, this development generally takes place during their education. That is, the teacher must develop a level of expertise that allows him or her to act intuitively, effectively and immediately in diffuse and rapidly evolving classroom situations.

Theories on expert development, as described in the second chapter, provide a basis for understanding the development of the teacher in training. These theories include representation theory, Dreyfus' model of skill acquisition, Ericsson's theory of expert performance and Fischer's skill theory. The chapter further details the role of schemata, scripts, mental models, situated cognition and social constructivism in relation to the construction of situated knowledge.

Dreyfus & Athanasiou (1986) propose a heuristic model for expert development, with a development of novice to expert over five stages. The defining characteristic of experts is that they act intuitively and effectively. Intuitively means instinctively basing choices on what is felt, without having to reflect. Dreyfus and Dreyfus (1988) describe an expert as someone who in routine situations does not solve problems or makes decisions, but as someone who does 'what he always does'. Other research in this context mentions intuitive experts (Kahneman & Klein, 2009), or refers to the decisions involved as being without formula but instead based on normal routine (Hyle, Ivory, & McClellan, 2010).

Their experiences with solution patterns that were applied previously allow them to automatically recognize and re-apply them (Gobet & Chassy, 2008). Furthermore, experts will not only recognize solution patterns, they are also able to do so at a higher level of abstraction (Nieuwenhuis, 2013).

In short, a good teacher is an expert and his development towards becoming an expert can be described as a process of 'deliberate practice'. To reach the level of expert, it is essential for the teacher in training to be constantly challenged, by setting new and higher performance goals (Ericsson, 2008).

Fischer's Skill Theory (1980) describes the way a teacher can link newly acquired skills to skills acquired previously. Additionally, complex dynamic systems theory offers a framework for studying the complexity of the system in which the learning process takes place (van Geert, 1994). The situated aspect of dynamic systems theory explains that adequate effective actions are always linked with a specific practical situation. Therefore, the knowledge involved is referred to as situated knowledge (Brown, Collins, & Duguid, 1989). After the contents of this knowledge are made clear, the potential role of video cases in acquiring this situated knowledge will be introduced.

7.1.2 The properties of situated knowledge

In this thesis, situated knowledge relates to general teacher skills, and is defined as the knowledge that results of cognition that *takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place* (Roth & Jornet, 2013). It is triggered by a specific situation (contextual), contains all relevant aspects of that situation (holistic) (Putnam & Borko, 1999), works only in that specific situation (Geerts et al., 2015), and grows with every interaction with that situation (Kim, 2011). Experiences with interactions in specific situations, therefore, lead to the creation of situated knowledge.

As was discussed in Chapter 2, when it comes to new study materials for facilitating the acquisition of situated knowledge in teachers in training, one of the most promising developments is the use of video cases. In this thesis, video cases are defined as clips with a holistic and diffuse character, which show a teacher other than the one in training. The holistic and diffuse character indicates that the scenarios and information are depicted in a way that corresponds to the way in which teachers encounter pedagogic and didactic problems (Blijleven, 2005; Geerts, van der Werff, Hummel, Steenbeek, & van Geert, 2015). This means that these cases show the big picture, the complete reality of the classroom, without simplifying it or focusing on the behavior of a single pupil so that a particular point of view on the situation is presented (Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008; Van Es & Sherin, 2002). Video cases allow teachers in training to apply their theoretical knowledge by analyzing a specific, authentic educational situation. By exploring the concrete behaviors of an experienced teacher on video, they can discover how to deal with that situation (Blijleven, 2005; Kurz, Llama, & Savenye, 2004).

In a situated perspective, cognitive processes are typically distributed across the network of interactions. This way, analyzing a practical situation will allow teachers in training to later on act intuitively and effectively in a real-world practical situation. The cognitive processes are influenced by all the relevant physical elements of the environment in which action is taken. These processes, therefore, are of an embedded nature. Embedded cognition focuses on the influence environmental elements have on an individual's cognition, as well as on their effective actions. What constitutes effective actions depends on the context and is based on embedded knowledge, which has a situated character as it is inseparably linked to the situations in which it is acquired. The situated character also stresses the interaction with the situation in which the thought processes occur.

7.1.3 Facilitating the acquisition of situated knowledge through the use of video

Chapter 2 states that beginners, in order to develop expertise and be able to act effectively and intuitively, should ask themselves: What am I doing, and why? It should be noted that this question focuses on actions and not on their verbalization. As long as actions are concerned, this question can be answered by referring to the concept of situated knowledge. Teachers in training develop situated knowledge during their training by linking theory, practical experiences and relevant knowledge about the situation. They are able to make these links because of assignments that focuses on converting experiences into meaning. A detailed description of how the teacher training is shifting from a traditional theory-to-practice model to an increasingly contextual way of training teachers in the 20th century, is given in paragraph 2.3. The learning assignments teachers in training use to convert their experiences into meaning must contain higher learning objectives, which will be explained in the next paragraph.

According to Bloom, six levels of learning objectives can be distinguished: *remembering, understanding, applying, analyzing, evaluating* and *creating* (Athanassiou & McNett, 2003). The first three of these mainly deal with factual knowledge and are considered lower learning objectives. *Analyzing, evaluating* and *creating* are considered higher learning objectives. Especially higher learning objectives allow, through reflection, for experiences to be turned into meaning. Giving meaning to experiences is necessary for a teacher in training to link theoretical knowledge, practical experiences and relevant knowledge about a situation. This way, situated knowledge is acquired (Onstenk, 1997). By analyzing and evaluating video cases, teachers in training can gain insights in both their own actions as well as the actions of an expert. Higher learning goals focus on reflection, and thus consequently allow for experiences to be turned into meaning.

Chapter 2 explained how Korthagen & Vasalos (2005) describe reflection as any effort to structure or restructure an experience, problem or existing knowledge or insights. Within teacher education, this process is described using the three orders or learning or loop learning (Argyris, 1996). These orders can be

seen as three different levels of reflection. According to Argyris, learning arises when a novice enters a situation in which a necessity to learn is felt. In these situations, three processes could occur (Argyris, 1996). The first of these is improving an existing solution, the second is to gain new insights and with that a new approach to solving the problem. The third is transforming one's own identity, when a beginner sees an opportunity to gain insight into his wishes and goals, and to re-adjust them. Together, these three orders of learning form a loop. A teacher in training reaches the next loop when the previous loop does not offer a solution. This process of reflection helps teachers in training to develop their situated knowledge which will allow them to act quicker and more effectively on any following occasion. The process of reflection does not need to be instantaneous, but can be postponed, and should result in the teacher in training managing to act more effectively in a subsequent situation. So, even though the teacher in training can reflect on his actions at a later point in time, every new situation poses for him a new, immediate question: *what will I do and why?*

The *why* deals with the intentions teachers in training have with their actions at the educational level. Choosing an action is based on their earlier experiences with classroom situations and the connections they formed previously between those situations and the theoretical knowledge and underlying principles that apply to them. Such an underlying principle is what Copeland and D'Emidio-Caston (1998) call an educational purpose, which they define as the sum of constantly changing process goals that the teacher sets for himself to have the lesson progress in a way he deems best. These are not learning objectives for a lesson (e.g. applying the Pythagorean theorem) but optimal choices a teacher makes during the execution of it (e.g. the teacher is alert to what is going on in the classroom). What he deems best is influenced by the way the lesson progresses. Therefore, educational purposes are situated and determine the actions a teacher chooses to employ.

According to Copeland and D'Emidio-Caston, a teacher's educational purposes become apparent when he is asked questions about the way he frames reality. Such a framework zooms in on guiding principles, educational goals for the student, action links, practical generalizations, theory links, negative value judgments, justified change and positive value judgments. The framework allows a teacher in training to come to a judgment and recognition of a real-world situation and answer the question of why he chose to judge a particular situation or action. Educational purposes guide a teacher in training's behavior and reveal the situated knowledge that a teacher in training uses to act effectively.

The question '*what do I do*' deals with the way a teacher in training translates his educational purposes into actions. For a novice teacher as well as an expert, these actions emerge intuitively and reflectively, based on their situated knowledge. Educational purposes might be relevant multiple times within a lesson, or at least during similar lessons. Therefore, the need to come up with a solution also occurs more than once and by reflecting on this series of solutions, experts as well as novices can construct a particular design pattern for a particular type of educational situation. A series of actions designed to deal with re-occurring problems

is called a design pattern. A design pattern is an internalized form of educational knowledge and experiences in the form of action patterns that give direction to solving recurring problems and consist of a structure of heuristics (Alexander et al., 1977; Goodyear et al., 2004). One characteristic of a design pattern is that it does not offer a set of guidelines, but rather consists of a compilation of actions that can be applied to a general, broad range of similar situations. A design pattern, wich can also be called a solution pattern, is considered situated knowledge, because its application is tuned for a specific situation. Its execution is triggered by that situation. A more in-depth discussion of design patterns can be found in section 2.4.3. In summary, we have seen that by reflecting during assignments, a teacher in training is able to develop situated knowledge in the form of educational purposes and design patterns. This thesis focuses on whether study assignments using video cases can contribute to the development of situated knowledge about educational purposes and design patterns. In the following sections the results of a literature study and three empirical studies will be detailed, which were used to answer this question.

7.2 Summaries of the four studies

7.2.1 Are video cases being used to strive for higher learning objectives?

The literature study in this thesis concerned the extent to which video cases are being used to strive for either higher, lower, or a mix of higher and lower learning objectives. This question is relevant because higher learning objectives are a catalyst of the reflection process, which is essential for constructing situated knowledge. To answer this question, 19 international studies that appeared from 2000 until 2012 have been analyzed, which together form a complete set of studies about training teachers with video that were published within that timeframe. The type of learning objective that was set in each of these studies was determined, followed by an overview of both intended and achieved learning objectives. The results show that in these studies, both higher and lower learning objectives are pursued. Also, for both the higher and the lower learning objectives, more achieved than intended learning objectives are reported. In these studies, some goals were not formulated at the start, but afterwards more goals were reported than was expected in advance. This difference can probably be explained by the explorative nature of these studies: they mainly report about the initial implementation of video cases in the curriculum, when the focus on reaching particular learning objectives is still lacking. This leads to the conclusion that teacher trainers often apply methods of teaching, such as the use of video cases, without carefully specifying the learning goals in advance. However, these teacher trainers are able to conclude afterwards that certain learning objectives, mainly higher ones, have been achieved. Apparently, the use of video is promising to achieve higher learning objectives, and with it, situated knowledge. The results indicate, finally, that

teacher trainers, when using video cases, are insufficiently focused on reaching these higher learning objectives that enable the acquisition of situated knowledge.

7.2.2 Does the training of teachers focus on situated knowledge?

The first empirical study considers whether teacher education in the Netherlands offers courses that use video cases to promote situated knowledge acquisition by setting higher learning objectives. If teacher trainers deploy video cases during courses that focus on the professional component, the use of situated knowledge should be apparent in the test at the end of the course. Eleven Dutch second degree teacher training faculties submitted their final test for a course in vocational training in general teaching skills. These were analyzed using a specially designed assessment tool, to determine whether they test situated knowledge. Two conditions were set to this end: firstly, whether the majority of the test items was aimed at higher learning objectives and, secondly, whether the test was constructed in accordance with the six requirements for tests with cases.

The results indicate that ten out of eleven second degree teacher training faculties use either a written case test or a video case, focused on mapping out situated knowledge. However, just one out of ten tests turned out to satisfy the conditions set to determine whether the faculty is focused on assessing situated knowledge.

Because only one test satisfied both conditions, it can be concluded that current teacher training tests insufficiently test situated knowledge. But the fact that 10 out of 11 teacher training faculties use case tests indicates that they recognize the importance of situated knowledge, as the motivation for choosing a case test is the intention to measure higher learning objectives and the associated situated knowledge.

The fact that tests with cases are not fully utilized leads to the conclusion that teacher trainers are insufficiently aware of the best way to shape a case test based on situated knowledge. Because they are insufficiently aware of how to test situated knowledge, it can be assumed that they are also insufficiently aware of the best way to facilitate the acquisition of situated knowledge for teachers in training. A positive exception is the teacher training whose test satisfied both conditions. It shows that courses and tests for training teachers can indeed be used to assess situated knowledge acquisition.

7.2.3 Do video cases contribute to the acquisition of situated knowledge?

If teacher trainers wish to promote the acquisition of situated knowledge in teachers in training, they require a better understanding of this process. The second empirical study therefore explores whether the use of video cases in a course on classroom management in the second year of teacher training contributes to the teacher in training's acquisition of situated knowledge.

Situated knowledge in this study is operationalized as the situated form of educational purposes, design patterns and pattern language. These variables have

been measured in a group of participants who attended a course using video cases, and in another group that attended a course without video cases. However, the measuring in the posttest for the first as well as for the second group was done using a video case. This way, the three elements were measured both before and after the course took place, by scoring their frequency in the written advice and interview the teachers in training gave in response to the video case. It was expected for the experimental group to score higher on all three variables.

Regarding educational purposes, there turned out to be no difference between the pre- and post-test in the experimental group. At the same time, a moderately sized loss of signaling educational purposes after taking the course was found in the control group. The observed difference between the experimental group and the control group is moderately meaningful (d=0.54, p=0.04). This is contrary to the expectation that the experimental group is able to list more educational purposes. But it is in line with the expectation that the experimental group does better than the control group.

For pattern language the results indicate that the experimental group can list more design patterns during the post-test compared to the pre-test. Based on a comparison of the differences in scores in the experimental group and the control group, it was determined that there is a meaningful difference (d=0.87, p=0.05). This confirmed the expectation that the experimental group would score better than the control group. It can be concluded that analyzing videos using higher learning objectives during a course in the second year of the teacher training contributes to the development of the pattern language 'teaching' in teachers in training.

Finally, teachers in training who attend a course that uses video cases clearly show a better developed design pattern 'dealing with disorder', compared to the control group. In addition, in the post-test, the control group shows a better development of this design pattern, even though the increase was not as strong as in the experimental group. The difference between the pre-test relative to the post-test is for the control group d=1.76, p<0.001 and for the experimental group d=3.47, p<0.001). The differences are meaningful for both groups. The effect size expressed as a difference between effect sizes in both the experimental and the control group is also meaningful (d=2.20). The results show that the probability of this difference occurring by chance is just over 5% (p=0.06). Therefore, the conclusion is that it is highly likely that the development of the design pattern dealing with disorder is more strongly stimulated by a course with video than by a course that does not use video.

The overall conclusion of the third study is that the use of video cases in a classroom management course contributes to a teacher in training's acquisition of situated knowledge during the second year of teacher training. It should be noted that no progress in their number of educational purposes could be discerned.

7.2.4 Does a fourth-year teacher in training possess situated knowledge?

To gain a better view of the development of situated knowledge in teachers in the final years of their training, the third empirical study explored whether the situated knowledge of fourth-year teachers in training matched what can be expected of a starting expert.

The situated knowledge is expressed when a teacher in training analyzes a video case. The first expectation is that fourth-year teachers in training, like beginning experts, complete a full reflection process. Reflection processes are described using single-, double-, and triple-loop learning (Argyris, 2002). The three loops describe how experiences are used to adapt to the environment. Adaptations apply to current actions (single), new insights or new actions (double) or creating a new identity (triple). These three loops can be considered different levels of reflection. The second expectation is that fourth-year teachers in training, like beginning experts, will be able to recognize a variety of educational purposes and design patterns in a practical situation, as shown on video, containing holistic and contextual information of a situated nature. This variety is operationalized as the ability of a fourth-year teacher in training to signal at least four unique design patterns and educational purposes.

To explore the first expectation, participants watched a video case and wrote, in pairs, an advice to the virtual main character of the video. Working partially in pairs is representative of the approach of the researched training which, in its educational didactics, regularly works in pairs. All participants were fourth-year teachers in training at the NHL language department. All participants attended a short educational training that made use of video cases. Out of 33 participants, three female students and one male (aged 25 to 27) chose identical cases. The identical cases allow the results to be compared. These four participants are qualitatively representative for their year group. The responses revealed that the three loops can be recognized in the case test answers of all four teachers in training. Reflection on these loops occurs in at least two instances in their answers, both in the individual answers and in the advice they wrote in pairs. All participants satisfy the first expectation by demonstrating a complete reflection. This means that they are able to go through a learning cycle that covers all three loops and therefore affects their current actions, new insights and personal identity in the fourth-year of their training. As to the second expectation, that a substantial number of design patterns and educational purposes can be identified in the teacher in training's analysis of the video case, it was found that the reports of the four respondents show a diverse range of educational purposes. Further, three fourth-year teachers in training also featured a wide range of unique design patterns. One teacher in training mentioned only two unique design patterns, however this teacher in training scores the lowest number of learning loops. This teacher in training does not satisfy the second expectation.

The results of the fourth study indicate that the reflection done by fourth-year teachers in training matches what can be expected of a beginning expert.

Teachers in their fourth year of training can be characterized as beginning experts, based on their answers to a video case, because they reflect on all three of Argyris's (2002) loops, which results in the development of situated knowledge in the form of a wide range of educational purposes and design patterns. When it comes to reflection and the number of unique, situated educational purposes and design patterns, meaningful individual differences between the four teachers in training exist.

7.3 General conclusion and discussion

The literature study shows that the use of video for training teachers provides a promising method for the acquisition of higher learning objectives and situated knowledge. The first empirical study shows that teacher trainers recognize the importance of situated knowledge but are still searching for the best way to employ video to achieve higher learning objectives. The second empirical study shows that the use of video cases during a course of classroom management contributes to a second-year teacher in training's acquisition of situated knowledge. Therefore, it is concluded that the use of video contributes to the development of novice to expert. The third empirical study finally shows that teachers in training, at the end of their training period, acquire situated knowledge by reflecting on their actions, their new insights and their identity. This largely corresponds to what can be expected of a starting expert.

7.3.1 Theoretical contribution

This thesis is limited to general teacher skills that all teachers should possess regardless of the specific course they are teaching. This means that it is limited to the generic part of Pedagogical Content Knowledge (PCK), which in total consists of content knowledge and of didactical knowledge about the specific subject. This generic knowledge is of a situated nature. To build situated knowledge, reflection and practical experiences are crucial. The contribution of this thesis to the scientific knowledge on the training of teachers lies in the innovative way of theoretically framing how a teacher becomes an expert. The way this process is framed has large potential consequences for the way the teacher training is designed, as the concretization below will illustrate. Three aspects from the theoretical framework will be used for the concretization, which is later linked to the second and third empirical study.

The first thing that should be noted is that within this framework, the complex, diffuse reality of the situation in the classroom, in which the teacher is supposed to act, is viewed as a complex dynamic system. The theoretical framework shows (in paragraph 2.2.1.5) that all the characteristics of a complex dynamic system can be applied to a classroom situation. First, the learning results

in this complex reality are both a product of the phase preceding it, and input for the next learning phase, and therefore iterative. Second, all components of the system influence each other. Thirdly the current situation not only determines what is happening now, but is also the basis for change in the long term. That is, there exists a bidirectional relationship between the short-term and the long-term timescale of change. Fourth, attractors are involved, which, in this case are self-sustaining states towards which the system is progressing. Fifth, the development progresses in a variable and non-linear way. Sixth, a complex dynamic system is influenced by chance.

In conclusion, knowing that a teacher acts in an educational setting that can be described as a complex dynamic system has consequences for the design of the teacher training that we wish to promote. We propose a teacher training that continually builds on previous practical experiences of the teacher in training and therefore constantly links theory and practice. This concentric character is a consequence of the first, iterative, character of a complex dynamic system. Further, this concentric character allows for the alignment of the various components of the system, conform the second characteristic of complex dynamic systems. This enables the teacher in training to develop on different timescales (third characteristic). Adjusting the weight of the tasks in the learning environment is possible in a concentric teacher training. Because of this, students increasingly become experts, which serves as a self-sustaining attractor state (fourth characteristic). This progress varies from one student to the next, and also from one moment to the next. Progress is, after all, non-linear (fifth) and chance plays a role in this system (sixth). So, the curriculum needs to be continually building on previous practical experiences of the teacher in training. It needs to enable the teacher in training to connect his theoretical knowledge with his real-world experiences. Simply offering courses that focus on theory and tests is insufficient, as the coming paragraphs will show.

Secondly, Ericsson's theory of expert development underscores that, in order to build situated knowledge, reflection and practical experiences are crucial. According to Ericsson, expert development can be described as a process of deliberate practice (2008). A teacher's education, if designed from this view on expert development, would be concentric. In a concentric approach, designs are first discussed globally, and subsequently repeated for more intensive processing to make sure they will function at a higher level. This approach to the theoretical framework has consequences for the design of the full curriculum, which at the moment is narrowly focused on separate, single, courses (Hill, Ball, & Schilling, 2008). The connection between theoretical knowledge of expert development and the field of training teachers can only be partially recognized in the way the research on training teachers is carried out. Shulman does emphasize this connection by comparing the classroom to the emergency department of a hospital (2004). Emergency help is viewed as a complex skill, which is increasingly mastered through time. Emergency help means effective, immediate and intuitive

actions in diffuse and complex situations. The expertise necessary is acquired in the situations it applies to and is therefore considered to be situated knowledge. This process is comparable to that of teachers in training. As with emergency help, teachers in training build up expert knowledge that consists of situated knowledge. Framing educational research as expert development research has consequences, not only for the educational literature used at the teacher training, but also for the way educational policy is designed. For example, the generic knowledge base, set by the government, was originally expected to result in a nationwide knowledge test (HBO-raad, 2011). However, based on a theoretical framework similar to the one set out in this thesis, the preamble of the current Generic Knowledge base 2.0 (HBO-raad, 2017) mentions that it is not about reproducing educational facts, but about the acquisition of situated knowledge based on the generic knowledge base. This indicates that there is a national policy to focus not only on gaining knowledge, but also on expert development.

Thirdly the framing examines the way teachers in training make mental representations of reality. Whenever a representation of reality changes, cognitive development occurs. For example, cognitive development takes place when beginners, during their development to becoming an expert, encounter situations in which they are unable to react adequately (Ericsson, 2008). In the field of teacher education, Argyris's theory of loop learning (see section 7.1.3) is often used to describe this process of cognitive development. It offers not only a theoretical framework understandable for teacher trainers, but one that is also suitable for further research.

Situated knowledge is the result of cognition that takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place (Roth & Jornet, 2013). This means that situated knowledge is acquired in the situation. Because it is virtually impossible for a teacher trainer to have teachers in training acquire this knowledge in the situation, a promising alternative can be found in the use of video cases. Video cases are holistic and contextual, which is why they stand close to the real-world workplace of a teacher. The results of this thesis confirm that video cases are extremely suitable, because authentic situations can be presented in all their complexity, and because they illustrate the diffuse and holistic character of the teachers' workplace. Because video cases can show this holistic and diffuse character, it allows teachers in training to reflect on teaching practice as it occurs in authentic situations. Here, reflection means not just reflecting on improving their current solution patterns or discovering new approaches, but also reflecting on personal wishes and the underlying identity.

The way video cases are best used to make the education of teachers more effective, is mainly dealt with in the second and third empirical study: reflection on the three levels described by Argyris (2002). Reflecting on three levels can be greatly facilitated by providing materials in which all properties necessary for

such reflection are present. A holistic, diffuse and realistic video case warrants the use of assignments that require the teacher in training to reflect on situated knowledge in the form of design patterns and educational purposes.

7.3.2 Methodological considerations

In order to answer the main questions, we have adopted a combination of literature review and in-depth empirical studies. The literature review examines studies that employ video cases in the training of teachers to explore the extent to which the video cases are being used for achieving either higher, lower, or a mix of higher and lower learning objectives. This question is relevant because higher learning objectives are a catalyst of the reflection process, which is essential for constructing situated knowledge.

The studies were published in the period from 2000 until 2012. In hindsight, there is no reason to choose differently, as the chosen period yields a representative number of articles to base a conclusion on, regarding the use of video at the teacher training worldwide. Further, there is an important methodological difference between intended learning objectives and learning objectives reported afterwards. This dichotomy had not been foreseen in the original design of the review. However, because the first analysis showed that many learning objectives were reached that had not been intended beforehand, the dichotomy was added to be able to write an exhaustive report on achieved learning objectives. In more recent reports on the use of video, teacher trainers address that a complete estimation of learning objectives is not always possible in advance. Sherin and Dyer express this as follows: "Yet the true power of video comes not just from seeing what is possible but from unpacking the twists and turns that are so common in teaching and learning" (2017). It should also be noted that methodological reliability of reporting learning objectives varies for each paper.

The first empirical study used a course test to determine whether that course was focused on acquiring situated knowledge. The tests that were used were to a large extent, unsuitable to measure situated knowledge. Stating that the course itself was focused on situated knowledge acquisition is too blunt a conclusion. Since most of the tests contained cases, their intention was focused on acquiring situated knowledge. If the situated aspect of the course itself would be assessed, also its contents preparing for the tests would have to be studied.

For the second empirical study, a time period of two months was chosen to outline situated knowledge. In this study, the researchers compared a course with video cases to one without. A period of two months during a course on classroom management for second-year teachers in training is, in hindsight, a too limited timeframe for outlining the development of situated knowledge. The methodological recommendation for studying the development of situated knowledge in teachers in training is to follow this development in the long-term, i.e. a full academic year at a minimum.

The third empirical study took place over a whole academic year. This amount

of time proved to be very suitable to map the development of situated knowledge of fourth-year teachers in training. Furthermore, for this third study, the researchers did a case study, limiting the study to a set number of exemplary cases. While a case study is often regarded as a tool to say something about a single, specific situation, this method can yield general knowledge when it is exemplary and meets particular requirements (Flyvbjerg, 2006). Because the study was limited to a set number of cases, these cases could be studied more intensively, which, in hindsight, can be considered a strong point. The recommendation is therefore to use a case study over several years to map out the development of a teacher in training in the long term, and the effectiveness of the learning assignments. A qualitative case study would be most appropriate. Secondly it is also possible to consider scaling up the number of subjects and number of measurements, but this should not come at the cost of reducing the level of detail and the focus on individual responses.

7.3.3 Recommendations for practice

This thesis starts by explaining that any efforts to improve teacher education are always essentially rooted in the dynamic, didactic triangle of teacher trainer, teacher in training and task. It is limited to general teacher skills that all teachers should possess, regardless of the course they teach. The didactic triangle shows that the teacher trainer has a considerable influence on the way the triangle is designed and determines the way the teacher training is shaped. The key to improving the current teacher training lies in the hands of the trainers.

Brouwer and Korthagen (2005) state that the traditional approach of the teacher training, with a strict divide between theory and practice, can be made more realistic by attuning the acquisition of theoretical knowledge to a teacher in training's practical experiences. This requires, according to Brouwer and Korthagen, an increased attention to the necessary reflective aspect of the teacher in training. This means the teacher in training reflects on his own actions. In order for the teacher trainer to guide this process by acting intuitively and effectively, he also needs to have adopted situated knowledge. The recommendation is to make teacher trainers increasingly aware of situated knowledge in their job. Concrete recommendations are:

- Teacher trainers are teaching experts and therefore possess the associated situated knowledge. During their classes, they should more frequently use a time-out to reveal what they are doing and why. Reflecting on situated knowledge in this way is essential to reveal the what and why of these actions; academic formation in a subject or field is not enough.
- Teacher training courses should make explicit use of learning tasks with higher learning objectives aimed at acquiring situated knowledge, based on video clips of authentic situations that the students are asked to reflect on.

  For the sake of not limiting reflection to the internships, the teacher training should feature holistic and diffuse video cases that show classroom situations

in such a way that teachers in training can reflect on their own workplace experiences using them. The teacher in training himself must be made aware of his development from novice to expert. During this development he learns to improve his existing solution patterns, gains new insights and learns to transform his own identity. This way, he acquires situational knowledge which can be applied in a wide variety of practical situations, intuitively and adequately. Based on this model of expert development, the teacher in training should try to manage his own development, which can be described as a process of deliberate practice. It is recommended for teacher training programs to provide their students with the tools they need: learning tasks with higher learning objectives.

- Teacher training courses should use suitable didactic instruments to help the teacher trainer and the teacher in training to focus on higher order goals of situated knowledge. These didactical instruments can be inferred from the empirical sections of the preceding chapters.

  Higher learning objectives are essential to encourage reflection on all three levels of Argyris. A holistic video case is suitable, as the diffuse and complex real world offers the viewer a chance to reflect on three levels. The question is how an assignment can be used to support the use of video.

  The empirical framework, supported by the second and third empirical study, offers a start to an answer to this question. It shows that it is meaningful to ask a teacher in training not only about the event, but also about its meaning. The meaning can be elucidated by asking about guiding principles, educational goals for the student, action links, practical generalizations, theory links, negative value judgments, justified change and positive value judgments (Copeland & D'Emidio-Caston, 1998). Together, these elements form the framework, which focuses on bringing out educational purposes, and helps the teacher in training to reach an assessment and appreciation of a practical situation. Not only educational purposes, but also the solution patterns which are used to reach these purposes, become visible. Learning with video cases can be enhanced by asking the teacher in training questions using the framework. In order for video cases to be effective means of acquiring situated knowledge, the learner should primarily focus on the actions of the major agent in the video case, which is the expert teacher. This way, the situated knowledge that an expert uses to act intuitively and effectively, becomes visible.

Of course, the effects of this approach on the percentage of students leaving the training unfinished remains to be seen, especially at the teacher training faculties in the 'Randstad', where this percentage is especially high at around 40% during the first year alone (Slijper, 2017). In order to help solve the problem of high attrition of teacher students during the first year of the study, teacher training programs should study of the relationship between a more realistic approach to training teachers, study success and identity development to be able to optimally contribute to the development of talent in potential teachers.

Nothing is as valuable as good education. Good education is designed within the dynamic, didactic triangle. A study by Assies, Steenbeek & Van Geert suggests that attention to the relationship between the teacher trainer and the teacher in training is essential because mutually reinforcing relationships have a positive influence on motivation (2017). This is not only true for the relationship between the teacher trainer and the teacher in training, but also for the relationship between the teacher in training and his students. If the teacher in training realizes that he can positively influence the learning results of his students, he knows he can make a difference.

The central recommendation of this thesis serves making a difference: teachers in training, during their training, should use video case-based study assignments that are focused on acquiring situated knowledge in the form of educational purposes and design patterns. Situated knowledge can not only contribute to the study results of teachers in training, but also to the job satisfaction of both the teachers in training and the teacher trainers. A teacher who has witnessed the effectiveness of his actions in the classroom, can start making a difference in the learning process of his students.

8

References

References Chapter 2

Admiraal, W., & Berry, A. (2016). Video narratives to assess student teachers' as new teachers. *Teachers and Teaching: theory and practice, 22*(1), 21-34.

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A Pattern Language- towns, buildings, construction*. New York: University Press.

Anderson, M. L. (2003). Embodied cognition: A field guide. *Artificial Intelligence*, 14, 91-130. doi:10.1016/S0004-3702(03)00054-7

Argyris, C. (1996). *Leren in en door organisaties*. Schiedam: Scriptum Books.

Argyris, C. (2002). Double-loop learning, teaching, and research. *Academy of Management Learning and Education, I*(2), 206-218.

Assies, F. G., Steenbeek, H. W., & Van Geert, P. L. (2017). *How are you motivated?* ECDP 2017. Utrecht.

Athanassiou, N., McNett, J. M., & Harvey, C. (2003). Critical thinking in the management classroom: Bloom's taxonomy as a leaning tool. *Journal of Management Education, 27*, 533-555.

Baldwin, M. W. (1982). Relational Schemas and the Processing of Social Information. *Psychological Bulletin, 112* (3), 461-484.

Barone, T., Berliner, D., Blanchard, J., Casanova, U., & McGowan, T. (1996). A future for teacher education: Developing a strong sense of professionalism. In Sikula, J., Buttery, T. J., Guyton, E. (Eds.), *Handbook of Research on Teacher Education*, N.Y. : Simon Schuster Macmillan, Prentice Hall International.

Beijaard, D., Buitink, J., & Kessels, C. (2010). Teacher induction. In B. McGaw, P. Peterson, & E. Baker (Eds.), *International Encyclopedia of Education* (3rd ed.). Oxford: Elsevier Scientific Publishers.

Belli, R., Soraci, S., & Purdon, S. (1989). *The generation effect in learning and memory: Implications for theory and practice*. Unpublished manuscript, Vanderbilt University, Learning Technology Center, TN.

Ben-Peretz, M. (1995). Curriculum of teacher education programs. In L. W. Anderson (Ed.), *International encyclopedia of teaching and teacher education* (pp. 543-547). Oxford: Pergamon.

Benammar, K., Van Schaik, M., Sparreboom, I., Vrolijk, S. & Wortman, O. (2006). *Reflectietools*. Amsterdam: Boom Uitgevers.

Berliner, D. C. (2004). Expert Teachers: their characteristics, development and accomplishments. *Bulletin of Science, Technology and Society, 24*(3), 107-128.

Blomberg, G., Renkl, A., Sherin, M., Borko, H., & Seidel, T. (2013). *Five research-based heuristics for using video in pre-service teacher education*. Journal for Educational Research Online / Journal FüR Bildungsforschung Online, 5(1), 90– 114.

Boonstra, J. J. (2000). *Lopen over water: over dynamiek van organiseren, vernieuwen en leren*. (Oratiereeks). Amsterdam: Vossiuspers AUP.

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher, 33*(8), 3-15.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal, 26*(4), 473-498.

Bransford, J., Brown, A., & Cocking, R. (2000). *How People Learn: Brain, Mind, Experience, and School: Expanded Edition*. (J. D. Bransford, Ed.) Washington, D. C.: National Academy Press.

Brouwer, N., & Korthagen, F. (2005). Can teacher education make a difference? *American Educational Research Journal, 42*(1), 153-224.

Brown, J., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.

Brown, H. D. (2001). *Teaching by Principles: An interactive approach to language pedagogy (second edition)*. New York: Longman.

Calandra, B., Gurvitch, R., & Lund, J. (2008). An exploratory study of digital video editing as a tool for teacher preparation. *Journal of Technology and Teacher Education, 16*(2), 137-153.

Carlson, H. L., & Falk, D. R. (1990). Effectiveness of interactive videodisc instruction- al programs in elementary teacher education. *Journal of Educational Technology Systems, 19*(2), 151–63.

Chi, M. (2006). Laboratory Methods for Assessing Experts' and Novices' Knowledge. In K. A. Ericsson (Ed.), *The Cambridge handbook of expertise and expert performance* (pp. 167-184). Cambridge: Cambridge University Press.

Chi, M. (2011). Theoretical perspectives, methodological approaches, and trends in the study of expertise. In Y. Li (Ed.), *Expertise in mathematics instruction: An international perspective*. New York: Springer.

Chi, M., Feltovich, P., & Glaser, R. (1981). Categorization and Representation of Physics Problems by Experts and Novices. *Cognitive Science, 5*(2), 121-152.

Cochran-Smith, M. (2004). The problem of teacher education. *Journal of Teacher Education, 55*(4), 295-300.

Coderre, S., Mandin, H., Harasym, P., & Fick, G. (2003). Diagnostic reasoning strategies and diagnostic success. *Medical Education, 37*(8), 695-703.

Cognition and Technology Group at Vanderbilt. (1993a). Integrated media: Toward a theoretical framework for utilizing their potential. *Journal of Special Education Technology, 12*(2), 76-89.

Copeland, W. D., & D'Emidio-Caston, M. (1998). Indicators of development of practical theory in pre-service teacher education students. *Teaching and Teacher Education,*

14(5), 513-534. Retrieved from http://www.sciencedirect.com/science/article/pii/S0742051X98000031

Copeland, W. D. & Decker, D. L. (1996). Video cases and the development of meaning making in preservice teachers. *Teaching and Teacher Education, 12*(5), 467–481.

Czerniawski, G. (2013). Professional development for professional learners: Teachers' experiences in Norway, Germany and England. *Journal of education for teaching, 39*(4), 383-399.

Darling-Hammond, L. (2006). Constructing 21st-Century teacher education. *Journal of Teacher Education, 57*(3), 300-314. doi:10.1177/0022487105285962

Day, C., Sammons, P., Stobart, G., Kington, A., & Gu, Q. (2007). *Teachers matter: Connecting work, lives and effectiveness*. London: Open University Press.

de Groot, A. (1965). *Thought and choice in chess*. Amsterdam: Amsterdam University Press.

de Jong, A. J. M., & Ferguson-Hessler, M. G. M. (1996). *Types and qualities of knowledge, 31*(2), 105-113.

Doyle, J., & Ford, D. (1998). Mental models concepts for system dynamics research. *System Dynamics Review, 14*(1), 3-29.

Dreyfus, H. L., & Dreyfus, S. E. (1988). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York: Free Press.

Dreyfus, H., Dreyfus, S., & Athanasiou, T. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. Oxford: B. Blackwell.

Dudley, P. (2013). Teacher learning in lesson study: What interaction-level discourse analysis revealed about how teachers utilised imagination, tacit knowledge of teaching and fresh evidence of pupils learning, to develop practice knowledge and so enhance their pupils' learning. *Teaching and Teacher Education, 34*, 107-121. doi:10.1016/j.tate.2013.04.006

Endsley, M. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors, 37*(1), 32–64.

Endsley, M. (2006). Expertise and situation awareness. In K. A. Ericsson, N. Charness, P. Feltovich, & R. Hoffman (Eds.), *The Cambridge handbook of expertise and expert performance* (pp. 633–651). New York:Cambridge University Press.

Ericsson, K. A. (1993). The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review, 100*(3), 363-406.

Ericsson, K. (2006). *The cambridge handbook of expertise and expert performance*. Cambridge: Cambridge University Press.

Ericsson, K. A. (2008). Deliberate Practice and Acquisition of Expert Performance: A General Overview. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine, 15*(11), 988-994.

Feiman-Nemser, S. (1983). Learning to teach. In L. Shulman, & G. Sykes (Eds.), *Handbook of teaching and policy* (pp. 150-170). New York: Longman.

Fischer, K. W. (1980). A Theory of Cognitive Development: The Control and Construction of Hierarchies of Skills. *Psychological Review, 87*(6), 477-531.

Fischer, K. W. (2008). Dynamic cycles of cognitive and brain development: Measuring growth in mind, brain, and education. (2008). In A. Battro, K. Fischer, & P. Léna (Eds.), *The Educated Brain: Essays in Neuroeducation* (pp. 127-150). Cambridge:

Cambridge University Press. doi:10.1017/CBO9780511489907.010

Fischer, K. W., & Pruyne, E. (2002). Reflective thinking in adulthood: Emergence, development, and variation. In J. Demick & C. Andreoletti (Eds.), *Handbook of adult development* (pp. 169–198). New York: Plenum.

Fischer, K., & Rose, L. (2001). Webs of skill: How students learn. *Educational Leadership, 59*, 6-13.

Fletcher, G. & Fitness, J. (2014). *Knowledge structures in close relationships: A social psychological approach*. Mahwah, N.J.: Lawrence Erlbaum Associates.

Fukkink, R. G., Trienekens, N., & Kramer, L. C. (2011). Video feedback in education and training: Putting learning in the picture. *Educational Psychology Review, 23*, 45– 63. doi: 10.1007/s10684-010-9144-5

Gage, N. (1978). *The scientific basis of the art of teaching*. New York: College Press.

Gallese, V. (2009). Motor abstraction: a neuroscientific account of how action goals and intentions are mapped and understood. *Psychological Research, 73*, 486-498. doi: 10.1007/s00426-009-0232-4

Gamma, E., Helm, R., Johnson, R. & Vlissides, J. (1995). *Design patterns: Elements of reusable object-oriented software*. Reading, MA: Addison-Wesley.

Geelhoed, J. W., & Vieijra, J. P. M. (2014). Onderzoek naar leervorderingen. In J. A. Tank, J. D. Bosch, S. Begeer, & G. Albrecht (Eds.), Handboek psychodiagnostiek voor de hulpverlening aan kinderen een adolescenten. (pp. 445-490). Utrecht: De Tijdstroom.

Geerts, W., Van der Werff, A., Hummel, H. G., Steenbeek, H. W., & Van Geert, P. L. (2015). *Assessing situated knowledge in secondary teacher training by using video cases. EAPRIL 2015*. Luxembourg City.

Geerts, W. & Van Laeken, M. (2006). Authentic Video Cases for Teacher Training: Didiclass. In C. Crawford, R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2006* (pp. 2857-2865). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Geerts, W., van Laeken, M. & Wouda, S. (2010). *De bijdrage van Didiclass in de professionele ontwikkeling van leraren-in-opleiding*. Enschede: Onderwijs Research Dagen.

Geveke, C. H. (2016). *It's not Rocket Science: Developing Pupils' Science Talent in Out-of-School Science Education for Primary Schools* (Doctoral Dissertation). Rijksuniversiteit Groningen, Groningen.

Gobet, F. & Chassy, P. (2008) Towards an Alternative to Benner's Theory of Expert Intuition in Nursing: A Discussion Paper. *International Journal of Nursing Studies, 45*, 129-139.

Gogus, A. (2012). Evaluation of Mental Models: Using Highly Interactive Model-Based Assessment Tools and Technologies (HIMATT) in Mathematics Domain. *Tech., Inst., Cognition and Learning, 9*, 31-50.

Goodyear, P., Avgeriou, P., Baggetun, R., Bartoluzzi, S., Retalis, S., Ronteltap, F., & Rusman, E. (2004). *Towards a Pattern Language for Networked Learning*. Groningen: Johann Bernoulli Institute for Mathematics and Computer Science.

Grossman, P. (2005). Research on pedagogical approaches in teacher education. In M.

Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (425–476). Mahwah, NJ: Erlbaum.

Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching, 8*(3), 381-391.

Hambrick, D., Oswald, F., Altmann, E., Meinz, E., Gobet, F., & Campitelli, G. (2014). Deliberate practice: Is that all it takes to become an expert? *Intelligence, 45*, 34-45.

Hummel, H. G. K. (2005). *Design of Cueing in Multimedia Practicals: Studies into Cueing Formats, Learner Control and Collaboration to Support the Learning of Complex Skills*. Heerlen: Open Universiteit Nederland.

Hummel, H., Geerts, W., Slootmaker, A., Kuipers, D., Westera, W. (2015). Collaboration scripts for mastership skills: online game about classroom dilemmas in teacher education. *Interactive Learning Environments, 23*(6), 670-682. doi:10.1080/10494820.2013.789063

HBO-raad. (2011). *Generieke Kennisbasis Tweedegraads lerarenopleidingen*. HBO-raad. Retrieved from https://10voordeleraar.nl/documents/kennisbases_bachelor/kb-generiek.pdf

Hoy, A., & Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: A comparion of four measures. *Teaching and teacher education, 21*(4), 343-356.

Hoyle, E. & John, P, D. (1995) *Professional Knowledge and Professional Practice*. Cassell: London.

Hyle, A., Ivory, G., & McClellan, R. (2010). Hidden expert knowledge: The knowledge that counts for the small school-District superintendent. *Journal of Research on Leadership Education, 5*(4), 154-178.

Khemlani, S., Goodwin, G., Johnson-Laird, P. N. (2015). *Causal relations form kinematic simulations*. Talk presented at London Reasoning Workshop, London, UK and Cognitive Science Society, Pasadena, California.

Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. *The American Psychologist, 64*(6), 515-26.

Karimi-Aghdam, S. (2017). Zone of proximal development (ZPD) as an emergent system: A dynamic systems theory perspective. *Integrative Psychological and Behavioral Science, 51*(1), 76-93.

Keller-Schneider, M. (2014). Self-Regulated Learning in Teacher Education– The Significance of Individual Resources and Learning Behaviour. *Australian Journal of Educational & Developmental Psychology, 14*, 144-158.

Kennedy, M. (1999). The problem of evidence in teacher education. In R. Roth (Ed.), *The role of university in the preparation of teachers* (pp. 87-107). Philadelphia: Falmer.

Kim, H. (2011). Exploring freshmen preservice teachers' situated knowledge in reflective reports during case-based activities. *The Internet and Higher Education, 14*(1), 10-14. doi:10.1016/j.iheduc.2010.03.005

King, P., & VanHecke, J. (2006). Making connections: Using skill theory to recognize how students build and rebuild understanding. *About Campus, 11*(1), 10-16.

Kinzer, C. K., & Risko, V. J. (1998). Multimedia and enhanced learning: Transforming preservice education. In D. Reinking, M. C. McKenna, L. D. Labbo, & R. D. Kieffer (Eds.), *Handbook of literacy and technology: Transformations in a post-typo- graphic*

world. New York, NY: Routledge.

Kitchener, P., & King, K. (2004). Reflective Judgment: Theory and Research on the Development of Epistemic Assumptions Through Adulthood. *Educational Psychologist, 39*(1), 5-18.

Knowles, M., Holton, E., & Swanson, R. (2005). *The adult learner: The definitive classic in adult education and human resource development (6th ed.)*. Amsterdam: Elsevier.

Kolfschoten, G., Lukosch, S., Verbraeck, A., Valentin, E., & de Vreede, G. J. (2010). Cognitive Learning Efficiency through the Use of Design Patterns in Teaching. *Computers & Education, 54*(3), 652-660.

Korthagen, F. (2010). Situated learning theory and the pedagogy of teacher education: Towards an integrative view of teacher behavior and teacher learning. *Teaching and Teacher Education, 26*(1), 98-106. doi:10.1016/j.tate.2009.05.001

Korthagen, F., & Vasalos, A. (2005). Levels in reflection: Core reflection as a means to enhance professional development. *Teachers and Teaching: Theory and Practice, 11*, 49–73.

Krathwohl, D. R. (2002) A revision of bloom's taxonomy: An overview. *Theory into practice, 41*, 212-218.

Lakoff, G. (2012). Explaining Embodied Cognition Results. *Topics in Cognitive Science, 4*, 773-785. doi:10.1111/j.1756-8765.2012.01222.x

Lam, A. (1997). Embedded Firms, Embedded Knowledge: Problems of Collaboration and Knowledge Transfer in Global Cooperative Ventures. *Organization Studies, 18*(6), 973-996.

Lanier, J. (1982). Teacher education; Needed research and practice for the preparation of teacher professionals. In D. Corrigan (Ed.), *The future of teacher education: Needed research and practice* (pp. 13-36). College Station: College of Education, Texas A & M University.

Larkin, J. H., McDermott, J., Simon, D. P., & Simon, H. A. (1980). Expert and novice performance in solving physics problems. *Science, 208*, 1335-1342.

Lave, J. & Wenger, E. (1991). *Situated Learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lubarsky S., Charlin, B., Cook, D. A., Chalk, C., van der Vleuten, C.P. (2011). Script concordance testing: a review of published validity evidence. *Medical Education, 45*, 329–338.

Maina, M., Craft, B. & Mor, Y. (2015). *Handbook of visual languages in instructional design: Theorie pratices*. Hershey, PA: Sense Publishers.

Mansvelder, D., Beijaard, D. & Verloop, N. (2007). The portfolio as a tool for stimulating reflection by student teachers. *Teachers and Teacher Education, 23*(1), 47-62.

McGee, P. & Reis, A. (2012). Blended course design: A synthesis of best practices. *Journal of Asynchronous Learning Networks, 16*(4), 7-22.

Ministerie van Onderwijs, Cultuur en Wetenschap. (2008). *'Krachtig meesterschap' Kwaliteitsagenda voor het opleiden van leraren 2008-2011*. Den Haag: Ministerie van Onderwijs, Cultuur en Wetenschap.

Monroe-Baillargeon, A. (2002). Talking about our work: Teachers' use of video as a problem-solving tool. In R. Griffin, J. Lee & V. Williams (Eds.), *Visual literacy in*

message design (pp. 2–6). Rochester: International Visual Literacy Association.

Murray, J., McNamara, O., & Jones, M. (2013). *Workplace Learning in Pre-service Teacher Education: An English Case Study (Vol. 10)*. Dordrecht: Springer Science+Business Media.

Mor, Y., Mellar, H., & Warburton, S. (2014). *Practical Design Patterns for Teaching and Learning with Technology.* Rotterdam: Sense Publishers. doi:10.1007/978-94-6209-530-4

Murray, J., McNamara, O., & Jones, M. (2014). Improving workplace learning in teacher education. In *Workplace learning in teacher education* (pp. 293-315). Dordrecht: Springer Netherlands.

Nicolaides, A. (2014). Inquiry in action for leadership in turbulent times: Exploring the connections between transformative learning and adaptive leadership. *Journal of Transformative Education, 11*(4), 246-260. doi:10.1177/1541344614540333

Nieuwenhuis, L., Vink, R. & van der Neut, I. (2013). *Docentprofessionalisering met ICT*. Tilburg: IVA Onderwijs.

Onderwijsraad. (2013). *Leraar zijn: Meer oog voor professionele kwaliteit*. Den Haag.

Onstenk, J. (1997). *Lerend leren werken*. Proefschrift Katholieke Universiteit Nijmegen.

Perone, S. & Simmering, V. R. (2017). Applications of dynamic system theory to cognition and development: New frontiers. In J. Benson (Ed.) *Advances in Child Development and Behavior* (Vol. 52 , 43-80).

Perkins, D. N. & Salomon, G. (1988). Teaching for Transfer. *Educational Leadership, 46* (1), 22-32.

Perry, G. & Talley, S. (2001). Online video case studies and teacher education: A new tool for pre-service teacher education. *Journal of Computing in Teacher Education, 17*(4), 6-31.

Persky, A. M., & Robinson, J. D. (2017). Moving from novice to expertise and its implications for instruction. *American Journal of Pharmaceutical Education, 81*(9), 72-80. doi:10.5688/ajpe6065

Peterson, P. L., & Clark, C. M. (1987). Teachers' reports of their cognitive processes during teaching. *American Educational Research Journal, 15*, 555-565.

Peterson, P. L., & Comeaux, M. A. (1987). Teachers' schemata for classroom events: The mental scaffolding of teachers' thinking during classroom instruction. T*eaching and Teacher Education, 3*(4), 319-331.

Putnam, R., & Borko, H. (1999). What Do New Views of Knowledge and Thinking Have to Say About Research on Teacher Learning? *Educational Researcher, 29*(1), 4-15.

Robbins, P., & Aydede, M. (2009). *The Cambridge handbook of situated cognition*. Cambridge: University Press.

Roth, W., & Jornet, A. (2013). Situated Cognition. *Wiley Interdisciplinary Reviews: Cognitive Science, 4*(5), 463-478.

Rupert, R. (2010). Extended cognition and the priority of cognitive systems. *Cognitive Systems Research, 11*, 343-356.

Schank, R. (1999). *Dynamic Memory Revisited*. Cambridge: University Press.

Schank, R. C. & Abelson, R. P. (2013). *Scripts, Plans, Goals, and Understanding*. Hillsdale, NJ: Erlbaum.

Schön, D. A. (1987). *Jossey-Bass higher education series. Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.

Sherin, M. G. & van Es, E. A. (2005). Using video to support teachers' ability to notice classroom interactions. *Journal of Technology and Teacher Education, 13*(3), 475-491.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-23.

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning & Memory, 4*, 592–604.

Smeets, P. M., Barnes, D., Schenk, J. J. & Darcheville, J. C. (1996). Emergent simple discriminations and conditional relations in children, intellectually impaired adults, and normal adults. *The Quarterly Journal of Experimental Psychology. B, Comparative and Physiological Psychology, 49*(3), 201-19.

Soraci, N. J., Jr., Bransford, J. D., Franks, J. J., & Chechille, R. (1987). A multiple-cue model of generation activity. *Proceedings of the 1987 Psychonomics Society*. New Orleans.

Spencer, J. P. & Perone, S. (2008). Defending qualitative change: The view from dynamical systems theory. *Child Development*, 79(6), 1639-1647.

Steenbeek, H., & Uittenbogaard, W. (2009). Bèta-talenten van jonge kinderen in kaart. *Tijdschrift voor nascholing en onderzoek van het reken-wiskunde onderwijs: Panama-Post, 28*, 89 -100.

Tigelaar, D., Dolmans, D., Wolfhagen, I., & Van der Vleuten, C. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education, 48*(2), 253-568.

Tom, A. R. (1997). *Redesigning Teacher Education*. New York: SUNY Press.

Tsui, A. B. M. (2003). *Understanding Expertise in Teaching: Case Studies in ESL*. Cambridge: Cambridge University Press.

van de Grift, W., Helms-Lorenz, M., & Maulana, R. (2014). Teaching skills of student teachers: Calibration of an evaluation instrument and its value in predicting student academic engagement. *Studies in Educational Evaluation, 43*, 150-159.

van de Grift, W., Helms-Lorenz, M., Maandag, D., & de Vries, S. (2012). *Vakkundig Meesterschap en meesterlijk vakmanschap*. Groningen: RUG.

van den Bos, P., & Brouwer, J. (2014). Learning to teach in higher education: how to link theory and practice. *Teaching in Higher Education, 19*(7), 772-786.

van der Wolf, J., & van Beukering, J. (2013). *Gedragsproblemen in scholen : het denken en handelen van leraren : intuïtie, theorie en reflectie*. Leuven: Acco.

van Geert, P. (1994). *Dynamic systems of development. Change between complexity and chaos*. New York: Harvester.

van Geert, P. (2011). The contribution of complex dynamic systems to development. *Child Development Perspectives, 5*(4), 273-278.

van Kuijk, J. & Stéfanie , A. (2009). *Didiclass: Productevaluatie door het Ruud de Moor Centrum*. Nijmegen: Radboud Universiteit.

van Veen, K. & Janssen, F. (2016). Praktijkkennis van Leraren. In Beijaard, D. (Ed.), *Weten Wat Werkt: Onderwijsonderzoek vertaald voor lerarenopleiders*, 27-35. Meppel: Ten Brink Uitgevers.

van Vondel, S., Steenbeek, H., van Dijk, M., van Geert, P. (2017). Ask, don't tell; a complex dynamic systems approach to improving science education by focusing on the co-construction of scientific understanding. *Teaching and Teacher Education, 63*, 243-253. doi:10.1016/j.tate.2016.12.012

Velon (2005). *Congres voor lerarenopleiders 2005*. Vereniging Lerarenopleiders Nederland. Retrieved from http://www.lerarenopleider.nl/velon/congres-voor-lerarenopleiders-2005/

Wetzels, A. F. M. (2015). *Curious Minds in the classroom. The influence of video feedback coaching for teachers in science and technology lessons*. Academic Dissertation, Rijksuniversiteit Groningen, Groningen.

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.

Wilson, A., & Golonka, S. (2013). Embodied cognition is not what you think it is. *Frontiers in Psychology, 4*, 1-13.

Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review, 9*, 625-636. doi:10.3758/BF03196322

Winitzky, N. (1992). Structure and process in thinking about classroom management: An exploratory study of prospective teachers. *Teaching and Teacher Education, 8*(1), 1-14. Retrieved from http://www.sciencedirect.com/science/article/B6VD8-466FC19-3B/2/8ad046d8e51c9c57860252dd5e62bc0d

Wolff, C., van den Bogert, N., Jarodzka, H., & Boshuizen, H. (2015). Keeping an Eye on Learning: Differences Between Expert and Novice Teachers' Representations of Classroom Management Events. *Journal of Teacher Education, 66*(1), 68-85.

Zeichner, K. & Lui, K.Y. (2010). A Critical Analysis of Reflection as a Goal for Teacher Education. In N. Lyons, *Handbook of Reflection and Reflective Inquiry* (67-84). New York Dordrecht Heidelberg London: Springer.

Zitter, I., Kinkhorst, G., Simons, R. J., & ten Cate, O. (2009). In search of common ground: A task conceptualization to facilitate the design of (e)learning environments with design patterns. *Computers in Human Behavior, 25*, 999-1009.

References Chapter 3

Alkema, E. (2006). *Meer dan Onderwijs [More than Education]*. Assen: Van Gorcum.

Athanassiou, N., McNett, J. M., & Harvey, C. (2003). Critical thinking in the management classroom: Bloom's taxonomy as a learning tool. *Journal of Management Education, 27*(5), 533-555.

Blijleven, P. J. (2005). *Multimedia-cases: Naar een Brug Tussen Theorie en Praktijk [Multimedia Cases: Toward a Bridge Between Theory and Practice]*. Universiteit Twente, Enschede.

Bloom, B. S. (1979). *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive domain.* London: Longman.

Blumentritt, R., & Johnston, R. (1999). Towards a Strategy for Knowledge Management. *Technology Analysis & Strategic Management, 11*(3), 287 - 300.

Clark, A. (1997). The Dynamical Challenge. *Cognitive Science, 21*(4), 461-481.

Even, R. (1993). Subject-Matter Knowledge and Pedagogical Content Knowledge: Prospective Secondary Teachers and the Function Concept. *Journal for Research in Mathematics Education, 24*(2), 94-116.

Furst, E. J. (1981). Bloom's taxonomy of educational objectives for the cognitive domain: Philosophical and educational issues. *Review of Educational Research, 51*(4), 441-453.

Garner, D. D. (2000). The Continuing Vitality of the Case Method in the Twenty-First Century. *Brigham Young University Education & Law Journal* (2), 307.

HBO-raad (Ed.). (2011). *Generieke Kennisbasis Tweedegraads Lerarenopleidingen [Generic Knowledge Base for Second-degree Teacher Training]*. Den Haag: HBO-raad.

Keijzer, R., & Kool, M. (2012). *Mathematical Knowledge for Teaching in the Netherlands.* Paper presented at the 12th International Congress on Mathematical Education, Seoul, South-Korea.

Korthagen, F. (2009). Reflecteren op Praktijkcasussen: Aanwijzingen voor Optimaal Leren [Reflectioning on Practise-based Cases: Clues for Optimal Learning]. In W. Geerts, M. Van Laeken & M. Mitzschke (Eds.), *Wat zou jij doen? Leren van dilemma's in de onderwijspraktijk* (pp. 175-189). Bussum: Coetinho.

Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice, 41*(4), 212-218.

Kurz, T. L., Llama, G., & Savenye, W. (2004). Issues and Challenges of Creating Video Cases to Be Used With Preservice Teachers. *TechTrends, 49*(4), 67-73.

Lam, A. (1997). Embedded Firms, Embedded Knowledge: Problems of Collaboration and Knowledge Transfer in Global Cooperative Ventures. *Organization Studies, 18*(6).

Moreno, R., & Valdez, A. (2007). Immediate and Delayed Effects of Using a Classroom Case Exemplar in Teacher Education: The Role of Presentation Format. *Journal of Educational Psychology, 99*(1), 194-206.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long Range Planning, 33*(1), 5-34.

Onderwijsraad. (2011). *Naar Hogere Prestaties in het Voortgezet Onderwijs [Toward Higher Achievements in Secondary Education]*. Den Haag: Onderwijsraad.

Plecki, M. L., Elfers, A. M., & Nakamura, Y. (2012). Using evidence for teacher education program improvement and accountability: An illustrative case of the role of value-added measures. *Journal of Teacher Education, 63*(5), 318-334.

Rosaen, C. L., Lundeberg, M., Cooper, M., Fritzen, A., & Terpstra, M. (2008). Noticing Noticing. *Journal of Teacher Education, 59*(4), 347-360.

Roth, W., & Jornet, A. (2013). Situated Cognition. *Wiley Interdisciplinary Reviews: Cognitive Science, 4*(5), 463-478.

Saeli, M., Perrenet, J., Jochems, W. M. G., & Zwaneveld, B. (2012). Programming: Teachers and Pedagogical Content Knowledge in the Netherlands. *Informatics in Education, 11*(1), 81-114.

Santagata, R., & Guarino, J. (2011). Using Video to Teach Future Teachers to Learn From Teaching. *ZDM, 43*(1), 133-145.

Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher, 15*(2), 4-14.
Shulman, L. S. (1987). Knowledge and Teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1).
Shulman, L. S. (1992). Toward a Pedagogy of Cases Teacher-written Cases with Commentaries: A Teacher-researcher Collaboration. In J. Shulman (Ed.), *Case methods in teacher education* (pp. 1-33). New York: Teachers College Press.
Simons, P. R. J. (1999). Competentieontwikkeling: van behaviorisme en cognitivisme naar sociaal-constructivisme [Development of competences: from behaviorism and cognitivism toward social-sonstructivism]. *Opleiding en Ontwikkeling, 2*, 41-45.
Smith, L. B. (2005). Cognition As a Dynamic System: Principles From Embodiment. *Developmental Review, 25*, 278-298.
Stronge, J. H., Ward, T. J., & Grant, L. W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *Journal of Teacher Education, 62*(4), 339-355.
van den Berg, E., & Visscher-Voerman, I. (2000). Multimedia Cases in Elementary Science Teacher Education: Design and Development of a Prototype. *Education and Information Technologies, 5*(2), 119-132.
van den Berg, E., Wallace, J., & Pedretti, E. (2008). Multimedia Cases, Teacher Education and Teacher Learning. In J. Voogt & G. Knezek (Eds.), *International Handbook of Information Technology in Primary and Secondary Education* (Vol. 20, pp. 475-487). New York: Springer US.
van Es, E., & Sherin, M. (2002). Learning to Notice: Scaffolding New Teachers' Interpretations of Classroom Interactions. *Journal of Technology and Teacher Education, 10*(4), 571-596.
Vogels, R., & Bronneman-Helmers, R. (2006). *Wie Werken Er in het Onderwijs? Op Zoek Naar het 'Eigene' van de Onderwijsprofessional [Who Is Working in the Field of Education? A Search For the 'Individuality' of the Educational Professional].* Den Haag: SCP.
Yung, B., Wong, S., Cheng, M., Hui, C., & Hodson, D. (2007). Tracking Pre-service Teachers' Changing Conceptions of Good Science Teaching: The Role of Progressive Reflection with the Same Video. *Research in Science Education, 37*(3), 239-259.

References Chapter 4

Adams, W. K., & Wieman, C. E. (2011). Development and Validation of Instruments to Measure Learning of Expert-Like Thinking. *International Journal of Science Education, 33*(9), 1289-1312.
Athanassiou, N., McNett, J. M., & Harvey, C. (2003). Critical Thinking in the Management Classroom: Bloom's Taxonomy as a Learning Tool. *Journal of Management Education, 27*(5), 533-555. doi: 10.1177/1052562903252515
Biggs, J. B., & So-kum Tang, C. (2011). *Teaching for Quality Learning at University: What the Student Does*. Maidenhead: McGraw-Hill/Society for Research into Higher

Education/Open University Press.
Blijleven, P. J. (2005). *Multimedia-cases: Naar een Brug Tussen Theorie en Praktijk [Multimedia Cases: Toward a Bridge Between Theory and Practice]*. Enschede: Universiteit Twente.
Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher, 33*(8), 3-15. doi: 10.3102/0013189X033008003
Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42. doi: 10.3102/0013189X018001032
Brush, T., & Saye, J. (2014). An Instructional Model to Support Problem-Based Historical Inquiry: The Persistent Issues in History Network. *The Interdisciplinary Journal of Problem-Based Learning, 8*(1), 38-50.
Darling-Hammond, L., & Snyder, J. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education, 16*(5–6), 523-545. doi: http://dx.doi.org/10.1016/S0742-051X(00)00015-9
Farmer, E. A., & Page, G. (2005). A practical guide to assessing clinical decision-making skills using the key features approach. *Medical Education, 39*(12), 1188-1194.
Fleiss, J. L. (1971). Measuring nominal scale agreement among many raters. *Psychological Bulletin, 76*(5), 378-382. doi: 10.1037/h0031619
Furst, E. J. (1981). Bloom's Taxonomy of Educational Objectives for the Cognitive Domain: Philosophical and Educational Issues. *Review of Educational Research, 51*(4), 441-453. doi: 10.3102/00346543051004441
Geerts, W., Van der Werff, A., Hummel, H. G. K., & Van Geert, P. L. C. (2015). *Video Cases in Teacher Education: A review study on intended and achieved learning objectives using video cases.* Manuscript submitted for publication.
Greeno, J. G. (1997). On Claims That Answer the Wrong Questions. *Educational Researcher, 26*(1), 5-17. doi: 10.3102/0013189X026001005
Gulikers, J. T. M., Kester, L., Kirschner, P. A., & Bastiaens, T. J. (2008). The effect of practical experience on perceptions of assessment authenticity, study approach, and learning outcomes. *Learning and Instruction, 18*(2), 172-186. doi: http://dx.doi.org.proxy-ub.rug.nl/10.1016/j.learninstruc.2007.02.012
Hamp-Lyons, L. (1997). Washback, impact and validity: ethical concerns. *Language Testing, 14*(3), 295-303. doi: 10.1177/026553229701400306
Huxham, M., Campbell, F., & Westwood, J. (2012). Oral Versus Written Assessments: A test of student performance and attitudes. *Assessment & Evaluation in Higher Education, 37*(1), 125-136.
Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice, 41*(4), 212-218.
Kurz, T. L., Llama, G., & Savenye, W. (2004). Issues and challenges of creating video cases to be used with preservice teachers. *TechTrends, 49*(4), 67-73. doi: 10.1007/bf02824113
Momsen, J. L., Long, T. M., Wyse, S. A., & Ebert-May, D. (2010). Just the Facts? Introductory Undergraduate Biology Courses Focus on Low-Level Cognitive Skills. *CBE-Life Sciences Education, 9*(4), 435-440. doi: 10.1187/cbe.10-01-0001
Opfer, V. D., & Pedder, D. (2011). Conceptualizing Teacher Professional Learning.

Review of Educational Research, 81(3), 376-407. doi: 10.3102/0034654311413609
Ploegman, M., & De Bie, D. (2008). *Aan de slag! Inspirerende opdrachten maken voor beroepsopleidingen.* Houten: Bohn Stafleu van Loghum.
Putnam, R. T., & Borko, H. (2000). What Do New Views of Knowledge and Thinking Have to Say About Research on Teacher Learning? *Educational Researcher, 29*(1), 4-15. doi: 10.3102/0013189X029001004
Regehr, G., & Norman, G. R. (1996). Issues in cognitive psychology: implications for professional education. *Academic Medicine, 71*(9), 988-1001.
Rosaen, C. L., Lundeberg, M., Cooper, M., Fritzen, A., & Terpstra, M. (2008). Noticing Noticing. *Journal of Teacher Education, 59*(4), 347-360.
Shulman, L. S. (1992). Toward a pedagogy of cases teacher-written cases with commentaries: A teacher-researcher collaboration. In J. Shulman (Ed.), *Case methods in teacher education* (pp. 1-33). New York: Teachers College Press.
Spratt, M. (2005). Washback and the classroom: the implications for teaching and learning of studies of washback from exams. *Language Teaching Research, 9*(1), 5-29. doi: 10.1191/1362168805lr152oa
van Berkel, H., & Bax, A. (2006). *Toetsen in het Hoger Onderwijs.* Houten: Bohn Stafleu van Loghum.
van Es, E., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10*(4), 571-596.
Wiggins, G. (1998). *Educative Assessment: Designing Assessment to Inform and Improve Student Performance.* San Fransisco: Jossey-Bass Inc. Publishers.

References Chapter 5

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A Pattern Language- towns, buildings, construction*. New York: Oxford University Press.
Barden, J. & Tormala, Z. L. (2014). Elaboration and attitude strength: The new meta-cognitive perspective. *Social and Personality Psychology Compass, 8*(1), 17-29. doi:10.1111/spc3.12078
Berliner, D. (2001). Learning about and learning from expert teachers. *International Journal of Educational Research, 35*(5), 463-482. doi:10.1016/S0883-0355(02)00004-6
Blanton, W. E., Blanton, L. P., & Cross, L.S. (1994). An exploratory study of how general and special education teachers think and make instructional decisions about special needs students. *Teacher Education and Special Education, 17*, 62-74.
Blijleven, P. J. (2005). *Multimedia-cases: Naar een Brug Tussen Theorie en Praktijk [Multimedia Cases: Toward a Bridge Between Theory and Practice].* Enschede: Universiteit Twente.
Bloom, B. (1984). *Taxonomy of Educational Objectives.* Boston: Allyn and Bacon.
Borchers, J. O. (2008). A Pattern Approach to Interaction Design. In S. Gill (Ed.), *Cognition, Communication and Interaction* (pp. 114-131): Springer London.

Boshuizen, H. P. A. (2009). Teaching for expertise: problem-based methods in medicine and other professional domains. In K. A. Ericsson (Ed.), *The development of professional performance: Approaches to objective measurement and designed learning environments* (pp. 379-404). UK: Cambridge University Press.

Bowe, J. & Gore, J. (2017). Reassembling Teacher Professional Development: The Case for Quality Teaching Rounds. *Teachers and Teaching 23(3)*, 352–366.

Brophy, J. (1988). Educating Teachers About Managing Classroom and Students. *Teaching and Teacher Education*, *4* (1), 1-18.

Brophy, J. (2006). History of research on classroom management. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 17-43). Mahwah, NJ: Lawrence Erlbaum Associates.

Brown, J., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.

Carter, K., & Doyle, W. (1987). Teachers' knowledge structures and comprehension processes. In J. Calderhead, *Exploring teachers' thinking* (pp. 147-160). London: Cassell.

Christofferson, M., & Sullivan, A. (2015). Preservice Teachers' Classroom Management Training: A Survey of Self-reported Training Experiences, Content Coverage, and Preparedness. *Psychology in the Schools, 52*(3). doi:10.1002/pits.21819

Copeland, W. D., & D'Emidio-Caston, M. (1998). Indicators of development of practical theory in pre-service teacher education students. *Teaching and Teacher Education, 14*(5), 513-534.

Copeland, W., Birmingham, C., DeMeulle, L., D'Emidio-Caston, M., & Natal, D. (1994). Making Meaning in Classrooms: An Investigation of Cognitive Processes in Aspiring Teachers, Experienced Teachers, and Their Peers. A*merican Educational Research Journal, 31*(1), 166-196.

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science, 25*(1), 7-29. doi:10.1177/0956797613504966

Derry, J. (2013). *Vygotsky philosophy and education* (The journal of philosophy of education book series). Hoboken: Wiley.

Geerts, W., Van der Werff, A., Hummel, H. G., Steenbeek, H. W., & Van Geert, P. L. (2015). Assessing situated knowledge in secondary teacher training by using video cases. *EAPRIL 2015*. Luxembourg City.

Geerts, W. & Van Kralingen, R. (2016). *Handboek voor leraren.* Bussum: Coutinho.

Geerts, W., Van Laeken, M. & Mitzschke, M. (2007). *Doorkijk naar Didiclass*. Leeuwarden: Noordelijke Hogeschool.

Gershkoff-Stowe, L. & Thelen, E. (2004). U-Shaped Changes in Behavior: A Dynamic Systems Perspective, *Journal of Cognition and Development, 5*(1), 11-36, DOI: 10.1207/s15327647jcd0501_2.

Gibb, R. (2008). Field Coding. *Encyclopedia of Survey Research Methods* (pp. 277-278). Thousand Oaks, USA: 'SAGE Publications'.

Goodyear, P., Avgeriou, P., Baggetun, R., Bartoluzzi, S., Retalis, S., Ronteltap, F., & Rusman, E. (2004). *Towards a Pattern Language for Networked Learning*. Groningen: Johann Bernoulli Institute for Mathematics and Computer Science.

Haider, H. & Frensch, P. A. (1996). The role of information reduction in skill acquisition. *Cognitive Psychology, 30*(3), 304-337. doi:10.1006/cogp.1996.0009

HBO-raad. (2011). *Generieke Kennisbasis Tweedegraads lerarenopleidingen*. HBO-raad. Retrieved from https://10voordeleraar.nl/documents/kennisbases_bachelor/kb-generiek.pdf

Inspectie van het Onderwijs. (2014). *De Sector Lerarenopleidingen in Beeld: Studiesucces, studenttevredenheid en aansluiting op de arbeidsmarkt*. Retrieved from https://www.onderwijsinspectie.nl/documenten/publicaties/2014/10/08/de-sector-lerarenopleiding-in-beeld

Jensen, J., MacDaniel, M., Woodard, S., & Kummer, T. (2014). Teaching to the Test... or Testing to Teach: Exams Requiring Higher Order Thinking Encourage Greater Conceptual Understanding. *Educational Psychological Review, 26*, (307-329).

Kim, H. (2011). Exploring freshmen preservice teachers' situated knowledge in reflective reports during case-based activities. *The Internet and Higher Education, 14*(1), 10-14. doi:10.1016/j.iheduc.2010.03.005

Kline, R. (2013). *Beyond significance testing: Statistics reform in the behavioral sciences* (2nd ed.). Washington, D.C.: American Psychological Association.

Kolfschoten, G., Lukosch, S., Verbraeck, A., Valentin, E., & de Vreede, G.-J. (2010). Cognitive Learning Efficiency through the Use of Design Patterns in Teaching. *Computers & Education, 54*(3), 652-660.

Kounin, J. (1970). *Discipline and group management in classrooms.* New York, NY: Holt, Rinehart & Winston.

Kurz, T. L., Llama, G., & Savenye, W. (2008). Issues and challenges of creating video cases to be used with preservice teachers. *TechTrends, 49*(4), (67-73). doi:10.1007/BF02824113

Lam, A. (1997). Embedded Firms, Embedded Knowledge: Problems of Collaboration and Knowledge Transfer in Global Cooperative Ventures. *Organization Studies, 18*(6), 973-996.

Landau, D., & Binder, K. (2015). *A Guide to Monte Carlo Simulations in Statistical Physics*. Cambridge: Cambridge University Press.

Lavrakas, P. J. (2008). *Encyclopedia of Survey Research Methods*. Thousand Oaks, Calif.: SAGE Publications.

Lesgold, A., Greeno, J., Glaser, R., Pellegrino, J., & Chase, W. (1988). *Cognitive and Instructional Factors in the Acquisition and Maintenance of Skill*. Pittsburgh: Pittsburgh University Learning, Research and Development Centre .

Masats, D., & Dooly, M. (2011). Rethinking the use of video in teacher education: A holistic approach. *Teaching and Teacher Education, 27*(7), 1151-1162. Retrieved from http://www.sciencedirect.com/science/article/pii/S0742051X11000497

Padhy, B., Emo, K., Djira, G., & Deokar, A. (2015). Analyzing Factors Influencing Teaching. *SAGE Open*, *5* (1), 1-12.

Powell, S., Millwood, R., & Tindal, I. (2008). *Developing technology-enhanced work-focused learning - a Pattern Language approach.* Proceedings of Special Track on Technology Support for Self-Organized Learners (TSSOL 2008), Salzburg, Austria, 26 May 2008. CEUR Workshop Proceedings, 349, 84-105.

Putnam, R., & Borko, H. (1999). What Do New Views of Knowledge and Thinking Have to Say About Research on Teacher Learning? *Educational Researcher, 29*(1), 4-15.

Rosaen, C. L., Lundeberg, M., Cooper, M., Fritzen, A., & Terpstra, M. (2008). Noticing Noticing. *Journal of Teacher Education, 59*(4), 347-360.

Rusman, E., Van Bruggen, J., Cörvers, R., Sloep, P. B., & Koper, R. (2009). From pattern to practice: evaluation of a design pattern fostering trust in Virtual teams. *Computers in Human Behavior, 25*(5), 1010-1019.

Ruud de Moor Centrum, 2007. *Catalogus Casusbank Didiclass*. Leeuwarden: Noordelijke Hogeschool.

Sheridan, H., & Reingold, E. (2011). Recognition memory performance as a function of reported subjective awareness. *Consciousness and Cognition, 20*(4), 1363-1375.

Shulman, L. S. (1992). Toward a pedagogy of cases teacher-written cases with commentaries: A teacher-researcher collaboration. In J. Shulman (Ed.), *Case methods in teacher education* (pp. 1-33). New York: Teachers College Press.

Todman, J.B., & Dugard, P. (2001). *Single-case and small-n experimental designs: A practical guide to randomization tests*. Mahwah (NJ): Erlbaum.

van den Bogert, N., Van Bruggen, J., Kostons, D., & Jochems, W. (2014). First steps into understanding teachers' visual perception of classroom events. *Teaching and Teacher Education, 37*, 208- 216.

van Es, E., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10*(4), 571-596.

van Meeuwen, L., Jarodzka, H. Brand-Gruwel, S., Kirschner, P. A., de Bock, J. P. R. , van Merrienboer, J. J. G. (2014). Identification of effective visual problem solving strategies in a complex visual domain. *Learning and Instruction, 32*, 10-21. doi:10.1016/j.learninstruc.2014.01.004

Velon, (2012). *Congres voor lerarenopleiders 2012*. Vereniging Lerarenopleiders Nederland. Retrieved from http://www.lerarenopleider.nl/velon/congres-voor-lerarenopleiders-2012/

Wolff, C., van den Bogert, N., Jarodzka, H., & Boshuizen, H. (2015). Keeping an Eye on Learning: Differences Between Expert and Novice Teachers' Representations of Classroom Management Events. *Journal of Teacher Education, 66*(1), 68-85.

Wolff, C., Jarodzka, H, van den Bogert, N. & Boshuizen, H. P. A. (2016). Teacher vision: Expert and novice teachers' perception of problematic classroom management scenes. *Instructional Science: An International Journal of the Learning Sciences, 44*(3), 243-265.

References Chapter 6

Abrahamson, D., Sánchez-García, R. (2016). Learning is moving in new ways: The ecological dynamics of mathematics education. *Journal of the Learning Sciences, 25*(2), 203-239. doi:10.1080/10508406.2016.1143370

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel,

S. (1977). *A Pattern Language- towns, buildings, construction*. New York: University Press.

Anderson, T., & Soden, R. (2001). Peer Interaction and the Learning of Critical Thinking Skills. *Psychology Learning and Teaching, 1*, 37-40.

Argyris, C. (2002). Double-loop learning, teaching, and research. *Academy of Management Learning and Education, I*(2), 206-218.

Bahrami, B., Olsen, K., Latham, P., Roepstorff, A., Rees, G., & Frith, C. (2010). Optimally Interacting Minds. *Science, 329*(5995), 1081-1085.

Blijleven, P. J. (2005). *Multimedia-cases: Naar een Brug Tussen Theorie en Praktijk*. (Doctoral dissertation), Universiteit Twente, Enschede. Retrieved from http://doc.utwente.nl/50430/1/thesis_Blijleven.pdf

Bloom, B. S. (1979). Taxonomy of Educational Objectives: The Classification of Educational Goals. In *Handbook 1*: Cognitive domain. London: Longman.

Centraal Bureau voor de Statistiek. (2016). Hoger onderwijs; ingeschrevenen, studierichting, herkomstgroepering. Retrieved 09 13, 2016, from http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71037NED&D1=0&D2=a&D3=l&D4=0-2&D5=0-2%2c5%2cl&D6=0&D7=16-20&HDR=T%2cG2%2cG5%2cG6&STB=G1%2cG3%2cG4&VW=T

Ching, C. P. (2014). Linking Theory to Practice: A Case-based Approach in Teacher Education. *Social and Behavioral Sciences*, *123*(2014), 280-288.

Copeland, W. D., & D'Emidio-Caston, M. (1998). Indicators of development of practical theory in pre-service teacher education students. *Teaching and Teacher Education, 14*(5), 513-534. Retrieved from http://www.sciencedirect.com/science/article/pii/S0742051X98000031

Copeland, W., Birmingham, C., DeMeulle, L., D'Emidio-Caston, M., & Natal, D. (1994). Making Meaning in Classrooms: An Investigation of Cognitive Processes in Aspiring Teachers, Experienced Teachers, and Their Peers. *American Educational Research Journal, 31*(1), 166-196.

Dean, C., Lauer, P., & Urquhart, V. (2005). Outstanding Teacher Education Programs: What Do They Have That the Others Don't? *The Phi Delta Kappan, 87*(4), 284-289. Retrieved from http://www.jstor.org/stable/20441990

Dubinsky, E. (1991). Reflective abstraction in advanced mathematical thinking. In D. Tall (Ed.), *Advanced Mathematical Thinking*, (pp. 95-123). Dordrecht, The Netherlands: Kluwers

Engeström, Y. (2009). From Learning Environments and Implementation to Activity. *Actio: An International Journal of Human Activity, 2*, 17-33.

Ericsson, K. A. (2008). Deliberate Practice and Acquisition of Expert Performance: A General Overview. *Academic Emergency Medicine : Official Journal of the Society for Academic Emergency Medicine, 15*(11), 988-994.

Fischer, K. W. (1980). A Theory of Cognitive Development: The Control and Construction of Hierarchies of Skills. P*sychological Review, 87*(6), 477-531.

Fischer, K., & Granott, N. (1995). Beyond One-Dimensional Change: Parallel, Concurrent, Socially Distributed Processes in Learning and Development. *Human Development, 38*, 302-314.

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry, 12*(2), 219-245.

Geerts, W., Van Laeken, M. & Mitzschke, M. (2008). *Doorkijk naar Didiclass*. Leeuwarden: Noordelijke Hogeschool.

Geerts, W., Van der Werff, A., Hummel, H. G., Steenbeek, H. W., & Van Geert, P. L. (2015). Assessing situated knowledge in secondary teacher training by using video cases. *EAPRIL 2015*. Luxembourg City.

Hattie, J. (2003). *Teachers Make a Difference: What is the research evidence?* Australian Council for Educational Research.

HBO-raad. (2011). *Generieke Kennisbasis Tweedegraads lerarenopleidingen*. HBO-raad. Retrieved from https://10voordeleraar.nl/documents/kennisbases_bachelor/kb-generiek.pdf

Kerr, N., & Tindale, R. (2004, 2). Group Performance and Decision Making. *Annual Review of Psychology, 55*, 623-655.

Kitchener, P., & King, K. (2004). Reflective Judgment: Theory and Research on the Development of Epistemic Assumptions Through Adulthood. *Educational Psychologist, 39*(1), 5-18.

Koriat, A. (2012). When Are Two Heads Better than One and Why? *Science, 336*(6079), 360-362.

Kurz, T. L., Llama, G., & Savenye, W. (2008). Issues and challenges of creating video cases to be used with preservice teachers. *TechTrends, 49*(4), 67-73. doi:10.1007/BF02824113

Landis, J. R., & Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159-174.

Maina, M., Craft, B. & Mor, Y. (2015). *Handbook of visual languages in instructional design: Theorie pratices*. Hershey, PA: Sense Publishers.

Markauskaite, L., & Goodyear, P. (2014). Tapping into the mental resources of teachers' workingknowledge: Insights into the generative power of intuitive pedagogy. *Learning, Culture and Social Interaction, 3*, 237-251.

McNamara, O., Murray, J., & Jones, M. (2013, Springer Science & Business Media). *Workplace Learning in Pre-service Teacher Education: An English Case Study* (Vol. 10). Dordrecht: Springer Science+Business Media.

Miller, K. F. (2011). Situation awareness in teaching: What educators can learn from video-based research in other fields. In M. Sherin, V. Jacobs & R. Philipp (Eds.), *Mathematics teacher noticing: Seeing through teachers' eyes* (pp. 51-56). New York: Routeledge.

Mor, Y., Mellar, H., & Warburton, S. (2014). *Practical Design Patterns for Teaching and Learning with Technology.* Rotterdam: Sense Publishers. doi:10.1007/978-94-6209-530-4

Padhy, B., Emo, K., Djira, G., & Deokar, A. (2015). Analyzing Factors Influencing Teaching. *SAGE Open*, 1-12.

Piaget, J. (1972). *Genetic epistemology*. New York: Columbia University Press.

Roth, W., & Jornet, A. (2013). Situated Cognition. *Wiley Interdisciplinary Reviews: Cognitive Science*, 4(5), 463-478.

Sarracino, D., & Innamorati, M. (2012). Attachment, Social Value Orientation and At-Risk Behavior in Early Adolescence. In C. Bassani (Ed.), *Adolescent Behavior* (pp. 98-110). New York: Nova Publishers.

van der Grift, W. J. (2010). *Ontwikkeling in de beroepsvaardigheden van leraren*. Groningen: Rijksuniversiteit Groningen.

van der Rijst, R., Bakker, M., & van Duijn, G. (2013). De praktijkschok van (v) mbo-leraren: Hoe goed bereiden wij leraren voor op de praktijk? *Tijdschrift voor Lerarenopleiders, 34*(1).

van Es, E. A., Stockero, S. L., Sherin, M. G., Van Zoest, L. R., & Dyer, E. (2015). Making the Most zof Teacher Self-Captured Video. *Mathematics Teacher Educator, 4*(1).

Velon, (2012). *Congres voor lerarenopleiders 2012*. Vereniging Lerarenopleiders Nederland. Retrieved from http://www.lerarenopleider.nl/velon/congres-voor-lerarenopleiders-2012/

Yin, R. K. (2009). *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.

References Chapter 7

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A Pattern Language- towns, buildings, construction*. New York: University Press.

Argyris, C. (1996). *Leren in en door organisaties*. Schiedam: Scriptum Books.

Argyris, C. (2002). Double-loop learning, teaching, and research. *Academy of Management Learning and Education, I*(2), 206-218.

Assies, F. G., Steenbeek, H. W., & Van Geert, P. L. (2017). *How are you motivated?* Utrecht: ECDP.

Athanassiou, N., McNett, J. M., & Harvey, C. (2003) Critical thinking in the management classroom: Bloom's taxonomy as a leaning tool. *Journal of Management Education, 27*, 533-555.

Blijleven, P. J. (2005). *Multimedia-cases: Naar een Brug Tussen Theorie en Praktijk [Multimedia Cases: Toward a Bridge Between Theory and Practice]*. Enschede: Universiteit Twente.

Brouwer, N., & Korthagen, F. (2005). Can teacher education make a difference? *American Educational Research Journal, 42*(1), 153-224.

Brown, J., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.

Copeland, W. D., & D'Emidio-Caston, M. (1998). Indicators of development of practical theory in pre-service teacher education students. *Teaching and Teacher Education, 14*(5), 513-534. Retrieved from http://www.sciencedirect.com/science/article/pii/S0742051X98000031

Dreyfus, H. L., & Dreyfus, S. E. (1988). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York: Free Press.

Dreyfus, H., Dreyfus, S., & Athanasiou, T. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. Oxford: B. Blackwell.

Ericsson, K. A. (2008). Deliberate Practice and Acquisition of Expert Performance: A

General Overview. *Academic Emergency Medicine : Official Journal of the Society for Academic Emergency Medicine, 15*(11), 988-994.

Fischer, K. W. (2008). Dynamic cycles of cognitive and brain development: Measuring growth in mind, brain, and education. (2008). In A. Battro, K. Fischer, & P. Léna (Eds.), *The Educated Brain: Essays in Neuroeducation* (pp. 127-150). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511489907.010

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry, 12*(2), 219-245.

Geerts, W., Van der Werff, A., Hummel, H. G., Steenbeek, H. W., & Van Geert, P. L. (2015). *Assessing situated knowledge in secondary teacher training by using video cases. EAPRIL 2015*. Luxembourg City.

Geveke, C. H. (2016). *It's not Rocket Science: Developing Pupils' Science Talent in Out-of-School Science Education for Primary Schools* (Doctoral Dissertation). Rijksuniversiteit Groningen, Groningen.

Gobet, F. and Chassy, P. (2008) Towards an Alternative to Benner's Theory of Expert Intuition in Nursing: A Discussion Paper. *International Journal of Nursing Studies, 45*, 129-139.

Goodyear, P., Avgeriou, P., Baggetun, R., Bartoluzzi, S., Retalis, S., Ronteltap, F., & Rusman, E. (2004). *Towards a Pattern Language for Networked Learning*. Groningen: Johann Bernoulli Institute for Mathematics and Computer Science.

HBO-raad (Ed.). (2011). *Generieke Kennisbasis Tweedegraads Lerarenopleidingen [Generic Knowledge Base for Second-degree Teacher Training]*. Den Haag: HBO-raad.

HBO-raad (Ed.). (2017). *Generieke Kennisbasis Tweedegraads Lerarenopleidingen 2.0 [Generic Knowledge Base for Second-degree Teacher Training 2.0]*. Den Haag: HBO-raad.

Hill, H. C., Ball, D. L., & Schilling. S. G. (2008). Unpacking pedagogical content knowledge: conceptualizing and measuring teachers'topic-specific knowledge of students. *Journal for Research in Mathematics Education, 39*(4), 372-400.

Hyle, A., Ivory, G., & McClellan, R. (2010). Hidden expert knowledge: The knowledge that counts for the small school-District superintendent. *Journal of Research on Leadership Education, 5*(4), 154-178.

Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. *The American Psychologist, 64*(6), 515-26.

Kim, H. (2011). Exploring freshmen preservice teachers' situated knowledge in reflective reports during case-based activities. *The Internet and Higher Education, 14*(1), 10-14. doi:10.1016/j.iheduc.2010.03.005

Korthagen, F. A. J., & Vasalos, A. (2005). Levels in reflection: Core reflection as a means to enhance professional development. *Teachers and Teaching: Theory and Practice, 11*, 49–73.

Kurz, T. L., Llama, G., & Savenye, W. (2004). Issues and challenges of creating video cases to be used with preservice teachers. *TechTrends, 49*(4), 67-73. doi: 10.1007/bf02824113

Nieuwenhuis, L., Vink, R., & van der Neut, I. (2013). *Docentprofessionalisering met ICT*. Tilburg: IVA Onderwijs.

Onstenk, J. (1997). *Lerend leren werken*. Proefschrift Katholieke Universiteit Nijmegen.
Putnam, R., & Borko, H. (1999). What Do New Views of Knowledge and Thinking Have to Say About Research on Teacher Learning? *Educational Researcher, 29*(1), 4-15.
Rosaen, C. L., Lundeberg, M., Cooper, M., Fritzen, A., & Terpstra, M. (2008). Noticing Noticing. *Journal of Teacher Education, 59*(4), 347-360.
Roth, W., & Jornet, A. (2013). Situated Cognition. *Wiley Interdisciplinary Reviews: Cognitive Science, 4*(5), 463-478.
Sherin, M. G., Dyer, E. B. (2017). Mathematics teachers' self-captured video and opportunities for learning. *Journal of Mathematics Teacher Education 98*(7), 49-54.
Shulman, L. S., & Shulman L. S. (2004). *The wisdom of practice: Essays on teaching, learning, and learning to teach*. San Francisco: Jossey-Bass.
Shulman, L. S. (1987). Knowledge and Teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1).
Slijper, J. (2017). *En wat kan ik dan later worden? Een onderzoek naar het studiekeuzeproces van juridische hbo-studenten*. Groningen: Rijksuniversiteit Groningen
Van Es, E., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10*(4), 571-596.
van Geert, P. (1994). *Dynamic systems of development. Change between complexity and chaos*. New York: Harvester.
Wevers, C. (1999, October 8). Oorzaak slecht imago leraar is verzwegen. *Trouw*, Retrieved from http://www.trouw.nl.

9

Addendum

9.1 Nederlandse samenvatting

9.1.1 Algemene inleiding

Welke rol kan video spelen tijdens het opleiden van leraren bij de opbouw van gesitueerde kennis met betrekking tot onderwijskundige bedoelingen en design patterns? Dat is de hoofdvraag die in dit proefschrift centraal staat. Bij de beantwoording komt aan de orde dat onderwijskundige bedoelingen bepalen welke handelingspatronen of design patterns in onderwijsleersituaties gebruikt worden. Gesitueerde kennis wordt in dit proefschrift gedefinieerd als *kennis die tot stand komt door de mentale activiteit die verbonden is met de interacties tussen het lichaam van een individu en de fysieke omgeving waarin gehandeld wordt* (Roth & Jornet, 2013).

Beter opgeleide leraren zijn gewenst omdat leraren de sleutelfactor zijn bij het faciliteren van het leren van hun leerlingen. Om het leerproces van de leerlingen optimaal te ondersteunen moet een docent in een flits de situatie analyseren, mogelijkheden tot ingrijpen afwegen om daarna tot uitvoering over te gaan. De dagelijkse onderwijspraktijk wordt dus mede gestuurd door de tijd. Voor de beginnend docent betekent dit dat de uitvoering van een les over het algemeen moet plaatsvinden in de vorm van onmiddellijk handelen, dat wil zeggen direct en zo adequaat mogelijk handelen in een concrete situatie. Wat betreft dit adequate handelen beperkt dit proefschrift zich tot algemene docentvaardigheden. Het gaat hier dus niet over specifieke vakkennis van het schoolvak waar de docent les in geeft zoals bijvoorbeeld zinsontleding of de bijbehorende vakdidactiek.

Samenvattend is het dus de kunst om in de dynamische complexe situatie van de dagelijkse lespraktijk intuïtief en doelmatig te handelen. Wat doelmatig is hangt af van de context en bestaat daarom uit kennis die gesitueerd van karakter is omdat deze kennis onlosmakelijk verbonden is met de situaties waarin die verworven is. Lesgeven is daardoor een dynamisch beroep: "voor de klas, elke dag anders". Dat maakt het docentschap tot een aantrekkelijk beroep, dat echter lastig aan te leren is omdat opleiden deels in de context moet plaatsvinden.

Een dergelijke context kan in een schriftelijke- of videocasus gevat worden. De inzet van videocasussen heeft de potentie in zich om bij te dragen aan de gesitueerde kennis die leraren nodig hebben om goed te functioneren. Een videocasus

brengt op een holistische wijze de praktijk direct in beeld. Daar hogere leerdoelen bij stellen maakt het mogelijk om de leraar in opleiding te laten reflecteren op een levensechte praktijk die bovendien klassikaal bekeken en besproken kan worden bij het desbetreffende college. Bij deze bespreking kan een onderscheid gemaakt worden tussen het waarom en het wat. De steeds terugkerende vraag voor een leraar in opleiding is namelijk '*wat doe ik en waarom*?'

Bij de vraag, '*wat doe ik?*', gaat het om de wijze waarop een leraar in opleiding zijn bedoelingen in handelen omzet. Door bijvoorbeeld een vraag aan een de hele klas te stellen, een wachttijd in te lassen en daarna een willekeurig leerling om het antwoord te vragen, laat de leraar in opleiding zien dat het zijn bedoeling is zicht te krijgen op de actuele kennis van leerlingen. Dit is een vorm van erkend goed didactisch handelen. Voor veel leraren in opleiding is het echter nog problematisch om op juiste wijze vragen te stellen. In de praktijk blijkt dat een leraar in opleiding dat vaak nog niet goed kan. Het gaat hier dus om een vaker voorkomend probleem. Een bepaalde set van handelingen om met vaker voorkomende problemen om te gaan wordt ook wel een design pattern genoemd. *Een design pattern is een oplossingspatroon voor een terugkomend probleem dat door de docent in de praktijk kan worden gebracht* (Alexander et al., 1977; Goodyear et al., 2004).

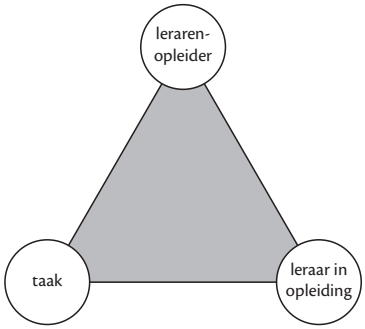
Bij de vraag '*waarom doe ik dat?*', gaat het om de vraag welke bedoelingen op onderwijskundig vlak de leraar in opleiding met zijn handelen heeft. De keuze voor een handeling berust op eerdere ervaringen van de leraar in opleiding met lessituaties, het leggen van verbanden tussen die situaties met daarbij horende theorie en de onderliggende principes die hij daarbij gevormd heeft; bijvoorbeeld dat uitleggen alleen niet voldoende is maar dat hij ook moet vragen naar antwoorden van leerlingen. Een dergelijk onderliggend principe noemen Copeland en D'Emidio-Caston (1998) een onderwijskundige bedoeling; *een gedurende het lesverloop constant wisselend procesdoel dat de docent zichzelf stelt om de les te laten verlopen op een manier die hem het beste lijkt.* Wat hem het beste lijkt wordt gedurende de les weer beïnvloed door het lesverloop, wat het gesitueerd karakter van onderwijskundige bedoelingen aangeeft. Onderwijskundige bedoelingen zijn leidend voor de keuze van de handelingen die de docent gaat inzetten. Afhankelijk van het doel valt immers de beslissing welke handelingen kunnen bijdragen aan het bereiken van het doel.

Om het leren van leerlingen te ondersteunen en de uitval van leraren in opleiding tijdens en na de opleiding te beperken, moeten lerarenopleidingen hun studenten in de gelegenheid stellen gesitueerde kennis op te bouwen in de vorm van onderwijskundige bedoelingen en design patterns. Daarmee bereiken leraren in opleiding een hoger competentieniveau. Dergelijke competenties zijn echter lastig te verwerven. De opleiding moet immers niet alleen kennis overdragen die uit het hoofd geleerd kan worden of begrepen moet worden. Het is ook van belang dat leraren in opleiding met deze kennis hun praktijk analyseren, evalueren en creëren. Niet om ter plekke snel te handelen maar om verbanden te kunnen leggen tussen praktijksituaties, de daarbij horende theorie en de onderliggende principes die zich gevormd hebben. De genoemde drie leeractiviteiten,

analyseren, *evalueren* en *creëren*, worden door Bloom (2002) omschreven als hogere leerdoelen. Hogere leerdoelen zijn van belang omdat het aldus reflecteren op, in stages, opgedane praktijkervaring de basis legt om uiteindelijk in de dynamische complexe situatie van de dagelijkse lespraktijk competent te kunnen handelen. Hoewel het verwerven van competenties ook na de opleiding nog tijd nodig heeft (Van de Grift 2010), kan het belang van het leerproces tijdens de formele opleiding niet onderschat worden. Met name omdat een beginnend docent vanaf zijn eerste werkdag de volledige verantwoordelijkheid krijgt voor een klas is het van belang dat hij vanaf dag één voldoende competenties in huis heeft om een succeservaring in de beroepsuitoefening te beleven. Om in de praktijk in een flits succesvol te kunnen handelen dienen leraren in opleiding kortom te beschikken over gesitueerde ingebedde kennis. Dit proefschrift zal de rol die videocasussen kunnen vervullen bij het verwerven van deze gesitueerde kennis tijdens de lerarenopleiding onderzoeken.

9.1.2 Theoretisch kader

Hoofdstuk twee van dit proefschrift verschaft een nadere toelichting op het gehanteerde theoretisch kader wat betreft gesitueerde kennis zoals dat in hoofdstuk 1 is aangekondigd. Vervolgens wordt op het functioneren van de lerarenopleiding ingezoomd door de leeromgeving van de opleiding te beschrijven als dynamische, didactische driehoek die gevormd wordt door de lerarenopleider, de leraar in opleiding en de taak. Deze driehoek, zoals weergegeven in figuur 1, is gebaseerd op een vergelijkbare driehoek die talentontwikkeling als proces beschrijft (Steenbeek & Uittenbogaard, 2009) en is bepalend voor de vormgeving van de lerarenopleiding.



Figuur 1
Dynamische, didactische driehoek van opleiden

Allereerst wordt ingezoomd op rol van de leraar in opleiding in de dynamische, didactische driehoek door te schetsen hoe de ontwikkeling van de leraar in opleiding, van novice tot expert, verloopt. Om deze ontwikkeling te duiden worden de representatie theorie, Dreyfus model of skill acquisition, Ericsson's theorie

over expert performance, Fischer's Skill Theory en de Complexe Dynamische Systeemtheorie besproken. Daarop aansluitend wordt beschreven wat de rol van schemata, scripts, mentale modellen en belichaamde kennis is in deze ontwikkeling. Meer inzicht in de ontwikkeling van novice tot beginnend expert is immers het aanknopingspunt om te onderzoeken hoe die lerarenopleiding beter gestalte kan krijgen.

Ten tweede, wat betreft het aandeel van de lerarenopleider bij het vormgeven van de dynamische, didactische driehoek is het van belang wat de essentie is van competent docentschap en hoe door de jaren heen het maatschappelijk perspectief op de invulling van het leraarsberoep is veranderd. Dit maatschappelijk perspectief is namelijk van invloed op het opleiden van leraren. Dat perspectief bepaalt of er tijdens de opleiding ruimte is voor het heroverwegen en herconceptualiseren van het denken van de leraar in opleiding over leren en onderwijzen.

Het derde aangrijpingspunt in deze dynamische driehoek betreft de taak. Deze taak dient te bevorderen dat de leraar in opleiding in staat is om de kloof van theorie over lesgeven te overbruggen naar de praktijk, zodat hij competent genoeg is om het werk of de stage naar behoren uit te voeren. De taak moet bijdragen aan reflectie op het eigen handelen in de praktijk, omdat deze reflectie essentieel is bij het verwerven van de benodigde competenties. Reflectie kan gestuurd worden met behulp van hogere leerdoelen. In dit hoofdstuk wordt ook het theoretisch kader beschreven waarmee dit reflectieproces onderzocht kan worden. Het gaat hier om het *wat* (design patterns) en *waarom* (onderwijskundige bedoelingen) dat leraren in opleiding kunnen leren van het kijken naar de praktijk.

Deze variabelen, design patterns en onderwijskundige bedoelingen, worden samen gebruikt om een beeld te krijgen van de rol die videocasussen kunnen spelen bij het verwerven van gesitueerde kennis. Een ervaren leraar blijkt onmiddellijk en adequaat te kunnen handelen. Dit doet hij in de klassensituatie intuïtief en doelmatig. Die intuïtie is gebaseerd op zijn ervaring. Ervaring die altijd verbonden is aan een praktijksituatie of context. Deze praktijk is dan ook onmisbaar voor het proces van expertontwikkeling. Een expert is in staat de achterliggende principes van een probleem te herkennen door in de praktijk naar het grotere geheel te kijken. Het daaraan voorafgaande leerproces vindt plaats in nauwe interactie tussen het leerproces en de context. De context bepaalt hierbij mede het leerproces, vice versa bepaalt het leerproces mede de context. Een context met veel support leidt tot een hoger niveau van presteren. Uiteraard moet de support passen bij de zone van naaste ontwikkeling van de lerende. Er is kortom sprake van gesitueerde kennis die in een dynamisch systeem tot stand komt.

De expert zoals die hierboven beschreven wordt maakt in de onderwijssituaties die hij tegenkomt gebruik van zijn gesitueerd kennis om effectief te handelen. Gesitueerde kennis is het product van gesitueerde cognitie. Dat wil zeggen dat het intelligente gedrag wat deze docent aan de dag legt niet alleen in zijn hersenen tot stand is gekomen maar onlosmakelijk verbonden is met de situaties, interacties en activiteiten waarin dit gedrag tot stand is gekomen. Leraren in opleiding moeten

leren om hun kennis te koppelen aan hun beoordeling van de complexe klassensituatie. Complexe situaties die vastgelegd zijn op video geven de mogelijkheid om op de lerarenopleiding op concrete situaties te reflecteren. Omdat het hogere leerdoel hierbij het herkennen van betekenisvolle patronen in een praktijksituatie is, wordt de leraar in opleiding in staat gesteld om gesitueerde kennis op te bouwen.

Diepgaande reflectie is een voorwaarde om dergelijke hogere leerdoelen te bereiken. Diepgaande reflectie wordt binnen de lerarenopleiding veelal beschreven als looplearning op drie niveaus. De eerste loop betreft het verbeteren van de bestaande oplossing, de tweede loop is gericht op het verkrijgen van nieuwe inzichten en de derde loop betreft een transformatie van eigen identiteit.

Dergelijke diepgaande reflectie middels looplearning legt de basis voor het herkennen van betekenisvolle patronen. Om dergelijke patronen in klassensituaties te herkennen is het van essentieel belang dat een leraar in opleiding niet alleen aandacht kan besteden aan gebeurtenissen maar daar ook betekenis aankan geven. Het kijkkader van onderwijskundige bedoelingen van Copeland & D'Emidio-Caston is bij uitstek geschikt om tot een beoordeling en waardering van een praktijksituatie te komen (1998). Het leren van videocasussen kan versterkt worden door een leraar in opleiding te bevragen op de acht principes uit dit kijkkader. Deze principes zijn namelijk leidend voor de keuze van het handelen van een expert en daarmee wordt de gesitueerde kennis zichtbaar die een expert gebruikt om adequaat te handelen.

In dat adequaat handelen komt ook tot uiting welke design patterns een expert gebruikt. Design patterns zijn geïnternaliseerde vormen van onderwijskundige kennis en ervaringen in de vorm van handelingspatronen die richting geven aan het oplossen van wederkerende problemen en bestaan uit een structuur van heuristieken. Het internaliseringsproces van een design pattern veronderstelt enerzijds wat zijn fysieke lichaam en zijn zintuigen waarnemen (belichaamd) en anderzijds de omgeving (ingebed). In die zin is de verwerving van een design pattern gebaseerd op gesitueerde cognitie, en het design pattern zelf bestaat derhalve uit gesitueerde kennis.

Omdat een ervaren leraar intuïtief doelmatig handelt, past hij dergelijke design patterns min of meer onbewust toe. Een ervaren leraar richt zijn aandacht dus op verschillende relevante acties en gebeurtenissen rondom het leren van de leerling. Hij bekijkt bijvoorbeeld het klassenmanagement vanuit meerdere perspectieven, houdt de continuïteit van de les in de gaten, voorziet problemen en grijpt in voordat ze verergeren. Voor een beginner is dat echter veelal onbegonnen werk omdat hij niet beschikt over de benodigde gesitueerde kennis.

De hoofdvraag van dit proefschrift luidt dan ook: welke rol kan video spelen als onderdeel van een leertaak gericht op het opbouwen van gesitueerde kennis bij het opleiden van leraren in de vorm van onderwijskundige bedoelingen en design patterns? Om deze potentiële geschiktheid van een leertaak ondersteund door videocasussen nader te onderzoeken omvat dit proefschrift een literatuurstudie en drie empirische studies, waarbij per hoofdstuk een van de volgende vragen centraal staat:

- Worden bij het opleiden van leraren videocasussen ingezet om ofwel hogere, lagere of een mix van leerdoelen te bereiken?
- Worden er op de tweedegraads lerarenopleidingen cursussen gegeven die gericht zijn op het verwerven van gesitueerde kennis?
- Draagt de inzet van een videocasus bij een cursus klassenmanagement bij aan het ontwikkelen van gesitueerde kennis, door een tweedejaars leraar in opleiding, in de vorm van onderwijskundige bedoelingen, pattern language 'lesgeven' en het design pattern 'omgaan met wanorde'?
- Komt de gesitueerde kennis van een vierdejaars leraar in opleiding overeen met de gesitueerde kennis van een beginnend expert?

9.1.3 Wordt video ingezet om hogere leerdoelen te bereiken?

Hoofdstuk drie bevat de literatuurstudie, en wordt gebruikt om te achterhalen in hoeverre video internationaal wordt ingezet bij het opleiden van leraren om ofwel hogere leerdoelen, ofwel lagere leerdoelen ofwel een combinatie daarvan te bereiken. Om deze vraag te kunnen beantwoorden zijn 19 artikelen geselecteerd op basis van de volgende criteria: het gaat over zowel lerarenopleidingen als videocasussen in een les, er is een beschrijving over '*beoogde*' of '*bereikte*' leerdoelen, de casus gaat niet over de leraar in opleiding zelf en het artikel is gepubliceerd tussen 2000 en 30 april 2012. De artikelen zijn verkregen uit de database ERIC, SpringerLink en Sage. Vervolgens zijn de in de artikelen aangetroffen leerdoelen door twee individuele onderzoekers gecategoriseerd in Kratwhols herziene taxonomie van Bloom (2002) om zo de plek van de leerdoelen in de taxonomie te bepalen. Deze taxonomie omvat zes verschillende niveaus, te weten onthouden, begrijpen, toepassen, analyseren, evalueren en creëren (Athanassiou, McNett & Harvey, 2003). Waar de eerste drie van deze vooral te maken hebben met lagere leerdoelen in de vorm van feitelijke kennis, vallen analyseren, evalueren en creëren onder de hogere leerdoelen (Krathwohl, 2002). Hogere leerdoelen zijn immers de katalysator in een opleidingsprogramma om een proces van reflectie op gang te brengen dat verwerving van gesitueerde en ingebedde kennis mogelijk maakt.

Uit de resultaten blijkt dat in deze onderzoeken met video zowel hogere als lagere leerdoelen nagestreefd worden. Verder worden er, voor zowel de hogere als lagere leerdoelen, meer bereikte dan vooraf beoogde leerdoelen gerapporteerd. Dit is verklaarbaar omdat de artikelen veelal rapporteren over de eerste invoering van videocasussen in het leerplan. Men is dan nog onvoldoende gericht is op het bereiken van leerdoelen. Dit leidt tot de conclusie dat lerarenopleiders nog zoekende zijn naar de wijze waarop ze video inzetten om hogere leerdoelen te bereiken die gericht zijn op het verwerven van gesitueerde kennis. Ook in recente rapportages over de inzet van video blijkt dat lerarenopleiders vooraf niet altijd een complete inschatting van de leerdoelen kunnen maken. Sherin en Dyer verwoorden dit als volgt: "Yet the true power of video comes not just from seeing what is possible but from unpacking the twists and turns that are so common in teaching and learning" (Sherin en Dyer, 2017).

9.1.4 Wordt gesitueerde kennis nagestreefd op de lerarenopleidingen?

In hoofdstuk vier is nagegaan of deze gesitueerde kennis nagestreefd wordt op Nederlandse lerarenopleidingen. In de context van dit onderzoek ging het daarbij niet om de stages maar om cursussen op de lerarenopleiding. Videocasussen zijn potentieel het meest effectief om praktijksituaties in dergelijke cursussen te introduceren. Om te achterhalen of de opbouw van gesitueerde kennis een algemeen aanvaard leerdoel is, is aan elf geaccrediteerde (NVAO) tweedegraads lerarenopleidingen gevraagd een casustoets in te sturen. Vervolgens zijn, om vast te stellen of de opleidingen hun leraren in opleiding aan gesitueerde kennisverwerving laten werken, de casustoetsen door twee verschillende onderzoekers beoordeeld en geanalyseerd door middel van een speciaal ontworpen instrument. Er is gekeken of de toetsvragen hogere leerdoelen bevatten, een authentiek probleem behandelen, zowel met validiteit als betrouwbaarheid rekening houden, de belangrijkste factoren (die de sleutel voor het oplossen zijn) benoemen en overkoepelende vragen gebruiken die gericht zijn op de essentiële aspecten van het docentschap.

Uit de resultaten van dit onderzoek komt naar voren dat tien van de elf tweedegraads lerarenopleiding in Nederland ofwel een schriftelijke casustoets ofwel een videocasustoets gebruiken, die gericht is op hogere leerdoelen ofwel het opbouwen van gesitueerde kennis. Echter bleek maar een van de tien toetsen te voldoen aan de twee voorwaarden zoals die gesteld zijn om te beoordelen of een toets gericht was op het in kaart brengen van gesitueerde kennis. Namelijk dat de meerderheid van de toetsvragen zich focust op het bereiken van hogere leerdoelen en de casustoets voldoet aan de zes vereisten van een casustoets. Omdat slechts één toets voldeed aan de beide voorwaarden, kan er geconcludeerd worden dat de huidige toetsen van lerarenopleidingen in onvoldoende mate gesitueerde kennis toetsen. Dat toetsen met casussen niet op hun volle capaciteit benut worden geeft aanleiding tot de conclusie dat cursussen op de lerarenopleiding in onvoldoende mate gericht zijn op het verwerven van gesitueerde kennis.

9.1.5 Dragen videocasussen bij aan het verwerven van gesitueerde kennis?

Hoofdstuk vijf behandelt de vraag of het ontwikkelen van gesitueerde kennis, door een tweedejaars leraar in opleiding, bevorderd wordt door de inzet van een videocasus bij een cursus klassenmanagement. Gesitueerde kennis wordt hier geoperationaliseerd in de vorm van onderwijskundige bedoelingen, diverse design patterns rondom 'lesgeven' en het design pattern 'omgaan met wanorde'. Twee groepen tweedejaars leraren in opleiding hebben tijdens een cursus onderwijskunde ofwel gekeken naar een casus op video (experimentele groep) ofwel een casus zonder beeldmateriaal bestudeerd (controlegroep). Bij beide groepen is een voor- en natoets afgenomen, die gebaseerd zijn op een videocasus. Met behulp van drie deelvragen is onderzocht in hoeverre het gebruik van video casussen in een cursus klassenmanagement in het tweede jaar van de lerarenopleiding

bijdraagt aan het verwerven van gesitueerde kennis.

Als eerste deelvraag is onderzocht of de experimentele groep in staat was meer onderwijskundige bedoelingen te verbinden aan een getoonde praktijksituatie op video dan de controlegroep. Bij de experimentele groep bleek er geen sprake van verschil tussen voor- en nameting: bij de experimentele groep is dus sprake van geen enkel effect. Tegelijkertijd blijkt voor de controlegroep sprake te zijn van een gematigd groot leerverlies in het signaleren van onderwijskundige bedoelingen na het volgen van de cursus. Het geobserveerde verschil tussen de experimentele groep en de controlegroep is daarbij gemiddeld betekenisvol (d=0.54, p=0.04). Deze resultaten zijn strijdig met de verwachting dat de experimentele groep meer onderwijskundige bedoelingen kan noemen in de nameting dan in de voormeting. Maar deze resultaten zijn in lijn met de verwachting dat de experimentele groep beter zal presteren dan de controlegroep.

Als tweede deelvraag is gekeken naar het aantal onderdelen van het pattern language lesgeven. Uit de resultaten bleek dat leraren in opleiding die een cursus onderwijskunde volgen die gebruik maakt van videocasussen meer design patterns noemen in de nameting ten opzichte van de voormeting. Op basis van een vergelijking tussen de verschilscores van controle en experimentele groep kunnen we vaststellen dat er sprake is van een betekenisvol verschil (d=0.87, p=0.05). Geconcludeerd kan worden dat het analyseren van video's aan de hand van hogere leerdoelen tijdens een cursus van het tweede jaar van de lerarenopleiding bijdraagt aan de ontwikkeling van de pattern language lesgeven bij leraren in opleiding.

Uit de beantwoording van de derde deelvraag blijkt dat leraren in opleiding die de cursus volgen die gebruikt maakt van videocasussen duidelijk meer ontwikkeling van hun design pattern 'omgaan met wanorde' vertonen dan de controlegroep. Ook de controlegroep toont in de nameting een grotere ontwikkeling van dat design pattern, hoewel de stijging hier minder sterk was dan in de experimentele groep. De effectgrootte als verschil van de voormeting ten opzichte van de nameting bedraagt voor de controlegroep d=1.76, p<0.001 en voor de experimentele groep d=3.47, p<0.001. Bij beide groepen is dus sprake van een betekenisvol verschil. Bij de experimentele groep is het effect zonder meer bijzonder groot te noemen. De effectgrootte uitgedrukt als verschil tussen de effectgroottes bij de experimentele en de controlegroep is eveneens groot te noemen met d=2.20. De uitkomst wijst uit dat de kans dat het gemeten verschil op toeval berust net iets boven de 5% ligt bij een p=0.06. De conclusie hier luidt dan ook dat het zeer waarschijnlijk is dat de ontwikkeling van het design pattern omgaan met wanorde sterker gestimuleerd wordt door een cursus met video dan door een cursus zonder video.

In zijn totaliteit kan uit dit derde onderzoek geconcludeerd worden dat inzet van videocasussen in een cursus klassenmanagement bijdraagt aan het verwerven van gesitueerde kennis door de leraar in opleiding in het tweede jaar van de opleiding. Waarbij aangetekend moet worden dat er geen vooruitgang in het aantal onderwijskundige bedoelingen is vastgesteld.

9.1.6 Beschikt een vierdejaars leraar in opleiding over gesitueerde kennis?

Hoofdstuk zes bevat de derde empirische studie die exploratief van aard is. Die studie richt zich op het zichtbaar maken van de ontwikkeling van de leraar in opleiding tot beginnend expert: komt de gesitueerde kennis van een vierdejaars leraar in opleiding overeen met de gesitueerde kennis die van een beginnend expert verwacht mag worden? In de samenvatting in hoofdstuk zeven is gesteld dat deze gesitueerde kennis tot uiting komt als een leraar in opleiding een videocasus analyseert. De eerste verwachting hierbij is dat vierdejaars leraren in opleiding net als beginnend experts een volledig reflectieproces doorlopen. Reflectieprocessen worden in dit onderzoek beschreven met behulp van single-, double-, en triple-looplearning (Argyris, 2002). Deze drie loops beschrijven hoe iemand ervaringen gebruikt om aanpassingen te maken. Deze aanpassingen kunnen betrekking hebben op het huidige handelen (single), nieuwe inzichten ofwel nieuwe handelingen (double) of het vormen van een nieuwe identiteit (triple). Deze drie loops zijn te beschouwen als drie verschillende niveaus van reflectie. De tweede verwachting is dat vierdejaars leraren in opleiding net als beginnend experts een diversiteit aan design patterns en verschillende onderwijskundige bedoelingen kunnen herkennen in een praktijksituatie, zoals getoond op video met holistische en contextuele informatie die dus gesitueerd van aard is. Van een dergelijk diversiteit wordt geacht sprake te zijn als de vierdejaars leraren minimaal vier unieke design patterns en onderwijskundige bedoelingen kunnen signaleren.

Om de eerste verwachting te onderzoeken is gekeken of het reflectieproces van alle vier vierdejaars leraren in opleiding plaatsvindt op de drie verschillende niveaus die door de loops worden onderscheiden. Deelnemers aan dit onderzoek bekeken een videocasus en schreven vervolgens als tweetal een advies aan de hoofdpersoon. Uit de antwoorden blijkt dat bij alle vier de leraren in opleiding deze drie loops te herkennen zijn in hun antwoorden op een casustoets. Deze reflectie op deze drie loops komt op minstens twee plaatsen in hun antwoorden voor, ofwel in de individuele antwoorden bij het interview ofwel in hun advies dat ze als tweetal opstelden. Daarmee voldoen alle respondenten aan verwachting één, namelijk dat ze volledigheid van reflecteren demonstreren. Dat geeft dus aan dat ze in jaar vier in staat zijn om leercycli te doorlopen die betrekking hebben op het verbeteren van bestaand handelen, nieuwe inzichten en eigen identiteit. Een dergelijk leerprocessen omvatten dus alle drie de loops.

Om de tweede verwachting te onderzoeken is geanalyseerd of de genoemde variabelen te herkennen waren in hun analyse van de praktijksituatie, zoals getoond op video. Alle vierdejaars leraren in opleiding blijken te beschikken over een diversiteit aan onderwijskundige bedoelingen. Drie vierdejaars leraren in opleiding blijken tevens te beschikken over een grote diversiteit aan unieke design patterns. Een van de leraren in opleiding benoemt echter slechts twee unieke design patterns in totaal. Deze leraar in opleiding voldoet op dit onderdeel daarom niet aan verwachting twee, namelijk dat ze een diversiteit aan design patterns en

verschillende onderwijskundige bedoelingen kan herkennen. Ze behaalt namelijk niet vier unieke design patterns.

Uit de resultaten van dit vierde onderzoek blijkt dat de reflectie van vierdejaars in opleiding overeenkomt met datgene wat verwacht mag worden van een beginnend expert. Op basis van hun antwoorden op een videocasus kunnen vierdejaars in opleiding merendeels gekarakteriseerd kunnen worden als beginnend expert, omdat zij over reflectie op alle drie de loops van Agryris (2002) beschikken die zorgen voor de opbouw van gesitueerde kennis in de vorm van een diversiteit aan onderwijskundige bedoelingen en design patterns. Qua reflectie en aantallen genoemde gesitueerde onderwijskundige bedoelingen en design patterns bestaan er echter betekenisvolle individuele verschillen tussen de vier leraren in opleiding.

9.1.7 Algemene conclusie en discussie

9.1.7.1 Bijdrage aan de theorie

In dit proefschrift is de wijze waarop de ontwikkeling tot expert-docent theoretisch wordt ingekaderd van belang. Deze inkadering maakt ten eerste duidelijk dat de situatie in een klaslokaal beoordeeld kan worden als zijnde een complex dynamisch systeem. Uit de eigenschappen van een complex dynamisch systeem volgt dat het leerplan van de lerarenopleiding moet voortbouwen op eerdere praktijkervaringen van de leraar in opleiding. Het leerplan dient te faciliteren dat de leraar in opleiding de aangeboden theoretische kennis gaat verbinden met zijn praktijkervaringen.

Ten tweede blijkt uit de theoretisch inkadering van dit proefschrift dat de ontwikkeling tot ervaren docent te vergelijken is met het proces van expert-ontwikkeling wat Ericsson beschrijft als het proces van 'deliberate practice'. Vanuit deze visie gedacht zou het logisch zijn om op de lerarenopleiding het leeraanbod concentrisch vorm te geven waarbij eerder besproken onderwerpen op een steeds hoger niveau van beheersing terugkeren. Lesgeven is immers een ontwikkeling die niet stopt wanneer de basisbeginselen onder de knie zijn, maar een complexe vaardigheid die in de loop der jaren steeds beter beheerst wordt.

Ten derde is in de theoretische inkadering terug te zien dat de cognitieve ontwikkeling van de leraar in opleiding samenhangt met de wijze waarop leraren in opleiding zich een representatie van de werkelijkheid vormen. Bij een verandering in de representatie van de werkelijkheid is er sprake van een cognitieve ontwikkeling (Ericsson, 2008). Het concept van looplearning is in dit verband van belang (Argyris, 1996). Dit concept biedt niet alleen een raamwerk voor het handelen van de leraar in opleiding, maar geeft ook handvatten voor het inzetten van leertaken door lerarenopleiders om de beoogde gesitueerde kennis na te streven.

9.1.7.2 Methodologische overwegingen

Om de hoofdvraag te beantwoorden is er gebruik gemaakt van een combinatie van een literatuuronderzoek en drie empirische onderzoeken. Het literatuuronderzoek besloeg de periode van 2000 tot 2012 omdat het startpunt van dit proefschrift in 2012 lag. In methodologisch opzicht is er in de loop van het onderzoek een onderscheid aangebracht tussen beoogde en achteraf gerapporteerde leerdoelen opdat de rapportage van de bereikte leerdoelen zo compleet mogelijk kon geschieden. Ook in recente rapportages over de inzet van video blijkt dat lerarenopleiders vooraf niet altijd een complete inschatting van de leerdoelen kunnen maken (Sherin en Dyer, 2017).

In het eerste empirisch onderzoek is op basis van de analyse van de summatieve eindtoets van een cursus vastgesteld of de cursus was gericht op de verwerving van gesitueerde kennis. De gebruikte summatieve toetsen waren voor de overgrote meerderheid ongeschikt om gesitueerde kennis te meten. Hieruit valt de conclusie te trekken dat de onderliggende cursussen niet gericht waren op gesitueerde kennis is echter te kort door de bocht. Dit temeer omdat de meeste summatieve toetsen waren opgebouwd uit casussen. De inzet van casussen duid op de wens om gesitueerde kennis over te dragen.

In het tweede empirisch onderzoek is gekozen voor een tijdsverloop van twee maanden om de ontwikkeling van gesitueerde kennis in kaart te brengen. Achteraf is echter het advies om die ontwikkeling op een veel langere termijn, van bijvoorbeeld een heel schooljaar, te volgen. Het ontbreken van vooruitgang in het aantal onderwijskundige bedoelingen zou dan verklaard kunnen worden vanuit een ontwikkelingsproces over die langere termijn.

In het derde empirisch onderzoek is gekozen voor de tijdspanne van een leerjaar. Die keuze bleek zeer geschikt om de ontwikkeling van gesitueerde kennis bij een vierdejaars leraar in opleiding in kaart te brengen. Het advies is om de methode van casusonderzoek te benutten om de longitudinale ontwikkeling van een leraar in opleiding over een langere termijn in kaart te brengen dan alleen het vierde leerjaar om zodoende nog beter zicht te krijgen op het verwervingsproces en de effectiviteit van bijbehorende leertaken. Ten tweede kan ook gedacht worden aan het opschalen van het onderzoek, zonder dat dit ten koste gaat aan de diepgang op individueel niveau. Hierbij valt te denken aan tien casussen met een groep van twintig leraren in opleiding.

9.1.7.3 Adviezen voor de praktijk

Aangrijpingspunten om de lerarenopleiding te verbeteren zijn in essentie altijd gesitueerd in de dynamische, didactische driehoek die bestaat uit de lerarenopleider, de leraar in opleiding en de taak. In de uitwerking beperkt dit proefschrift zich daarbij tot de algemene docentvaardigheden. Brouwer en Korthagen (2005) stellen dat de traditionele aanpak van de lerarenopleiding, met een scheiding tussen theorie en praktijk, omgebogen kan worden naar een realistische

wijze van opleiden waarbij de verwerving van theoretische kennis afgestemd is op opgedane praktijkervaringen met lesgeven. Realistisch opleiden vereist in de ogen van Brouwer & Korthagen een grotere aandacht voor het benodigde reflectieve aspect van de leraar in opleiding. Het gaat hierbij om het reflecteren door de leraar in opleiding op zijn eigen handelen. Concrete aanbevelingen, wat betreft de rol van de lerarenopleider, zijn:

- lerarenopleiders dienen te beschikken over gesitueerde kennis en hierop te reflecteren gedurende de colleges die ze geven;
- lerarenopleiders zouden meer gebruik moeten maken van op videocasussen gebaseerde leertaken met hogere leerdoelen;
- lerarenopleiders moeten geschikte didactische instrumenten, zoals beschreven in de voorgaande hoofdstukken gebruiken om leraren in opleiding zich te laten focussen op hogere leerdoelen om gesitueerde kennis op te bouwen. Hogere leerdoelen zijn essentieel om de reflectie op drie niveaus van Argyris te ondersteunen. Het is daarbij gewenst om een leraar in opleiding niet alleen naar het handelen te vragen maar ook naar het waarom. Het waarom kan ontdekt worden door vragen te stellen over leidende principes, educatieve doelen voor de leerling, verbanden tussen oorzaak en gevolg, praktische generalisaties, links met educatieve theorieën, gerechtvaardigde veranderingen, negatieve waardeoordelen en positieve waardeoordelen (Copeland & D'Emidio-Caston, 1998). Samen vormen deze elementen een raamwerk dat gericht is op de ontdekking van de achterliggende onderwijskundige bedoelingen. Niet alleen de onderwijskundige bedoelingen, maar ook de achterliggende design patterns worden daarmee zichtbaar. Videocasussen kunnen ingezet worden voor leertaken die gericht zijn op het zichtbaar maken van de gesitueerde kennis van de hoofdpersoon in de casus.

Uiteraard is het de vraag wat deze aanpak zou betekenen voor de studie-uitval die momenteel met name in Randstedelijke hogescholen hoog is in de zin dat in het eerste jaar 40% van studie verandert of stopt (Slijper, 2017). Nader onderzoek naar de relatie tussen realistisch opleiden, studie-succes en identiteitsontwikkeling is hierbij gewenst om optimaal bij te dragen aan de talentontwikkeling van potentiële leraren.

Niets is zo kostbaar als goed onderwijs. Goed onderwijs wordt vormgegeven binnen de dynamische, didactische driehoek. Onderzoek van Assies, Steenbeek & van Geert suggereert dat aandacht voor de relatie lerarenopleider- leraar in opleiding essentieel is omdat elkaar wederzijds versterkende relaties een positieve invloed hebben op de motivatie (2017). Dit is niet alleen zo voor de relatie tussen de lerarenopleider en de leraar in opleiding maar ook voor de relatie tussen leraar in opleiding en zijn leerlingen. Als de leraar in opleiding zich realiseert dat hij een positieve invloed kan hebben op de leerresultaten van zijn leerlingen, dan beseft hij dat hij een verschil kan maken.

De centrale aanwijzing in dit proefschrift om een verschil te maken: leraren in opleiding moeten tijdens hun opleiding gebruik maken van op video gebaseerde opdrachten die gericht zijn op de verwerving van gesitueerde kennis in de vorm

van onderwijskundige bedoelingen en ontwerppatronen. Gesitueerde kennis kan niet alleen bijdragen aan de opleidingsresultaten van leraren in opleiding, maar ook aan hun tevredenheid en die van hun opleiders over het beroep. Een leraar die zich bewust is van de effectiviteit van zijn handelen in de klas, kan het verschil maken in de leerresultaat van zijn leerlingen.

9.1.8 Referenties Nederlandse samenvatting

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A Pattern Language- towns, buildings, construction*. New York: University Press.

Argyris, C. (2002). Double-loop learning, teaching, and research. *Academy of Management Learning and Education, I*(2), 206-218.

Assies, F. G., Steenbeek, H. W., & van Geert, P. L. (2017). *How are you motivated?* Utrecht: ECDP.

Athanassiou, N., McNett, J. M., & Harvey, C. (2003) Critical thinking in the management classroom: Bloom's taxonomy as a leaning tool. *Journal of Management Education, 27*, 533-555.

Brouwer, N., & Korthagen, F. (2005). Can teacher education make a difference? *American Educational Research Journal, 42*(1), 153-224.

Brown, J., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.

Copeland, W. D., & D'Emidio-Caston, M. (1998). Indicators of development of practical theory in pre-service teacher education students. *Teaching and Teacher Education, 14*(5), 513-534. Retrieved from http://www.sciencedirect.com/science/article/pii/S0742051X98000031

Ericsson, K. A. (2008). Deliberate Practice and Acquisition of Expert Performance: A General Overview. *Academic Emergency Medicine : Official Journal of the Society for Academic Emergency Medicine, 15*(11), 988-994.

Goodyear, P., Avgeriou, P., Baggetun, R., Bartoluzzi, S., Retalis, S., Ronteltap, F., & Rusman, E. (2004). *Towards a Pattern Language for Networked Learning*. Groningen: Johann Bernoulli Institute for Mathematics and Computer Science.

Keller-Schneider, M. (2014). Self-Regulated Learning in Teacher Education– The Significance of Individual Resources and Learning Behaviour. *Australian Journal of Educational & Developmental Psychology, 14*, 144-158.

Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice, 41*(4), 212-218.

Sherin, M. G., Dyer, E. B. (2017). Mathematics teachers' self-captured video and opportunities for learning. *Journal of Mathematics Teacher Education 98*(7), 49-54.

Slijper, J. (2017). *En wat kan ik dan later worden? Een onderzoek naar het studiekeuzeproces van juridische hbo-studenten*. Groningen: Rijksuniversiteit Groningen

Steenbeek, H., & Uittenbogaard, W. (2009). Bèta-talenten van jonge kinderen in kaart. *Tijdschrift voor nascholing en onderzoek van het reken-wiskunde onderwijs: Panama-Post, 28*, 89 -100.

van de Grift, W. J. (2010). *Ontwikkeling in de beroepsvaardigheden van leraren*. Groningen: Rijksuniversiteit Groningen.

9.2 Dankwoord

In december 1994 solliciteerde ik als lerarenopleider. Met meer dan tien jaar ervaring in het vmbo onderwijs leek me dat een mooie uitdaging. Met een studie onderwijskunde op zak bleek ik de ideale kandidaat. Een week later kon ik beginnen. Ik kreeg een rooster, een paar readers en een handboek met onderwijskundige theorie.

De theoretische basis was nog dezelfde als uit mijn eigen opleidingstijd. Zelf de theorie kennen is misschien essentieel, maar dat alleen maakt je nog geen goede lerarenopleider. Theorie gaat pas leven als je de theorie in de praktijk kunt herkennen. Het is net als bij diepzeeduiken. Als je voor het eerst duikt, dan zie je voornamelijk veel stenen, zand en donker gras, maar als je beter kijkt, dan zie je vele visjes, krabben, mooie vissen en dan denk je: jeetje, wat zit het hier tjokvol met beesten en ja, zo werkt het ook met de praktijk van een opleider.

Je eigen praktijkervaring overdragen is een hele uitdaging. Een modelstudent bleek ooit zelfs mijn meest elementaire theorie uit het college niet te hebben meegekregen. Haar verklaring was ontwapenend en inspirerend: "Ik luisterde nooit naar je colleges, ik keek altijd alleen maar hoe je het deed. Dat was al mooi genoeg". Het beeld van de uitvoering in de praktijk was voor haar krachtiger dan de theorie. Bij het zoeken naar een betere verbinding tussen theorie en praktijk kwam ik al snel in aanraking met de kracht van authentieke video. Het besef dat beelden oproepen tot reflectie door leraren in opleiding stond aan de wieg van de ontwikkeling van een casusbank met dilemma's. Bij deze casusbank Didiclass staat het begrijpen centraal. Begrijpen van de ander, de situatie, de materie en jezelf; daar draait het bij Didiclass om. De beroepskennis van een leraar draait immers niet alleen om het schoolvak en de bijbehorende vakinhoudelijke kennis, maar ook om onderwijskundige competenties op pedagogisch-didactisch terrein.

Wat voor u ligt is een reisverslag van de zoektocht naar een zinvolle inzet van videocasussen bij het opleiden van leraren. Deze zoektocht begon in de praktijk met het bouwen aan een casusbank vanaf 2001. Mijn bijdrage leverde ik als lerarenopleider in dienst van de NHL-Hogeschool. Voor het samen bouwen aan Didiclass wil ik in de eerste plaats alle gefilmden bedanken, maar zeker ook Marc Van Laeken en Matthias Mitzschke als mede-initiators en alle andere medebouwers zoals Marieke Versijde, Peter van Sluijters, Ruud Hoefakker en Henk van den Brink. Landelijk waren de contacten met Ellen van den Berg, Ellen Rusman, Henk Münstermann, Niels Brouwer en vele anderen inspirerend. Bij het vervolg, de theoretische onderbouwing vanaf 2012, vervulden de lectoren Hans Hummel, Henderien Steenbeek en de promotor Paul van Geert een essentiële rol als begeleider. Allen waren gedreven in hun onderwijs en de wetenschap, Paul was behalve promotor ook een begenadigd schilder, Belg en Bourgondiër. Niets is zo kostbaar als begeleiders met het hart op de goede plek. Ik wil jullie bedanken in het vertrouwen in de bewandelde weg en de warme invulling van jullie opleidersrol. Het faciliteren van deze rol is mogelijk gemaakt door de

NHL-Hogeschool in het algemeen en haar tweede graad lerarenopleiding onder leiding van Willem Eikelenboom in het bijzonder. De toenmalig leidinggevenden Diane Keizer, Hans Hardus, Alex van der Stouwe en Marjan Scholman maakten de samenwerking met anderen mogelijk: Anne-dag werd een begrip voor mijn directe collega's. Haar de lof voor de accuratesse, mij de schuld voor de onnauwkeurigheid. Jan Simon zijn steun was groot bij de vertaling. Daphne de dank voor haar constructieve bijdrage in het herschrijven van het Handboek voor Leraren, maar zeker ook voor de vriendelijke vasthoudendheid waarmee ze me het aangaan van andere klussen dan promoveren verbood. Dat de collega's Janneke, Lysbeth, Toine, Marco en Wybe geïnteresseerd waren in de opbrengst van dit proefschrift voor lerarenopleiding gaf me de steun die je van een goed team zou wensen. Uiteindelijk was deze klus niet mogelijk geweest zonder de ruimte van mijn partner Henriëtte want in de baas zijn tijd bleek een fictie. Ik hoop dat dit proefschrift een realistisch beeld geeft van het opleiden van leraren, hoe de inzet van authentieke video hieraan kan bijdragen en de daarbij behorende theoretische onderbouwing. Kortom, in de geest van de casusbank Didiclass, een vergrootglas om naar je eigen handelen als lerarenopleider te kijken.

Midlaren, voorjaar 2018

9.3 Curriculum vitae

Walter Geerts heeft gewerkt als schooldecaan en als leraar maatschappijleer, informatiekunde, handvaardigheid en kalligrafie op scholen die tegenwoordig onder het vmbo vallen.
Later is hij als adjunct-afdelingshoofd werkzaam geweest op de NHL, momenteel is hij als onderwijskundige verbonden aan de NHL Stenden Hogeschool. Behalve voorzitter van de examencommissie en projectleider voor Surf was hij vanaf de start trainer in diverse trajecten van de basiskwalificatie onderwijs (BKO). Zijn belangstelling voor het gebruik van videomateriaal leidde tot het project Didiclass.
In partnerschap met de Open Universiteit Nederland was Geerts als projectleider betrokken bij vraagsturingsprojecten van het Ruud de Moor Centrum rondom werkplekleren.
Zijn bijdrage in het NHL-lectoraat was gericht op het opbouwen van praktijkkennis werkplekleren van docenten in opleiding met behulp van didactische dilemma's en classroommanagementconflicten (Didiclass).
Als lerarenopleider is hij een van de opstellers van de generieke kennisbasis. Samen met René van Kralingen schreef Geerts *Handboek voor leraren*. Verder werkte hij mee aan publicaties als *Doeltreffende didactiek, Praktijkboek voor leraren, www.didiclass.nl* en *DOCENT! Didactiek en praktijk in het hoger onderwijs*.

9.4 Publicaties

9.4.1 Internationaal

Deinum, J. F. & Geerts, W. (2003). *Digital video cases in teacher training*. Leiden: International Study Association on Teachers and Teaching 2003 (ISATT).

Geerts, W. & Mitzschke, M. (2004). *Unterrichtsprobleme kreativ bearbeiten; „Didiclass" - ein niederländisches Projekt zu videobasierter Lehreraus- und –fortbildung* (Lehraufträge Allgemeine Pädagogik/Schulpädagogik, bijdrage Sokrates-project) Karlruhe: Karlsruher GEW-Journal.

Geerts W., Steenbeek H. W., & van Geert, P. L. (2017). Visualising the development of a teacher-in-training into a beginning expert. *International Education Studies, 10*, (12), *100-101*.

Geerts W., Steenbeek H. W., & van Geert, P. L. (2018). Effect of video-cases on the acquisition of situated knowledge of teachers. *International Education Studies, 11*, (1), *100-101*.

Geerts W., Steenbeek H. W., & van Geert, P. L. (2018). Assessing situated knowledge. *International Journal of Education and Practice*, 6 (3), 134-146.

Geerts, W., van der Werff, A., Hummel, H. G., Steenbeek, H. W., & van Geert, P. L. (2015). *Assessing situated knowledge in secondary teacher training by using video cases. EAPRIL 2015*. Luxembourg City.

Geerts, W. & Van Laeken, M. (2006). Authentic Video Cases for Teacher Training: Didiclass. In C. Crawford, R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2006* (pp. 2857-2865). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Hummel, H., Geerts, W., Slootmaker, A., Kuipers, D., Westera, W. (2015). Collaboration scripts for mastership skills: online game about classroom dilemmas in teacher education. *Interactive Learning Environments, 23*(6), 670-682. doi:10.1080/10494820.2013.789063

Hummel, H., Geerts, W., Slootmaker, A., Kuipers, D., Westera, W. (2015). *Structuring collaboration scripts: optimizing online group work on classroom dilemmas in teacher education*. Oxford: Routledge.

9.4.2 Nationaal

Geerts, W. (2006). *Bouwstenen MVT onderwijs in het VMBO*. Tilburg: MesoConsult.

Geerts, W. (1999). *Realistisch procentrekenen*. NIVO-project min. OC&W. Vaassen: A&O Infora b.v.

Geerts, W., Balen, J. van (2010). *Meesterschapsspel. Docentenspel met vragen uit de praktijk*. Heerlen: Ruud de Moor Centrum.

Geerts, W., Balen, J. van & Postma, W. (2014). *Praktijkboek voor leraren.* Bussum: Coutinho.

Geerts, W. & Dijk, M. (2018). *Doeltreffende didactiek.* Bussum: Coutinho.

Geerts, W. & Kralingen, R. van (2016). *Handboek voor leraren.* Bussum: Coutinho.

Geerts, W. & Kralingen, R. van (2018). *The Teacher's Handbook.* Bussum: Coutinho.

Geerts, W., Van Laeken, M. & Mitzschke, M. (2007). *Doorkijk naar Didiclass*. Leusden: Bookperfect.

Geerts, W., Van Laeken, M., & Mitzschke M. (Eds.), *Wat zou jij doen? Leren van dilemma's in de onderwijspraktijk* (pp. 175-189). Bussum: Coutinho.
Geerts, W., Van Laeken, M. & Wouda, S. (2010). *De bijdrage van Didiclass in de professionele ontwikkeling van leraren-in-opleiding*. Enschede: Onderwijs Research Dagen.
Geerts, W., Steenbeek, H. W., & van Geert, P. L. (2018). *Gesitueerde kennis meten met diepgaande reflectie op videocasussen: Heeft een vierdejaars leraar in opleiding de lessituatie in zijn vingers. Tijdschrift voor lerarenopleiders, 39*, (1), *41-52.*
HBO-raad (Ed.). (2011). *Generieke Kennisbasis Tweedegraads Lerarenopleidingen.* Den Haag: HBO-raad.
HBO-raad (Ed.). (2017). *Generieke Kennisbasis Tweedegraads Lerarenopleidingen 2.0.* Den Haag: HBO-raad.
Kralingen, R. van & Geerts, W. (2015). *Docent! Didactiek en praktijk in het hoger onderwijs*. Bussum: Coutinho.
Lutgens, G. & Geerts, W. (2003). *Samenwerkend leren, ondersteund door ICT; Verslag van de SURF-studiereis naar CSCL Conference 2003*. Utrecht: Stichting Surf.
Visser, J. & Geerts, W. (2016). Reality check voor lio met behulp van video. Tijdschrift *Didactief*, juni 2016.

9.4.3 Presentaties gericht op het inzetten van video

Geerts, W. (2001). *Werken met video bij het opleiden van leraren.* Emden: Eems Dollard Regio.
Geerts, W. (2001). *Inzet van video bij het opleiden van leraren*. Oldenburg: Pädagogische Woche Universiteit Oldenburg.
Geerts, W. (2010). *Docenten-in-opleiding in interactie over videocasussen*. Symposium 'Werkplek-interactie van (onderwijs)professionals: onderzoek en praktijktoepassingen', Groningen: RijksUniversiteit Groningen.
Geerts, W. & Jellema, A. (2018). *The curious case of cases*. Roermond: VELON-congres.
Geerts, W. & Rusman E. (2010). *Leren van video met 'design pattterns*. Utrecht: Surf onderwijsdagen.
Geerts, W. & Van Laeken, M. (2006). *Didiclass*. Leuven: European Practice-Based and Practitioner Research conference on Learning and Instruction.
Geerts, W. & Van Laeken, M. (2006). *Didiclass*. Diverse interne presentaties Open Universiteit, o.a. Lex-Lvo, RdMC-klankbordgroep, Ministerie van OC&W.
Geerts, W. & Van Laeken, M. (2007). *Leren via reflectie: de casus Didiclass*. Den Bosch: Landelijke Dag Studievaardigheden (LDS).
Geerts, W. & Van Laeken, M. (2007). *Werken met video.* Amsterdam: Surf Herfstschool.
Geerts, W. & Van Laeken, M. (2007). *Werkplekleren met Didiclass*. Maastricht: European Practice-Based and Practitioner Research conference on Learning and Instruction.
Geerts, W. & Van Laeken, M. (2008). *Inzet van Didiclass op het Academisch Vormingsinstituut Leraren*. Leuven: Conferentie K.U. Leuven.
Geerts, W. & Van Laeken, M. (2008). *Werken met Didiclass*. Den Haag: Conferentie Nederlandse Taalunie.
Geerts, W. & Van Laeken, M. (2008). *Authentieke videocasussen over leraardilemma's*. Rotterdam: SURF Innovatium.

Geerts, W. & Van Laeken, M. (2008-2016). *Presentatie inzet Didiclass op lerarenopleidingen*. Divers o.a. HsLeiden, Windesheim Zwolle, Han-Nijmegen, EHva-Amsterdam, Hogeschool Rotterdam, Hogeschool Utrecht, RuG Groningen, Fontys-Sittard, Hogeschool Zuyd Heerlen.

Geerts, W. & Van Laeken, M. (2009). *Didiclass*. Amsterdam: Earli preconference "Visual Teacher Learning".

Geerts, W. & Van Laeken, M. (2011). *Werkplekleren met Didiclass- Het Meesterschapsspel*. Amersfoort: RdMC-conferentie.

Geerts, W. & Van Laeken, M. (2012). *Didiclass*. Diverse VELON-congressen, o.a. Antwerpen, Brussel, Noordwijkerhout en Zwolle.

Geerts, W. & Van Laeken, M. & Mitzschke, M. (2005-2010). *Landelijke Gebruikersdagen Didiclass*. Utrecht: Open Universiteit Nederland.

Geerts, W. & Van Laeken, M. & Mitzschke, M. (2007). *Casusbank Didiclass*. Utrecht: Nederlandse Onderwijstentoonstelling (NOT).

Welke rol kan video spelen tijdens het opleiden van leraren?

Leraren in opleiding dienen zich gesitueerde kennis eigen te maken. Gesitueerde kennis wordt gedefinieerd als *kennis die tot stand komt door de mentale activiteit die verbonden is met de interacties tussen het lichaam van een individu en de fysieke omgeving waarin gehandeld wordt* (Roth & Jornet, 2013). Gesitueerde kennis omvat onderwijskundige bedoelingen en handelingspatronen (design patterns). Deze bedoelingen bepalen welke design patterns in onderwijsleersituaties gebruikt worden.

De volgende vier deelvragen staan centraal:

- Worden bij het opleiden van leraren videocasussen ingezet om lagere, hogere leerdoelen of een combinatie van deze te bereiken? Uit dit literatuuronderzoek blijkt dat video inderdaad wordt ingezet om een combinatie van leerdoelen te bereiken. Ongeveer evenveel lagere als hogere leerdoelen worden gerapporteerd, zowel bij de nagestreefde als achteraf bereikte leerdoelen.
- Zijn er op de lerarenopleidingen cursussen die gericht zijn op het verwerven van gesitueerde kennis? Uit het onderzoek bij tweedegraads lerarenopleidingen naar het gebruik van summatieve toetsen gericht op het verwerven van gesitueerde kennis blijkt dat 10 van de 11 lerarenopleidingen hogere leerdoelen nastreven omdat ze een authentiek probleem in de toets opnemen. Slechts 1 toets voldoet echter aan de gestelde criteria om daadwerkelijk gesitueerde kennis te toetsen. Geconcludeerd kan worden dat lerarenopleidingen nog te weinig aandacht besteden aan het gesitueerde aspect van de beroepsvoorbereidende kennis in de betreffende cursussen.
- Draagt de inzet van een videocasus tijdens een cursus klassenmanagement bij aan gesitueerde kennis? Uit de resultaten blijkt dat de inzet van videocasussen bij een cursus onderwijskunde bijdraagt aan een sterkere ontwikkeling van onderwijskundige bedoelingen, het pattern language 'lesgeven' en het design pattern 'omgaan met wanorde' bij tweedejaars leraren in opleiding. Deze ontwikkeling is echter niet op alle punten zo sterk als verwacht mocht worden.
- Komt de gesitueerde kennis van een vierdejaars leraar in opleiding overeen met die van een beginnend expert? Instrumenten daarbij waren het schrijven van een schriftelijk advies naar aanleiding van een video, gevolgd door een interview en een individueel nagesprek. Uit de resultaten blijkt dat de twee tweetallen leraren in opleiding grotendeels de gesitueerde kennis hebben verworven die van een vierdejaars leraar in opleiding verwacht mag worden. Dit blijkt uit het feit dat ze alle drie de niveaus van looplearning benutten en daarbij een substantieel aantal design patterns en onderwijskundige bedoelingen gebruiken. Daarmee zijn ze in staat om te reflecteren op hun handelen, inzichten en identiteit, wat bijdraagt aan hun gesitueerde kennis.

Uit de vier studies tezamen blijkt dat op videocasussen gebaseerde opdrachten die gericht zijn op het verwerven van gesitueerde kennis in de vorm onderwijskundige bedoelingen en design patterns kunnen bijdragen aan de gesitueerde kennis die een leraar in opleiding zich eigen moet maken. Lerarenopleiders weten echter nog onvoldoende hoe ze de verwerving van gesitueerde kennis kunnen optimaliseren. Om gesitueerde kennis op te bouwen zouden lerarenopleiders daarom geschikte didactische instrumenten, zoals beschreven in dit proefschrift, gericht op het bereiken van hogere leerdoelen moeten gebruiken.

Does video have a part to play in the training of teachers?

Teachers in training must acquire situated knowledge. Situated knowledge in is defined as *knowledge that results from cognition that takes place, and is bound to, the interaction between the body of an individual and the physical environment in which the interaction takes place* (Roth & Jornet, 2013). Situated knowledge includes educational purposes and design patterns. Educational purposes determine the action patterns, or design patterns, that are used in educational settings.

Four sub questions are concentrated on:

- During the training of teachers, are video cases used in order to achieve either lower, higher, or a combination of both higher and lower learning objectives? In this literature study, it is found that video is indeed used to achieve a combination of learning objectives. An equal amount of lower and higher learning objectives was reported, both for intended as well as achieved learning objectives.
- Does a teacher training offer courses that focus on the acquisition of situated knowledge? A study of 11 Dutch second-degree teacher training institutes revealed that, in 10 cases, their summative tests focused on situated knowledge acquisition and made use of higher learning objectives by including an authentic problem in the test. Just a single one of these met the pre-determined requirements for testing situated knowledge. It can be concluded that teacher training institutes pay insufficient attention to the situated aspect of professional knowledge in the relevant courses.
- Does the use of a video case in a course on classroom management contribute to situated knowledge? Here, the results indicate that the use of video cases contributes to the development of educational purposes, the pattern language 'teaching' and the design pattern 'dealing with disorder' of second-year teachers in training. Across the board, this development is not as pronounced as was expected, however.
- Does the situated knowledge of a fourth-year teacher in training correspond to the situated knowledge of a starting expert? The instruments used to test this were a written advice in response to a video case, a subsequent interview and an individual interview. The results show that two dyads of teachers in training have acquired the majority of the situated knowledge that can be expected of a fourth-year teacher in training. This is evident from the fact that all three levels of loop learning are used by them and, while doing so, employ a substantial number of design patterns and educational purposes. At the end of their training, teachers in training are able to reflect on their actions, insights and identity, which contributes to their situated knowledge.

Together, these four studies reveal that assignments based on video cases that focus on situated knowledge acquisition in the form of educational purposes and design patterns, can contribute to the situated knowledge that a teacher in training must acquire. Teacher trainers are, however, insufficiently aware of how to optimize situated knowledge acquisition. Therefore, teacher trainers should use suitable didactic instruments to help the teachers in training to focus on higher order goals. These didactical instruments can be inferred from the empirical sections of this thesis.