Equipping Teachers Visually

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Note
(P) refers to preservice study
(I) refers to in-service study
1. Introduction

Since about 2000, the use of digital video (DV) for teacher education and professional development is rapidly gaining popularity in the Netherlands. A variety of DV uses has sprung up such as Didiclass, a collection of authentic video cases about classroom management which is available both online (http://portal.rdmc.ou.nl/casusbank/) and offline (www.didiclass.nl) and Colevi, a collection of scripted teacher-parent conversations (Bakx e.a., 1999). Video coaching of teachers, already longer in existence, has gone digital (www.svib.nl) and more recently, teacher peer coaching with DV is being developed (Brouwer, 2009). An important difference between such applications is whether the teachers involved view footage from others’ or their own lessons (cf. Tochon, 1999 about “other-viewing” and “self-viewing” respectively).

Nationally and internationally, both practical experience and research suggest that DV is a promising medium to encourage prospective and experienced teachers to link practical experience with theoretical study. Learning environments in which DV plays a central role may support teachers in modifying and expanding their teaching competence. In the Netherlands, the infrastructure for DV use in education is vigorously being developed. Local and regional initiatives have begun to build collections of video material which are subsequently made available nationally, e.g. the project Leoned about language teaching (http://content-e.ou.nl/content-e/pub_RDMC/Leoned_Kennisbasis_1219911781328/index.htm). The Dutch ministry of education has launched a web site with video documentaries about education (www.leraar24.nl) and publishers have pooled resources to make videos of teaching available (www.teacherstv.nl). It is to be expected that this development will continue.

So far, empirical evidence about effects and conditions of video use in teacher education and professional development has been produced more abroad than in the Netherlands itself (cf. the preliminary review of research in the US, Germany, Switzerland and other countries by Brouwer, 2011). It is therefore fortunate that Kennisnet (Knowledge Net), the Dutch national agency for ICT in education, has contributed funding to the two studies about DV use in preservice and in-service teacher education to be reported here. It is time for systematic research that helps us understand and underpin the steadily increasing use that is being made of DV in Dutch teacher education. Both studies focus on the outcomes of DV use by teachers and how these outcomes are produced.

We conceive of “outcomes” as the acquisition, elaboration and diversification of instructional and pedagogical insights and skills by teachers in interaction with learners, fellow students and colleagues. DV lends itself well to representing teachers’ interaction with learners concretely and authentically. Their interaction with learners – particularly the content-focused interaction in group settings – is an important point of reference in our research, as it is ultimately the learning results in learners that should benefit from teachers’ competence development. Teacher learning should therefore be studied in conjunction with the learning by their clients.

The studies reported here are both directed at self-viewing practices taking place in settings of collegial cooperation among teachers. The first study is referred to as the “preservice study”, as it is about student teachers who used a “portable video tool kit” for examining and discussing their lessons in reading comprehension in primary schools. The second study is referred to as the “in-service study”, as it concerns peer coaching by experienced teachers in different subjects in secondary education. In both cases, interventions in school settings are involved with a considerable duration, i.e. two and four years respectively.

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In chapter 2, the contexts and research designs of both studies are described. Chapter 3 contains the findings of the preservice study and chapter 4 those of the in-service study. Theoretical and practical implications for teacher education and professional development as well as suggestions for further research are dealt with in chapter 5. We conclude this introductory chapter by stating the research aim and questions (in section 1.1) and presenting a theoretical framework (in section 1.2).

1.1 Research aim and questions

The overarching aim of the research reported here is to identify firstly learning effects of DV use in prospective and experienced teachers in relation to their pupils’ learning and secondly conditions that promote or hinder teacher learning with DV. Evidence-based knowledge about such conditions is relevant for designing, implementing and upscaling video use in teacher education.

From this aim, the following research questions about the effectiveness of DV use for teacher education and professional development have been derived.

A. In which respects and in which ways can collegial learning with DV help teachers improve the quality of their instruction?
B. Can effects of DV use be observed not only in teachers themselves in the form of broader and richer skills repertoires, but also in pupils’ reactions to teachers’ instructional behaviour in the sense of more adequate learning behaviour and/or better learning results?

The teaching skills and learning results mentioned concern both general and domain-specific aspects of teaching and learning.

In the concluding chapter, we will bring the findings of both studies to bear on the research questions A and B.

1.2 Theoretical framework

The research reported has its theoretical basis in the “Visual Teacher Learning” model. This model is based on a literature review of empirical research since 2000 about what and how teachers learn by using DV\(^1\). In this section, we summarise the findings from this review and introduce the model.

1.2.1 Review findings

The review findings about what teachers learn from using DV are as follows. Five areas were identified in which prospective and experienced teachers can learn from using DV.

First, modeling videos embedded in a multimedia learning environment can help prospective teachers to develop an understanding of the complexity of a teacher’s tasks (Bliss & Reynolds, 2004; Liu, 2005; Vervoort & Van den Berg, 2006). Second, DV representations of lessons can support prospective and experienced teachers in increasing their skills in lesson analysis (Santagata et al., 2006; Massler et al., 2005; Givvin et al., 2005). Third, such representations are a suitable tool that prospective and experienced teachers can use in the cooperation with colleagues and teacher educators in order to develop a deeper understanding of how teacher and learners interact with specific subject matter (Van Es & Sherin, 2002; Sherin & Han, 2004; Van Es & Sherin, 2005; Davies &

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\(^1\) The original full version of this review was published in Dutch (Brouwer, 2007). An English summary was presented at the 2011 AERA annual meeting (Brouwer, 2011).
Walker, 2005; Vervoort & Van den Berg, 2006). Fourth, there are indications of relationships between experienced teachers’ lesson-analysis abilities and their pedagogical content knowledge (Davies & Walker, 2005; Kersting, 2005; Kuntze & Reiss, 2005; Seidel, 2005). Fifth, there are indications that viewing and analyzing video clips of lessons – both others’ and one’s own lessons – can have consequences for teachers’ own professional action. Seeing and interpreting different ways in which teachers shape their teaching influence the development of intentions for one’s own professional action (Van Es & Sherin, 2005; Davies & Walker, 2005; Chan, 2003).

What is interesting about these findings is first of all the fact that viewing and analyzing lessons recordings can help teachers to understand processes of teaching and learning. It is important to note this fact for anyone eager to bridge the gap between theory and practice. It is at least equally interesting that this potential learning result relates to the subject-specific level of teacher-learner interaction. The fact that DV makes this interaction accessible in all its concreteness appears to be an important stimulus to teachers’ learning. What they learn is connected with considerations about subject-specific pedagogy. New insights developed by teachers participating in video study groups concern how lessons in a group setting evolve and the different ways in which learners conceive of subject matter including possible misconceptions. During their cooperation in a video study group, teachers develop an increasing interest in the part they themselves play in learners’ learning, in what their own actions and omissions add to or detract from the development of knowledge by learners and in how the learners they serve can solve misconceptions and overcome stumbling blocks. These findings mean that teachers’ learning in video study groups is closely related to their pedagogical content knowledge.

The first and second learning results mentioned above were found among prospective teachers, the remaining results mostly among experienced teachers. This confirms Fuller’s stage model of concerns-based teacher development (Fuller, 1969 and 1974, Fuller & Manning, 1973, Fuller & Bown, 1975). Prospective teachers should first come to understand what the core task of a teacher involves – promoting learners’ learning – and learn to evaluate how they themselves fulfil that task. This stage should be reached before the mental space opens up which is needed to analyze and understand how learners’ learning can work and how, as a teacher, one can influence this process. The latter question resides in the domain of pedagogical content knowledge. It is in this domain that DV use appears capable of making important contributions to teachers’ competence development.

The review findings about how teachers learn from using DV are as follows. The studies analysed yield a number of indications about the second theme of how teachers learn from visual representations of teaching. Teachers’ visual learning appears to be influenced by different factors. First, personal characteristics and individual differences can influence teachers’ visual learning. Perception can be influenced by someone’s cultural background, although it should be noted that the study involved (Zhou, 2004) concerns first-year psychology students and not teachers. In addition, perception can be influenced by specific beliefs and frames of reference that teachers have about their work, such as cognitivist versus constructivist ideas (Kuntze & Reiss, 2005). Number of years of teaching experience (Chan, 2003) and the amount of experience in thoroughly analysing lesson recordings (Liu, 2005; Givvin et al., 2005; Seidel, 2005) can also influence viewing. Second, it is evident that evocative examples of innovative teaching (modeling videos) have a distinct impact on the teachers viewing them (Liu, 2005; Bliss & Reynolds, 2004; Vervoort & Van den Berg, 2004 en 2006). Third, there are indications that self-viewing and receiving feedback on one’s own lessons can have a stronger impact than viewing and analysing others’ lessons (Seidel, 2005). Fourth, it has been shown to be possible to direct teachers’ attention while viewing lesson recordings by means of instructions. Developers and facilitators of courses in preservice teacher education and professional development can use – more or less structured – viewing instructions to direct attention towards certain aspects of teaching competence. One such aspect is the degree to which learners are
encouraged or discouraged to process subject matter actively by the ways in which a teacher goes about explaining and questioning (Zhou, 2004; Givvin et al., 2005; Seidel, 2005).

Fifth, there are indications that teachers, while viewing lesson recordings, perform a sequential series of different, complex cognitive activities, notably perceiving, interpreting, valuing, assessing, considering and deciding, and that these activities are undertaken with the intent of possibly changing their own teaching (Chan, 2003; Liu, 2005; Zhou, 2004; Seidel, 2005).

Teachers and teacher educators working practically with video have the experience that this can trigger a variety of thoughts and feelings in participants. The findings discussed just now show that this effect is based upon different factors, i.e. viewers’ personal characteristics, the instructions with which the viewing is framed and the nature of the viewed lesson recordings themselves. Especially for experienced teachers, who have already built a differentiated frame of reference about their work, it appears to be an educative experience to see themselves in action. Here, too, a concept introduced by Fuller, “self-confrontation”, proves its explanatory power.

The study by Chan (2003) deserves merit, because his “Cognitive Development Process Model” provides a conceptual map of what happens in teachers’ minds while viewing lesson recordings. What a teacher thinks during viewing can be interpreted as a decision-oriented assessment from a pedagogical perspective, in which he or she seeks answers to different questions:
- an interpretive question: Do I understand what is happening here? (“Comprehension”)
- a valuing question: Do I agree with this or not? (“Acceptance vs. Rejection”)
- a question for judging the pedagogical value of certain actions: Do I consider this a worthwhile thing to do? (“Connection”)
- decision-oriented questions related to own teaching intentions: Do I want to do this myself? If yes, how can I do this? (“Desire to act”).

This series of cognitive activities makes clear that teachers do not enter action just like that – for instance by way of imitation. “Teachers never adopt, they always adapt,” it has been stated (cf. Clarke & Hollingsworth, 2002).

The studies reviewed show that how teachers cooperate in viewing and analysing lesson recordings is a gradual, dynamic and complex process. The mix of visualisation and cooperative learning in a learning or change environment for teachers appears to be capable of influencing their actions eventually. However, this influence does not work in a direct way. Rather, it is strongly mediated by a teacher’s interaction with colleagues and individual thinking about professional practice. How educative learning with DV may be for participating teachers, is closely connected with the opportunities offered by the change environment for collegial exchange and feedback.

The functioning of a video club, the ways in which lesson fragments are analysed and the development of insights along the way constitute a gradual process that lasts at least one year (Sherin & Han, 2004; Van Es & Sherin, 2005; Krammer et al., 2006). How this process evolves appears to be related to the kinds of cooperation which the change environment facilitates. One factor in the work situation that may particularly encourage constructive exchange and feedback among the participating teachers appears to be when they face comparable and therefore recognisable, subject-specific challenges and questions (Van Es & Hayton, 2006; Krammer et al., 2006; Vervoort & Van den Berg, 2004, 2006; Liu, 2005; Givvin et al., 2005).

When there is sufficient time for collegial cooperation – in quantity as well as duration – teachers can derive new ideas and insights from video analyses, which they can subsequently convert into actions of their own. Before such a conversion succeeds, teachers, as discussed above, need to consider a number of arguments. Whether teachers will really change their actions and in which respects they do so depends on various factors, notably opportunities and constraints in the work situation (Sherin, 2003; Vervoort & Van den Berg, 2004), personal learning and work goals, intentions and frames of reference (Krammer et al., 2006; Vervoort & Van den Berg, 2004; Seidel, 2005) and institutional.

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standards about professional functioning on local, regional and/or national levels (Sherin, 2003; Brantlinger, 2006).

We conclude that for teachers, learning with DV is a feasible way to discover alternatives for and in professional action. However, DV is not a cure-all or a quick fix. Teachers should get the opportunity to work with it and to learn to work with it. In that case, DV can be a powerful tool relevant for professional learning and practice.

1.2.2 The Visual Teacher Learning Model

The theoretical concepts and empirical findings about teacher learning with DV discussed in this review clarify that this learning is influenced by a host of different factors. From the findings, it can be derived that at least the following nine factors play a part.

1. teachers’ personal characteristics, biography and learning goals
2. the change environment in which they work on their professional development
3. the learning activities they undertake for this purpose in cooperation with colleagues
4. the perceptual processes involved in these activities
5. the kind(s) of feedback they receive
6. how they interpret this feedback
7. the reflection processes involved in the foregoing
8. consequences for professional action and finally
9. their personal development in the teaching profession

The studies analyzed also shed some light on how these factors may be related, in other words which circumstances can influence teachers’ learning with DV, in which ways this learning evolves and which impact it can have on their development in the profession. From the perspective of research design, this formulation refers to relevant independent, mediating and dependent variables. To represent the possible relationships between the factors and variables mentioned, a model is now introduced entitled the Visual Teacher Learning Model. This model is meant as a conceptual map to serve theorizing and research about teachers’ learning with DV.
Figure 1. Visual Teacher Learning Model

CHANGE ENVIRONMENT

TEACHERS’ LEARNING ACTIVITIES

Perception
- Framing
- Self-viewing
- Other-viewing

Feedback
- Peer
- Self
- Learner
- Facilitator

Interpretation
- Examining
- Valueing

Reflection

Enactment

Entry characteristics
Biography

Ongoing development of teaching competence
professional motivation
The reasoning behind the Visual Teacher Learning Model is as follows. Personal characteristics and biography are considered background factors which may influence whether, how and what a teacher learns when participating in a preservice teacher education curriculum or a professional development course in which his or her personal and/or others’ teaching competence is visualized. As relevant characteristics can in any case be seen a person’s gender, age, teaching experience and work load. In addition, it is to be expected that a person’s professional motivation and significant experiences in working as a teacher play a role. These background factors will probably influence what kinds of personal learning goals a teacher is given or chooses in the context of preservice teacher education and/or workplace learning.

What and how a teacher can learn is not only determined by his or her background, but also by the learning or change environment that a teacher education program or an employer offers. Here, facilitation is an important factor in different respects. Naturally, the availability of work time is an influence, but also the composition of the collegial learning group, the opportunities provided for interaction, the types of activities undertaken and the facilities available for electronic collaboration.

These factors determine in which context teachers can undertake learning activities. The learning activities themselves, the ways in which they are structured and the collegial interactions that they invite immediately influence individual learning. As the studies reviewed indicate, it is important how teachers’ visual learning is framed. “Framing” refers in particular to how perception is influenced by the nature of the visual material (trigger videos, modeling videos and/or action videos), its source (whether other-viewing or self-viewing is involved) and the viewing instructions given or chosen. Individual learning is also considerably influenced by the feedback teachers receive from various sources. Sources can be colleagues (peer feedback), the self as when a person alone views a recording of a lesson given by himself or herself (self feedback), learners (learner feedback or more generally client feedback) and/or a teacher educator or provider of a professional development course (facilitator feedback). It is to be expected that the perception of visual material and the feedback a teacher receives will together influence his or her interpretation of it. As made explicit in the Cognitive Development Process Model by Chan (2003), the interpretive process involves a whole series of cognitive activities. These cognitive activities can be conceived of as a normatively guided assessment of intentions and decisions concerning change and expansion of the personal repertoire of teaching activities. This assessment involves what Korthagen (et al., 2001, p. 44) describes in his ALACT model as the phases of “Creating alternative methods of action” (phase 4), “Trial” (phase 5) and “Action” (phase 1 of a new reflection cycle).

Reflection can take place in more or less conscious ways. It is therefore to be expected that when a teacher changes his or her actions, this need not per se or predominantly be a consequence of explicit reflection. Teachers’ actions constitute a plastic entity with a dynamic of its own and a powerful influence on a person’s development as a professional (Brouwer, 1989, p. 59-104; Brouwer & Korthagen, 2005, p. 154-157).

The review findings show that representing one’s own or others’ teaching competence visually has the potential of influencing teachers’ actions. Lesson analysis by teachers using digital video (DV) can enhance the development of pedagogical content knowledge and effective teaching behaviors (cf. Brophy, 2004 and Goldman et al., 2007). Moreover, this influence extends over time. It may therefore be expected that visual learning by teachers can have a significance for the development of their professional competence and motivation in the longer term.

At the same time, the review findings make clear that just the use of DV for lesson viewing will not automatically result in teacher learning. For this to occur, several conditions should be fulfilled. We hypothesise that especially a combination of self-viewing and collegial cooperation may foster visual teacher learning. In such conditions, an interplay of factors as shown in Figure 2 may be at work.

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The arrows in Figure 2 visualise our hypothesis. The content-focused interaction between teacher and learners and the development of teachers’ instructional repertoires develop in close interdependence. Collegial learning with DV can exert a modifying influence on this relationship. We conceive of the development of teachers’ instructional repertoires as effects of this interplay of factors. From an explanation of this interplay, we hope to derive guidelines for the design of learning environments which can promote effective visual teacher learning.
2. Contexts and methods

In this chapter, the contexts and methods involved in the preservice and the in-service studies are described.

In both contexts, quantitative as well as qualitative data were collected. The quantitative data consist primarily of pre- and post-intervention criterion measures formulated in terms of specific teaching activities. These data were provided by the participating teachers through self-report questionnaires. The criterion measures used in both studies were derived from the literature about effective teaching behaviours. In addition, questionnaire data were collected from the pupils in the classes of the teachers participating in the in-service study.

The qualitative data consist of video recordings of teachers’ lessons and of peer consultation sessions with colleagues. During these sessions, they analysed and discussed excerpts from the video recordings of their lessons.

2.1 Preservice study

The preservice study was carried out in a college of primary teacher education, Iselinge College, which predominantly serves schools in a rural area in the East of the Netherlands. This is an independent, relatively small institution totalling approximately 500 students per academic year. Most students enter its programme after graduating from “HAVO” or “MBO” levels in secondary education, i.e. the middle level of general secondary education and the highest level of secondary vocational education respectively. Since 2009, Iselinge College has introduced a separate stream for students entering from “VWO”, i.e. the highest level in secondary education in the Netherlands. The creation of this stream is due to a national policy trend involving efforts to raise the academic level of primary teacher education. From this stream at Iselinge College, the first and the second cohorts of student teachers participated in the intervention involved in this study.

2.1.1 Context

The intervention studied took place before and during the student-teaching period in the first year of the preservice programme. It was meant to engage student teachers in filming their own and each others’ lessons with “portable video tool kits” (PVTKs), i.e. lightweight simple-to-use recording and playback equipment. In combination with this hardware, the students received “structured viewing guides” (SVGs) to analyse and discuss their video recordings. Structured viewing guides are lists of “viewing points”, i.e. observation items regarding effective teaching behaviours, subdivided in categories.

Each cohort was divided in an experimental and a control group. The approach taken was to enable the student teachers in the experimental groups to generate instant visual feedback on their own and their peers’ teaching by means of PVTKs and discuss it together using the viewing points offered in the SVGs. These viewing points were selected from research-based literature about effective teaching behaviours in teaching reading comprehension to 4-5 year olds. The students were required to study articles selected from this literature and derive their own viewing points from them. The points chosen by the teacher education programme and those chosen by the students were compared in a “confrontation
meeting”, where also mentors were present from the schools where the student teaching took place. All viewing points were compared and discussed and on this basis, a final version of the structured viewing guide was agreed. The latter was used during the six-week student-teaching period, in which the student teachers cooperated in mostly two- or three-person groups with their mentor teachers and each other.

Before student teaching, the student teachers were also trained in the use of PVTKs. They used this equipment during their student teaching to record, capture, edit and distribute video footage from their own lessons. The resulting footage was used in post-lesson conferences with mentors. After the completion of student teaching, all students in the experimental groups selected and edited fragments from their footage to illustrate how they had used the teaching behaviours targeted in their personal viewing points. Before each lesson fragment, they inserted the relevant viewing point as a caption in the video. These video productions were shown to and discussed with their peers and some of their mentors during plenary sessions shortly after the student teaching period. These discussions were meant to yield concrete intentions for further teaching action.

In sum, the students in the experimental groups generated instant visual feedback on their own teaching and discussed it during peer consultation using the viewing points provided in the structured viewing guides focusing on personally relevant effective teaching behaviors. In the control groups, the intervention described above did not take place. The students in these groups did not study literature specifically about reading comprehension and during their student teaching, they received only verbal feedback from their mentors on their lessons.

2.1.2 Data collection

The research design was directed at determining learning results of the use of portable video tool kits for encouraging competence development in student teachers as implemented in our sample. Data were also collected to address how such learning results came about including data about student teachers’ interaction with and impact on their pupils’ learning.

The experimental groups had a high-school graduation on VWO level, i.e. one level higher than the control groups, which had graduated on HAVO or MBO levels. This is because the experiment was carried out in the separate stream for VWO graduates introduced in the school year 2009-2010 as explained earlier (see section 2.1). Where the amount and nature of prior teacher education courses taken was concerned, the experimental and the control groups were similar.

Table 1 shows the distribution of respondents over the two cohorts of student teachers. It also shows how they were distributed over the experimental and control groups as well as how men and women were distributed.
Table 1. Participants

The distribution of men and women in the total sample is 17.4% vs. 82.6%. This is quite skewed, representing the feminisation in primary teacher education found in many countries. The distribution of men and women over the experimental and control groups hardly differs between the cohorts. The two experimental groups together comprise considerably fewer students than the two control groups. Compared to the first cohort, the second cohort has relatively few students in the experimental group.

At the beginning and the end of the student teaching period during the first year of the programme, quantitative data were collected in both groups by means of online questionnaires regarding background characteristics, notably gender and level of high school graduation. The remainder of these questionnaires concerned the students’ prior knowledge of and affinity with the subject of reading comprehension and self-assessments of their teaching behaviour. Table 2 shows the items administered. In this study, we use the student self-assessments of teaching behaviour as criterion variables. These variables were categorised in the following five groups:

I. Quality of own instructional behaviour
II. Cognitive activation of learners
III. Constructive response from learners
IV. Promoting anticipatory reading
V. Promoting cooperative learning
<table>
<thead>
<tr>
<th>Variables</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prior knowledge of and affinity with reading comprehension</strong></td>
<td></td>
</tr>
<tr>
<td>Liking for reading comprehension</td>
<td>When I was a pupil in primary school, I liked the subject of reading comprehension.</td>
</tr>
<tr>
<td>High notes as pupil</td>
<td>As a pupil, I always had high notes for reading comprehension.</td>
</tr>
<tr>
<td>Teaching experience</td>
<td>During student teaching, I already made a lot of experiences with reading comprehension.</td>
</tr>
<tr>
<td>Mentor</td>
<td>I have critically observed instructions for reading comprehension by my mentor.</td>
</tr>
<tr>
<td><strong>Quality of own instructional behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>Clear expectations</td>
<td>When I teach reading comprehension, I make clear what I expect from pupils.</td>
</tr>
<tr>
<td>Motivation</td>
<td>During my reading comprehension lessons, I succeed in motivating pupils to do the best they can.</td>
</tr>
<tr>
<td>Involving pupils</td>
<td>I succeed in motivating my pupils to participate actively in my reading comprehension lessons.</td>
</tr>
<tr>
<td>Predicting</td>
<td>During my lessons, I regularly let pupils predict the text content.</td>
</tr>
<tr>
<td>Illustrations</td>
<td>During my lessons, I often use illustrations, photos or video clips.</td>
</tr>
<tr>
<td>Recapitulating last lesson</td>
<td>At the beginning of a lesson, I always let pupils tell what the last lesson was about.</td>
</tr>
<tr>
<td>Making concrete</td>
<td>If possible, I make the meaning of difficult words concrete.</td>
</tr>
<tr>
<td>Achieving learning goals</td>
<td>In my lessons, I succeed in having the children achieve the learning goals within the time given.</td>
</tr>
<tr>
<td><strong>Cognitive activation of learners</strong></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>During reading comprehension lessons, I always let pupils present their own examples.</td>
</tr>
<tr>
<td>Think all</td>
<td>While questioning, I always take care to give all children enough opportunity to think for themselves.</td>
</tr>
<tr>
<td>Multimedia as trigger</td>
<td>In my lessons, I regularly use multimedia sources that trigger children.</td>
</tr>
<tr>
<td>Asking higher-order questions</td>
<td>I find it easy to find ways of asking questions that challenge children to think.</td>
</tr>
<tr>
<td>Encouraging text analysis</td>
<td>During my reading comprehension lessons, I encourage children to ask questions about the text themselves.</td>
</tr>
<tr>
<td>Speaking in whole class</td>
<td>I take care to give many children opportunities to speak in whole-class settings.</td>
</tr>
<tr>
<td>Giving compliments</td>
<td>During my reading comprehension lessons, I give task-oriented compliments like &quot;That's a clever solution, I think&quot;.</td>
</tr>
<tr>
<td><strong>Constructive response from learners</strong></td>
<td></td>
</tr>
<tr>
<td>Enthusiasm</td>
<td>When I introduce the lesson, children are always enthusiastic to tell their own stories about the theme.</td>
</tr>
<tr>
<td>Topics</td>
<td>During my lessons, pupils often present topical examples.</td>
</tr>
<tr>
<td>Finding out more</td>
<td>After my lessons, some children have become so interested that they want to find out more about the topic.</td>
</tr>
<tr>
<td>Main issues</td>
<td>Through my questions, I achieve that children can distinguish well between major and minor issues.</td>
</tr>
<tr>
<td>Original solutions</td>
<td>During my reading comprehension lessons, children often contribute original solutions.</td>
</tr>
<tr>
<td>Thinking aloud</td>
<td>During my lessons, children are willing to demonstrate while thinking aloud how they arrived at a...</td>
</tr>
</tbody>
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### Promoting anticipatory reading

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>Asking about pictures</td>
<td>At the beginning of a lesson, I often ask questions about pictures alongside the text, so that children can predict a little in which direction the text will go.</td>
</tr>
<tr>
<td>Predicting remaining text</td>
<td>I always have children make predictions about how the text will continue.</td>
</tr>
</tbody>
</table>

### Promoting cooperative learning

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing ideas</td>
<td>I often use the opportunity to have children share opinions and ideas in groups.</td>
</tr>
<tr>
<td>Discussion</td>
<td>I encourage children to arrive at different solution strategies through discussion.</td>
</tr>
<tr>
<td>Strategy</td>
<td>I deliberately ask children &quot;how&quot; they solve problems and challenge them to have a dialogue together about those solutions.</td>
</tr>
<tr>
<td>Dialogue and discussion</td>
<td>My lessons are mainly lessons in which I have dialogues and discussion with the children.</td>
</tr>
</tbody>
</table>

*Table 2. Pre- and post-intervention measures*
In addition to the measures in Table 2, the following qualitative data were collected.

For the first cohort, senior teacher educators rated video clips produced by the students on whether and how well the teaching behaviours they wanted to practice were actually displayed in the lesson fragments shown. For this purpose, video clips were chosen in which students’ interaction with children was clearly visible and audible. From a validity viewpoint, these ratings constitute an important complement to the students’ self-assessments, because they provide an independent perspective on the outcomes of teacher learning with video. Students may feel that they learnt, but whether and in which respects this is really the case can be more validly determined when an additional data source is used.

In addition, an interview with one student teacher from the first cohort and her mentor was recorded on video, in which they explain how they used video to record and analyse the student’s teaching.

In both cohorts, different types of qualitative data were collected during the plenary sessions which took place in the teacher education institute shortly after the student teaching period. These sessions were held on the 26th of May, 2010 in the first cohort and on the 24th of May, 2011 in the second cohort. On these occasions, video recordings were made of conversations in both plenary and small-group settings.

At the end of both sessions, students wrote open comments in reaction to the following two statements:
1. The video helps me develop a command of the teaching profession.
2. Self-viewing challenges me to think about how I design my lessons.

In addition, they wrote brief learner reports by completing the following sentences:
- The peer consultation has given me the idea to …..
- Through the peer consultation I have discovered that I …..
- Because of the peer consultation I am now better able to …..
- The peer consultation has given me the feeling that …..
- To develop my instruction, my new personal learning goal(s) is/are …..

2.1.3 Data analysis

The quantitative data were analysed as follows.

Response and non-response data were generated separately for each cohort and for both cohorts together. These data were also generated for the experimental and control groups separately. Because the composition of the experimental and control groups in both cohorts was not notably different apart from their level of graduation from secondary education (see Table 1 in section 2.1.2), they were pooled in the substantive analyses.

The pre- and post-intervention measures from both cohorts were analysed in the following steps. First, reliability analyses were performed in order to find out to what extent the variables used constituted homogeneous measurements – both as a group and within the categories distinguished in section 2.1.2. Then, descriptive statistics were calculated for the experimental and control groups separately. Thirdly, the mean scores in the experimental and control groups were compared by means of t-tests for independent samples. This was done separately for the pre-intervention measures to determine if and what initial differences existed between the control and the experimental groups and for the post-intervention measures to determine if and what changes in the experimental groups could be attributed

Equipping teachers visually
to the intervention. Finally, t-tests for paired samples were carried out on the available pairs of repeated measures. This was done separately for the control and the experimental groups to determine the existence and nature of changes after the intervention. For all comparisons, effect sizes were calculated (Grissom & Kim, 2005). The findings resulting from these quantitative analyses are reported in section 3.1.

The qualitative data were analysed as follows.

The video clips produced by the students in the first cohort were rated by the two experts using the following questions.

0. Are the clips suited for expert analysis, i.e. are the pupils and their (learning) activities visible and are their utterances reasonably comprehensible?
1. Which viewing points were selected by the students?
2. Is the teacher and/or pupil behaviour described in the viewing point chosen visible in the clip or not, i.e. has the student really displayed in her/his lesson the behaviour to which (s)he refers?
3. What — in the experts’ opinion — is the quality of the teacher behaviour that the student wants to show in her/his video clip?
   3a. Which teacher and/or pupil behaviour shown in the video clip is relevant for the viewing point chosen, i.e. what kind of teacher behaviour do we see exactly?
   3b. In which respects is the teacher behaviour displayed suited to encourage substantive learning by the pupils, i.e. what is the pedagogical and instructional quality of the teacher behaviour that we see?
4. What is the technical quality of the video clips?
5. In which respects are the video clips suited or unsuited for editing as model videos?

The findings resulting from these expert ratings are reported in section 3.2.1.

The statements made by the student from the first cohort and her mentor during the retrospective interview with them were summarised. The result is found in section 3.2.2. The interview itself can be viewed in a 7-minute video clip, which was subtitled for English speaking audiences.

Finally, cross-case analyses were performed on the open comments collected in both student cohorts in reaction to the two statements offered to the student teachers and on the learner reports completed by them at the end of the peer coaching sessions conducted. The results of these analyses are reported in section 3.2.3.

2.2 In-service study

From 2004 to 2008, we had the opportunity to support and study a reciprocal peer coaching project in which four cohorts of experienced teachers from the Urban Gymnasium Nijmegen in the Netherlands participated. From these teachers, both quantitative and qualitative data were collected during as well as after the conclusion of the project. The Urban Gymnasium Nijmegen is a school with about 1.000 pupils situated in the city of Nijmegen, which lies in the east of the Netherlands near the German border. It provides secondary education preparing for university entry. Over the course of the four project years, roughly half of this school’s teaching staff participated in reciprocal peer coaching. The use of video was introduced in this context by the facilitator / researcher.
2.2.1 Context

The goals of the reciprocal peer coaching project researched here were formulated as the consequence of a quality assurance initiative by the deputy school leader. He organised for 36 class mentors to observe during one school day all the lessons of the class entrusted to them. Both these pupils and the mentor teachers filled out questionnaires about how varied and motivating they found the instructional formats in the lessons attended and observed. Analysis and discussion of these data led to one important conclusion, shared by the teaching staff and the school’s management team, i.e. “We need to
- increase the variation of learning activities in order to activate learners,
- offer more opportunities for differentiation and
- increase pupils’ autonomy as learners” (Scheepens, 2004). These three goals became and remained leading for the project.

In a review of 29 peer coaching projects, Ackland (1991, p. 23-24) distinguishes between coaching by experts and reciprocal peer coaching and notes three common characteristics of such projects: “Peer coaching is distinct from evaluation [in the sense of teacher appraisal]. [...] 2. Peer coaching includes observation followed by feedback. [...] 3. Peer coaching focuses on improving instructional techniques.” From the first year onwards, a steadily increasing use was made of digital video to support the participating teachers in observing each other’s lessons. The participating teachers cooperated in pairs, in which they worked on lesson planning and observed and filmed each other during teaching. From the video recordings made, they selected personally significant fragments. These fragments were viewed and discussed, both in their work pairs and in plenary meetings that were conducted periodically during the school year. In these meetings, they also shared experiences, performed role plays and discussed issues involved in developing their teaching. Table 3 shows the three broad project goals describing the areas targeted for competence development and the criterion variables used to operationalise these areas.
<table>
<thead>
<tr>
<th>No.</th>
<th>Content</th>
<th>Criterion variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EXPLAINING</td>
<td>explain subject matter stepwise</td>
</tr>
<tr>
<td>2.</td>
<td>PRECISE INSTRUCTIONS</td>
<td>give precise instructions for exercises and assignments</td>
</tr>
<tr>
<td>3.</td>
<td>HOMEWORK</td>
<td>coordinate classroom activity and homework</td>
</tr>
<tr>
<td>4.</td>
<td>INSTRUCTIONAL DIALOGUE</td>
<td>use instructional dialogue to engage pupils</td>
</tr>
<tr>
<td>5.</td>
<td>INDEPENDENT WORK</td>
<td>have pupils work by themselves</td>
</tr>
<tr>
<td>6.</td>
<td>GROUP WORK</td>
<td>have pupils cooperate in groups</td>
</tr>
<tr>
<td>7.</td>
<td>PEER COMMENT</td>
<td>have pupils comment each others’ work</td>
</tr>
<tr>
<td>8.</td>
<td>PEER ASSESSMENT</td>
<td>have pupils assess each others’ work</td>
</tr>
<tr>
<td>9.</td>
<td>PUPIL PRESENTATION</td>
<td>have pupils present to the group</td>
</tr>
<tr>
<td>10.</td>
<td>DEBATE SUBJECT MATTER</td>
<td>have pupils debate subject matter together</td>
</tr>
<tr>
<td>11.</td>
<td>GAMES</td>
<td>engage pupils with subject matter in the form of games</td>
</tr>
<tr>
<td>12.</td>
<td>ICT</td>
<td>use ICT in the classroom</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Content</th>
<th>Criterion variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>WORK OUTSIDE CLASSROOM</td>
<td>have pupils work also outside the classroom</td>
</tr>
<tr>
<td>14.</td>
<td>ADDITIONAL MATERIAL</td>
<td>have pupils study additional material</td>
</tr>
<tr>
<td>15.</td>
<td>ADDITIONAL ASSIGNMENTS</td>
<td>have pupils work on additional assignments</td>
</tr>
<tr>
<td>16.</td>
<td>OWN PACE</td>
<td>have pupils work at their own pace</td>
</tr>
<tr>
<td>17.</td>
<td>OWN TOPICS</td>
<td>have pupils work on topics of their own choice</td>
</tr>
<tr>
<td>18.</td>
<td>COMPUTER WORK</td>
<td>have pupils work with the computer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Content</th>
<th>Criterion variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>PUPIL PLANNING</td>
<td>have pupils plan their own work</td>
</tr>
<tr>
<td>20.</td>
<td>PUPIL AS CO-TEACHER</td>
<td>have pupils present part of the lesson</td>
</tr>
<tr>
<td>21.</td>
<td>INTEREST IN SUBJECT</td>
<td>have pupils develop an interest in my school subject</td>
</tr>
<tr>
<td>22.</td>
<td>REFLECT ON FUTURE SUBJECT</td>
<td>have pupils reflect on what they want to do with my school subject in the future</td>
</tr>
</tbody>
</table>

Table 3. Project goals and criterion variables
Teacher learning was here conceived in terms of both thought and action, i.e. discovering and developing new ideas for teaching as well as experimenting with new behaviours and changing teaching practices.

### 2.2.2 Data collection

The research design was directed at determining learning results of the experienced teachers’ participation in the peer coaching project. Data were also collected to address how such learning results came about including data about the possible impact of teachers’ participation on their pupils’ learning.

Quantitative as well as qualitative data were collected from all four cohorts of participating teachers and from a number of their classes.

For quantitative data, entry and exit questionnaires were administered at the beginning and end of each school year, respectively. In the first cohort, only an exit questionnaire was administered, because the criterion variables were developed during the first project year. In the second, third and fourth cohorts, repeated measures of the criterion variables were taken.

The criterion variables were measured as follows. At the beginning of the school year, the participating teachers were asked to state in the form of yes-or-no questions whether they felt they already had a command of the teaching skills specified. At the same time and also with yes-or-no questions, they were asked to state whether they selected these skills as personal learning goals for the school year ahead. These questions permitted an operationalisation of their professional action and thought, respectively. At the end of the school year, the teachers were asked to state, again in the form of yes-or-no questions, about which teaching skills they felt they had acquired new insights and which skills they felt they had developed during the past school year. The exact wordings used in combination with the descriptions in Table 3 were:

- for teacher thought at the beginning of the school year:  
  *Through peer coaching with video I want to get to know (more) ways to... in my teaching.*
- for teacher thought at the end of the school year:  
  *Peer coaching with video has helped me get to know (more) ways to... in my teaching.*
- for teacher action at the beginning of the school year:  
  *In my teaching, I usually...*
- for teacher action at the end of the school year:  
  *Peer coaching with video has helped me ... (more often) in my teaching.*

In addition to the above criterion measures, the participating teachers assessed aspects of peer coaching with video as an intervention.

Besides the teacher questionnaires, also pupil questionnaires were administered in classes selected by participants in the second and third cohorts, in which they felt they had attempted most intensely to apply what they learned during the peer coaching project. The intent behind gathering pupil data in this way was to trace what changes, if any, pupils noticed in their teachers’ instructional behaviour during the school year in which they participated in the peer coaching project.

In addition, the following qualitative data were collected among the participating teachers.

*Equipping teachers visually*
Lessons given by participants were recorded on video. Subsequently, fragments selected from the recordings by the teachers who taught the lessons, were discussed during peer coaching sessions in plenary meetings. Some of these discussions were also filmed.

At the end of most plenary meetings, the teachers present completed verbal evaluation forms, in which they wrote comments about the progress they made in the pair work with their colleague and about the organisation of this pair work. In two additional categories, they gave comments on how the plenary meetings were conducted and voiced their needs and suggestions for these meetings.

In the last plenary session of each school year, the participating teachers presented posters to each other, in which they presented what they had done and learned in their work pair and what reactions from their pupils they noticed.

Finally, between three and six years after participation in the project, follow-up interviews were conducted among a representative sample from the group of participating teachers. Representativeness was sought regarding gender, years of teaching experience, whether teachers had participated in peer coaching during one or two years and on the basis of the number of changes they reported having made in their teaching as ascertained from a comparison between their pre and post measures. The interview questions were developed by the author and piloted in an interview with one participant. All remaining interviews were conducted by colleagues who were familiar with the intervention, but were not involved in its original enactment.

The follow-up interviews were intended to trace if and in which respects the teachers in the sample had changed their teaching under the influence of participation in the peer coaching project. For this purpose, retrospective questions about the development of their teaching practice were asked derived from the project goals and the criterion variables used for data collection during the project (cf. Table 3). In addition, questions were asked in order to find out what factors had influenced the development of the respondents’ teaching repertoires, notably factors in the person, the peer coaching intervention and the work environment.

Appendix II.1 contains a translation of the interview questions asked.

2.2.3 Data analysis

The data were analysed as follows.

For the quantitative teacher and pupil data, descriptive statistics were produced. The pre- and post-intervention criterion measures collected among the four cohorts of participating teachers were compared in order to trace in which respects and according to what patterns competence development occurred during the school years concerned. This comparison took place in a two-step procedure. First, the frequencies found in all cohorts for the criterion measures (see Table 3) at the beginning and the end of the school year were inspected. In this way, a baseline of the teachers’ existing skills and personal development goals was established. Differences found between this baseline and the criterion measures at the end of the school year then indicated which insights and behaviour changes the teachers felt they had developed. In a second step, crosstabulations were made for each criterion.

---

2 Five follow-up interviews were conducted by Dr. Fred Korthagen, two by Dr. Fokelien Robijns and two by Jan Vermeij.
variable between the measures taken at the beginning and at the end of the school year. The numbers of valid cases involved in these analyses did not allow interpretable values of chi square to be calculated, but the raw frequencies emerging in the cells did provide some illuminating insights. Table 8 shows an interpretation format for the crosstabulations performed. The cells in the upper part of this table specify in general terms what it means when a respondent has scored one of four possible combinations of “yes” or “no” on a criterion variable at the beginning and at the end of the school year. The middle part of the table does the same for the criterion variables concerning teacher thought and the lower part for those concerning teacher action. Using this format one can interpret the frequencies resulting from the crosstabulations as patterns according to which teachers’ insights and skills may develop.

- When a teacher scored “no” both at the beginning and at the end of the school year, we interpreted this as a pattern of standstill, i.e. no personal learning goal was set and no learning outcome was achieved (pattern A).
- When a teacher scored “yes” at the beginning of the school year and “no” at the end, we interpreted this as a pattern of failure, i.e. a personal learning goal was set, but no learning outcome was achieved (pattern B).
- When a teacher scored “no” at the beginning of the school year and “yes” at the end, we interpreted this as a pattern of serendipitous learning, i.e. no personal learning goal was set, but a learning outcome was achieved nevertheless (pattern C).
- When a teacher scored “yes” both at the beginning and at the end of the school year, we interpreted this as a pattern of success, i.e. a personal learning goal was set and a learning outcome was indeed achieved (pattern D).
<table>
<thead>
<tr>
<th>General Entry questionnaire</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td><em>Standstill</em></td>
<td><em>Failure</em></td>
</tr>
<tr>
<td></td>
<td>No personal learning goal set,</td>
<td>Personal learning goal set,</td>
</tr>
<tr>
<td></td>
<td>No outcome achieved</td>
<td>No outcome achieved</td>
</tr>
<tr>
<td>Yes</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td><em>Serendipity</em></td>
<td><em>Success</em></td>
</tr>
<tr>
<td></td>
<td>No personal learning goal set,</td>
<td>Personal learning goal set,</td>
</tr>
<tr>
<td></td>
<td>Outcome achieved</td>
<td>Outcome achieved</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thought Entry questionnaire</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td><em>Standstill</em></td>
<td><em>Failure</em></td>
</tr>
<tr>
<td></td>
<td>No need for insight felt,</td>
<td>Need for insight felt,</td>
</tr>
<tr>
<td></td>
<td>No new approach discovered</td>
<td>No new approach discovered</td>
</tr>
<tr>
<td></td>
<td>Insight remains out of reach</td>
<td>Intended insight remains out of reach</td>
</tr>
<tr>
<td>Yes</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td><em>Serendipity</em></td>
<td><em>Success</em></td>
</tr>
<tr>
<td></td>
<td>No need for insight felt,</td>
<td>Need for insight felt,</td>
</tr>
<tr>
<td></td>
<td>New approach discovered</td>
<td>New approach discovered</td>
</tr>
<tr>
<td></td>
<td>Discovery made</td>
<td>Intended insight achieved</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action Entry questionnaire</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td><em>Standstill</em></td>
<td><em>Failure</em></td>
</tr>
<tr>
<td></td>
<td>No routine,</td>
<td>Routine exists,</td>
</tr>
<tr>
<td></td>
<td>No change of action</td>
<td>No change of action</td>
</tr>
<tr>
<td></td>
<td>Skill remains out of reach</td>
<td>No development of existing skill</td>
</tr>
<tr>
<td>Yes</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td><em>Serendipity</em></td>
<td><em>Success</em></td>
</tr>
<tr>
<td></td>
<td>No routine,</td>
<td>Routine exists,</td>
</tr>
<tr>
<td></td>
<td>Change of action</td>
<td>Change of action</td>
</tr>
<tr>
<td></td>
<td>New skill developed</td>
<td>Further development of existing skill</td>
</tr>
</tbody>
</table>

*Table 4. Interpretation format for learning outcomes*
Using the interpretation format in Table 4, it was possible to discern different patterns of development for different (groups of) criterion variables by inspecting the frequencies appearing in the respective crosstabulation cells. The findings resulting from the above two-step procedure are reported in section 4.1.1.

Descriptive statistics about the teachers’ assessments of peer coaching as an intervention are reported in section 4.1.2. These data were also used in correlational analyses. From the pupil data collected in selected classes of teachers from the second and third cohorts, descriptive statistics were generated and compared with these teachers’ self-assessments on the criterion variables as collected at the end of the school years concerned. The results of these analyses are reported in section 4.1.3.

On the qualitative data, content and discourse analyses were carried out. Content analysis was carried out on the teachers’ written evaluations of the plenary meetings. The resulting findings are reported in section 4.2.1. For all four cohorts, the posters presented by the participating teachers in the last plenary session of each school year were analysed, first for each school year, then for all school years together. These findings are reported in section 4.2.2. The responses from follow-up interviews with three teachers conducted three to six years after their participation were categorised, summarised and analysed. The results are reported in section 4.2.3. The content analyses mentioned above were all carried out in a cross-case procedure, structured according to the categories used during data collection (cf. section 2.2.2). Any categories emerging from the data were also taken into account. In all analyses, data segments were first categorised under headings denoting similar topics. Then, the findings for each topic were summarised. For the evaluation of plenary meetings and the analysis of posters, this procedure was followed first for each of the cohorts involved separately, then pertaining to all cohorts together.


3. Preservice study results

In this chapter, findings are reported first from the quantitative analyses (section 3.1), then from the qualitative analyses (section 3.2).

3.1 Student-teacher competence development in experimental and control groups

Table 5 shows the response achieved for both cohorts.

<table>
<thead>
<tr>
<th></th>
<th>Cohort 1</th>
<th>Cohort 2</th>
<th>Total</th>
<th>Pairs of pre-and post-intervention measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Response</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Experimental groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort 1</td>
<td>13</td>
<td>13</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Control groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort 2</td>
<td>40</td>
<td>34</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>47</td>
<td>88.7</td>
<td>110</td>
</tr>
</tbody>
</table>

Table 5. Response to pre- and post-intervention measures

The response rates are satisfactory for both cohorts, although they are slightly lower in the second cohort. Not all respondents completed both pre- and post-intervention measures, so that for calculating difference scores, fewer complete pairs of measures were available. This is the case especially in the first control-group cohort, where data collection began with insufficient rigour. Even so, the response rates for the available pairs of measures are acceptable, especially in the pooled experimental groups.

Table 6 shows the results of the reliability analyses. Taken together, all variables can be assumed to form homogeneous measurements. This finding holds up for the pre-intervention and the post-intervention measures separately. Within the categories distinguished (cf. Table 2), the alphas found are lower, but still indicate relatively homogeneous measurement.

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3 An earlier version of this chapter (Brouwer, 2011b) was presented at the International symposium Research on the Use of Video in the Professional Development of Mathematics and Science Teachers, organised by the Haute École pédagogique du canton de Vaud in Lausanne, Switzerland, 23-25 June 2011. A publication for practitioners has appeared in Besselink et al., 2011.

Equipping teachers visually
Table 6. Reliability analysis

Table 7 contains the results of the comparison between the control and the experimental groups’ scores before the intervention. The means and standard deviations found for the control and the experimental groups are displayed separately. The last columns to the right of the table contain the effect sizes found and the results of the t-tests used. When comparisons yielded statistically significant results, the variable names involved are printed in bold for \( p < .001 \) and in italics for \( p < .005 \).
### Prior knowledge of and affinity with reading comprehension

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control groups</th>
<th>Experimental groups</th>
<th>Effect size</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liking for reading comprehension</td>
<td>2.57 (.98)</td>
<td>2.91 (1.19)</td>
<td>.08</td>
<td>.17</td>
</tr>
<tr>
<td>High notes as pupil</td>
<td>3.44 (.98)</td>
<td>3.73 (.88)</td>
<td>.08</td>
<td>.21</td>
</tr>
<tr>
<td>Teaching experience</td>
<td>2.7 (1.08)</td>
<td>2.39 (1.12)</td>
<td>-.07</td>
<td>.22</td>
</tr>
<tr>
<td>Mentor</td>
<td>2.77 (1.13)</td>
<td>2.39 (1.16)</td>
<td>-.08</td>
<td>.15</td>
</tr>
</tbody>
</table>

### Quality of own instructional behaviour

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control groups</th>
<th>Experimental groups</th>
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### Cognitive activation of learners

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### Constructive response from learners

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*Table 7 Pre-intervention differences between control and experimental group*
Table 7 shows that the control groups rated their initial competence slightly higher than the experimental groups on 24 out of the 31 variables. However, the effect sizes are small to negligible and no more than two variables – about letting pupils predict text content and giving all children enough opportunity to think for themselves – show statistically significant differences. Consequently, except for these two variables, the control and experimental groups' baseline can be considered comparable.
### Prior knowledge of and affinity with reading comprehension

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### Quality of own instructional behaviour

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### Cognitive activation of learners

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### Constructive response from learners

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*Table 8 Post-intervention differences between control and experimental groups*
Table 8 is made up in the same way as Table 7. Unlike the variables in the first category “Prior knowledge of and affinity with reading comprehension” those in the remaining categories are criterion variables. It can be seen that after the intervention, the control groups rated their competence on for most of the criterion variables lower than the experimental groups. This is the case for 18 out of the 24 interpretable criterion variables (i.e. excepting those three for which Table 7 shows significant initial differences). For four of these, significant differences were found, as visualised in Figure 3.

![Figure 3. Significant post-intervention differences between control and experimental groups](image)

Table 8 and Figure 3 yield indications that those students who used the portable video tool kits for recording their lessons and the structured viewing guides for analysing them in consultation with their mentors and peers felt they succeeded better than their fellow students in the control groups in making the content of their lessons concrete (variable Making concrete) and eliciting relevant reactions from their pupils. Notably, their pupils presented their own topical examples (variables Examples and Topics) and were enthusiastic to tell their own stories about the theme at hand (variable Enthusiasm).

Tables 9 and 10 contain the results of the repeated measures analyses aimed at changes over time within the control and experimental groups.
### Table 1: Pre- and Post-intervention Comparison

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*Equipping teachers visually*
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*Table 9 Repeated measures analysis for control groups*
Table 9 shows that after student teaching, the students in the control groups rated their competence lower than before it on about half the criterion variables – i.e. 14 out of 27. Five statistically significant differences were found. Four of these indicated decreases and one an increase. However, all effect sizes are small to negligible.

Still, it should be noted that all four variables for which decreases were found have to do with involving pupils in the lesson and activating them. The students in the control groups apparently felt that they made no progress or even regressed in motivating their pupils to participate actively in their reading comprehension lessons (variable Involving pupils), in giving all pupils opportunity to think for themselves (variable Think all) and in asking questions that challenge children to think (variable Asking higher-order questions). Also, over time the students in the control groups did not give their pupils more task-oriented compliments (variable Giving compliments).
<table>
<thead>
<tr>
<th>Variable (cf. Table 2)</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Effect size</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Prior knowledge of and affinity with reading comprehension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liking for reading comprehension</td>
<td>2.94</td>
<td>1.24</td>
<td>3.00</td>
<td>1.41</td>
</tr>
<tr>
<td>High notes as pupil</td>
<td>3.69</td>
<td>.95</td>
<td>3.88</td>
<td>1.03</td>
</tr>
<tr>
<td>Teaching experience</td>
<td>2.47</td>
<td>1.23</td>
<td>3.41</td>
<td>.87</td>
</tr>
<tr>
<td>Mentor</td>
<td>2.41</td>
<td>1.23</td>
<td>2.88</td>
<td>1.05</td>
</tr>
<tr>
<td>Quality of own instructional behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear expectations</td>
<td>3.44</td>
<td>.71</td>
<td>3.88</td>
<td>.49</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.21</td>
<td>.53</td>
<td>3.71</td>
<td>.59</td>
</tr>
<tr>
<td>Involving pupils</td>
<td>3.65</td>
<td>.49</td>
<td>3.65</td>
<td>.93</td>
</tr>
<tr>
<td>Predicting</td>
<td>3.12</td>
<td>1.17</td>
<td>3.71</td>
<td>.69</td>
</tr>
<tr>
<td>Illustrations</td>
<td>3.12</td>
<td>.99</td>
<td>3.88</td>
<td>.78</td>
</tr>
<tr>
<td>Recapitulating last lesson</td>
<td>2.75</td>
<td>1.24</td>
<td>3.13</td>
<td>.89</td>
</tr>
<tr>
<td>Making concrete</td>
<td>3.00</td>
<td>1.06</td>
<td>3.71</td>
<td>.69</td>
</tr>
<tr>
<td>Achieving learning goals</td>
<td>3.65</td>
<td>.61</td>
<td>3.65</td>
<td>.79</td>
</tr>
<tr>
<td>Cognitive activation of learners</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>3.06</td>
<td>1.14</td>
<td>4.18</td>
<td>.73</td>
</tr>
<tr>
<td>Think all</td>
<td>3.29</td>
<td>.77</td>
<td>3.76</td>
<td>.97</td>
</tr>
<tr>
<td>Multimedia as trigger</td>
<td>3.24</td>
<td>1.25</td>
<td>3.59</td>
<td>1.00</td>
</tr>
<tr>
<td>Asking higher-order questions</td>
<td>3.06</td>
<td>.66</td>
<td>3.24</td>
<td>1.09</td>
</tr>
<tr>
<td>Encouraging text analysis</td>
<td>2.88</td>
<td>.89</td>
<td>3.06</td>
<td>.85</td>
</tr>
<tr>
<td>Speaking in whole class</td>
<td>4.09</td>
<td>.57</td>
<td>4.29</td>
<td>.59</td>
</tr>
<tr>
<td>Giving compliments</td>
<td>3.94</td>
<td>.83</td>
<td>4.06</td>
<td>.66</td>
</tr>
<tr>
<td>Constructive response from learners</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enthusiasm</td>
<td>3.94</td>
<td>.97</td>
<td>4.06</td>
<td>.83</td>
</tr>
<tr>
<td>Topics</td>
<td>3.24</td>
<td>.90</td>
<td>4.00</td>
<td>.61</td>
</tr>
<tr>
<td>Finding out more</td>
<td>2.94</td>
<td>.85</td>
<td>2.88</td>
<td>.34</td>
</tr>
<tr>
<td>Main issues</td>
<td>2.75</td>
<td>.68</td>
<td>3.44</td>
<td>.96</td>
</tr>
<tr>
<td>Original solutions</td>
<td>3.18</td>
<td>.53</td>
<td>3.47</td>
<td>.72</td>
</tr>
</tbody>
</table>

Equipping teachers visually
<table>
<thead>
<tr>
<th>Variable (cf. Table 2)</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Effect size</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Thinking aloud</td>
<td>3.47</td>
<td>.80</td>
<td>3.79</td>
<td>.83</td>
</tr>
<tr>
<td>Promoting anticipatory reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asking about pictures</td>
<td>3.82</td>
<td>.81</td>
<td>3.94</td>
<td>.83</td>
</tr>
<tr>
<td>Predicting remaining text</td>
<td>3.31</td>
<td>.95</td>
<td>3.38</td>
<td>.62</td>
</tr>
<tr>
<td>Promoting cooperative learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharing ideas</td>
<td>2.50</td>
<td>.89</td>
<td>2.88</td>
<td>.96</td>
</tr>
<tr>
<td>Discussion</td>
<td>2.71</td>
<td>.69</td>
<td>3.18</td>
<td>.81</td>
</tr>
<tr>
<td>Strategy</td>
<td>3.06</td>
<td>.75</td>
<td>3.53</td>
<td>.80</td>
</tr>
<tr>
<td>Dialogue and discussion</td>
<td>2.88</td>
<td>.93</td>
<td>3.35</td>
<td>.70</td>
</tr>
</tbody>
</table>

*Table 10 Repeated measures analysis for experimental groups*

Equipping teachers visually
Table 10 shows that after using the portable video tool kits and the structured viewing guides for analysing their lessons in consultation with their mentors and peers, the students in the experimental groups rated their competence slightly higher on all but one of the criterion variables. For seven criterion variables, statistically significant increases were found, as visualised in Fig 4. On three of the criterion variables in Figure 4, the experimental groups significantly outperformed the control groups (cf. Table 8 and Figure 3), i.e. Making concrete, Examples and Topics.

**Figure 4. Significant pre-post-intervention differences in experimental groups**

These findings show that not only did the students in the experimental groups succeed more than their colleagues in the control groups in making the meaning of difficult words concrete and letting pupils present their own topical examples, but they also felt they progressed in making clear what they expect from pupils (variable Clear expectations), in motivating them to participate actively in their reading comprehension lessons (variable Motivation), in making children distinguish between major and minor issues (variable Main issues) and in using illustrations, photos or video clips (variable Illustrations).

### 3.2 Explorations of student teachers’ visual learning

In this section, the results of the qualitative analyses in the preservice study are presented.
3.2.1 Expert ratings of video fragments from student teaching

In the experimental group in the first cohort, eleven out of the thirteen students produced video clips about the lessons they had given during their student teaching period. Fragments from these students’ video clips were distinguished and analysed by the expert raters in the series of steps described in section 2.1.3. The results of this analysis are presented below following the order of these steps.

0. Suitability for analysis
To begin with, the analysis focused on whether the clips fulfilled two minimum conditions. The pupils and their (learning) activities had to be visible, if only they were filmed from the back. Also, the pupils’ reactions and input should be reasonably audible and comprehensible. It was also registered whether the images in the clips had been recorded from a fixed position directed at the whiteboard and the student teacher or from a camera position moving between student teacher and pupils. Eight of the eleven available clips were edited from footage with a fixed camera position and three from footage with a moving camera position.

In all, no more than five clips fulfilled the minimum conditions mentioned above. Among these were all three clips produced with a moving camera position.

1. Selection of viewing points
Table 8 contains an overview of those viewing points which the students incorporated in their video clips. The viewing guide about reading comprehension that was used in Iselinge College contains 37 viewing points divided over six categories. The second column shows how often the different viewing points were incorporated in all eleven available clips.
<table>
<thead>
<tr>
<th>READING COMPREHENSION VIEWING GUIDE</th>
<th>Total out of N = 11</th>
<th>Totaal out of N = 5 XX</th>
<th>Totaal out of N = 5 X0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I DISCUSS THE GOAL OF THE LESSON.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils feel challenged by my introduction of the lesson.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The pupils can name what kind of text is on the agenda.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The pupils are clearly motivated to read the text.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The pupils are willing to start the activity in a goal-directed way.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. The pupils actively thinking during the lesson.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I ACTIVATE PUPILS’ PRIOR KNOWLEDGE.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils can tell what the last lesson was about.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. The pupils can give their own useful examples in relation to the text.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. The pupils feel challenged by and react to my questions.</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3. I LET PUPILS PREDICT THE TEXT CONTENT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils can connect the text to elements from their own world of experience.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. The pupils can connect current events to the text.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. The pupils can master the (technical) reading level of the text.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. The pupils are triggered because I use the right multimedia sources in my lesson.</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Some pupils are so enthusiastic that they want to find out more about the topic, for example by searching the Internet, giving a talk or doing a project.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. MY LESSON IS RELEVANT FOR THE PUPILS.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils can connect the text to elements from their own world of experience.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. The pupils can connect current events to the text.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. The pupils can master the (technical) reading level of the text.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. The pupils are triggered because I use the right multimedia sources in my lesson.</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Some pupils are so enthusiastic that they want to find out more about the topic, for example by searching the Internet, giving a talk or doing a project.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I ASK QUESTIONS THAT CHALLENGE THE PUPILS TO THINK FOR THEMSELVES.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils feel challenged to answer questions about the text.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The pupils are challenged to answer questions about the text.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Through my questions, I achieve that children can distinguish well between major and minor issues.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The pupils feel encouraged to ask themselves: &quot;Do I understand what I read?&quot;</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The pupils react to solution strategies suggested by the teacher or other pupils in questions like:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- How would you go about this?</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>- Who ever tried this in a different way?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Who knows another clever way?</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I ENCOURAGE INTERACTION BETWEEN MYSELF AND THE PUPILS AND AMONG THE PUPILS THEMSELVES.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The pupils know what is expected from them.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. All pupils are attending to the lesson.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Many pupils get an opportunity to speak in whole-class settings.</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pupils give each other turns while speaking in whole class.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Pupils react to me and to each other.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The pupils find that they have a good chance of answering questions successfully.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The pupils value the feedback they get.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. The pupils find that they get sufficient time to react.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. The pupils are enthusiastic and keep focused on the lesson.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. The pupils participate actively in activity formats such as making a word web or word scheme..</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11. During the activity formats used, the pupils exchange with each other.</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12. Due to my interactive instruction and support, the pupils can start doing learning tasks with confidence.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAAL</td>
<td>41</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 11. Student teachers’ selection of viewing points

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Inspection of the second column shows that the students most often chose those viewing points falling in the categories 2. Activating prior knowledge, 4. Relevance for pupils and 6. Interaction. These points concern the extent to which the student teacher succeeds in involving pupils actively in the lesson. The students were apparently less interested in categories 1. Goal of the lesson and 5. Asking thinking questions. These are more concerned with the content of the lesson and what can be learnt from it.

2. Visibility of teacher behaviour

The third and fourth columns in Table 8 show which viewing points occur in the five clips selected as fit for rating by the experts and with which frequencies they occurred. These frequencies have been split referring to teacher behaviour that the experts considered evident in the student’s teaching in accordance with the viewing point (s)he had selected (code XX) or teacher behaviour for which the experts judged the viewing point selected by the student relevant, but which was actually not displayed during the lesson (code X0).

In all, the group of students whose clips were analysed by the experts selected 16 different viewing points. Comparison of the third and fourth columns in Table 8 shows that in all but two fragments, the student teachers actually displayed the teaching behaviors they had selected for practicing. In the two fragments where this was not the case, different behaviours were visible and/or students had labeled the behaviours shown incorrectly.

3. Relevance of teacher behaviour displayed

The experts not only analysed whether the teacher behaviour that the students pinpointed with the help of the viewing points was actually visible in the clips, but also what kind of behaviour they showed in their clips.

The clips of four out of the five student teachers show how they activated their pupils’ prior knowledge (viewing point 2). They did so by giving instructions for reading and writing tasks, asking for word meanings, using external representations of the learning content (such as a word web on the whiteboard and a reading text) and asking questions elaborating on pupil answers to earlier teacher questions or reactions from other pupils.

Where predicting text content was concerned (viewing point 3), two out of the five students showed their pupils a reading text and asked them about its contents.

Where the relevance of the lesson for the pupils and challenging pupils to think for themselves were concerned (viewing points 4 and 5 respectively), the experts noted that the student teacher behaviour consisted of asking starting questions and elaborating questions.

In addition to the above teaching behaviours, the experts noted in connection with interaction with and among pupils (viewing point 6) that four out of the five students activated their pupils by using forms of cooperative learning.

The experts also judged the pedagogical quality of the student teachers’ behaviour, i.e. to which extent it was suited to encourage pupils’ substantive learning.

For one student, the experts noted that she was too emphatic and lengthy in stating the lesson goal (viewing point 1), causing the pupils’ attention to wander. Regarding activating prior knowledge and predicting text content (viewing points 2 and 3 respectively) the experts noted that especially asking starting and elaborating questions raised the quality of the lesson. On the other hand, they found that one student did too little about this and challenged the pupils less to think for themselves (viewing point 5) than was actually possible.

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In four out of the five students, the experts noted that their interaction with pupils (viewing point 6) was characterised by forthcoming behaviour and an inviting attitude. In their judgment, this had a positive impact on the quality of the lesson.

4. **Technical quality**
From the perspective of lesson content, the experts noted that in three out of the five clips two lesson fragments could be distinguished. Their judgment of the technical quality of the clips was therefore based on eight homogeneous lesson fragments. They gave a predominantly negative rating of the video recordings concerned. This had mainly to do with the audibility of the teacher and the pupils, but also with unsteady holding of the camera and filming against sources of light. These aspects hinder comprehension and interpretation of the clips produced by the students.

5. **Suitability for editing as model video**
Out of the eight lesson fragments distinguished, the experts judged three suitable for editing as model videos. Whether they considered a fragment suitable or unsuitable depended mainly on two aspects: first the extent to which the clip offered a view of the student teacher’s interaction with pupils and her or his own part in this interaction, and second the extent to which the sequence of the lesson parts concerned could be reconstructed from the images.

Finally, the experts noted that for student teacher clips to be used as model videos, their consent will always have to be asked.

### 3.2.2 Retrospective interview with student teacher and mentor

One student teacher from the first cohort and her mentor gave the following interview about their experiences with using video and structured viewing guides for analysing her experiences during student teaching. This interview was edited under the title *Mentoring with video, an interview. Iselinge College of Primary Teacher Education. Doetinchem, the Netherlands*. The conversation shown in this clip is reproduced below with permission.

M = Mentor
S = Student
I = Interviewer

M She should discover things for herself.
I How did you reflect using video?
S I discovered new things all the time. We fill out the evaluation form we get step by step and discuss those points. That’s how you pick up things you can use the next time you teach. It helps. You shift your points of attention.
I You filmed a series of four lessons. In the course of reflecting on that material, do you feel you developed in certain respects?
S Again and again, you wonder: Did I succeed this time? Last time, I noticed something, now did I improve? That’s how you progress, by paying attention for instance to how you give turns to pupils.
M This kind of thing has worked out well. There’s always room for improvement, but she definitely used the viewing points on her agenda for improvement. Then, a film comes in handy to retrieve this whole lot of different things happening in a lesson.
I Were you present each time a lesson was filmed?
M Yes.
I Did you discover new things when you watched the video?

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M I'm not sure, really.
S I think there's a difference. I'm involved in my lesson, while Angelique is in the back of the room. Then you have a better overview. That's quite different.
M I do think, if I were to view the film again and the camera would have focused on her, I could find out more. Yes, I think, then it would have an added value. I didn't do that, but it could be.
I It's good to explore the possibilities.
M Of course, it was new to me too, but yes, if we do this again, I'd like to see another film.
I You now worked with video in language teaching. Would you apply what you learned also in other domains?
S Yes, questioning for instance is something you have to deal with also in other areas. You should ask not only closed, but also open questions. That's a general thing in all of your instruction.
I Of course, it's a good thing when students can make such links by themselves.
S+M Yes, exactly.

I I wonder, how did you go about the post-lesson conferences? Did you list all of your findings and compare them or did you tell about your lesson and did your mentor then join in?
S Yes, I usually began, didn't I. I had watched the video in advance and had in mind what struck me. That's what we began with and then, with the information sheet at hand, you get a conversation automatically. So many topics pop up! How you can do it the next time.
M Yes. "So much!!"
S No, but there are always things that went quite well and things that went less well. And you get good tips on how to solve things or do differently, for instance with a dice game.
I What strikes me is: you mention a lot of things that didn't go well.
S No, but also what went well.
M Yes.
I Video is a wonderful way to show that too.
M+S Oh, yes, sure.
M But when we worked through the evaluation sheet step by step, I would also draw upon the tips and tops that I had noticed and written down and then, the conversation just goes ahead. Then, when I want to know more, I ask questions. I do think Kim has moved forward since she came here. She has begun to think more about things and wondered: How can I do things the next time? She also has her own ideas. And especially, she now also looks at what is going well. Because in the beginning, she had this slightly negative outlook and felt uncertain.
S Correct. Yes.
M Then I'd say: Come on, what were all the things that did go well?
I How did you feel about looking into that in such a way?
S Yes, I had to get used to that. When I got that question, I had to stop and think and admit that quite a few things went well. You know, the things that go well often seem normal to you and what doesn't go well stands out. That's the whole point.
M Yes, that's what we all do.
I Yes, we're always being so critical.
M+S Yes, that's right.

### 3.2.3 Student-teacher comments and learner reports about peer consultation

All students in the experimental groups wrote open comments in reaction to the two statements "The video helps me develop a command of the teaching profession" and "Self-viewing challenges me to think about how I design my lessons" (cf. section 2.1.2). Responses were received from 15 out of 23 students, i.e. 65% in total. The cross-case analysis of these responses showed that all students agreed with both statements. The main reason they gave for this was that using video enabled them to analyse the strong and weak points.

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in their teaching behaviour and to formulate points for improvement. The points for improvement they mentioned most often had to do with how they positioned themselves towards groups of pupils, how they designed their lessons and how they involved pupils in those lessons. Illustrative answers are:

- You become more aware of how you face the group, how you react to pupils and what sort of language you use. It is strange to see yourself back.
- I can look at my own lesson and see what’s going right or what should get better.
- In this way you can also observe the class during your teaching.
- You see how you talk and how the pupils react. You have a clear overview.
- You see your strong and weak points. How you transmit knowledge, do you do that the right way?

The students in the experimental groups also completed the following sentences:
- The peer consultation has given me the idea to …..
- Through the peer consultation I have discovered that I …..
- Because of the peer consultation I am now better able to……
- The peer consultation has given me the feeling that …..
- To develop my instruction, my new personal learning goal(s) is/are....

19 out of 23 or 83% of the students noted that the peer consultation with video had given them the idea to film their own lessons more often, discuss these lessons with their fellow students and look for specific points for improvement while doing so. As students wrote:

- It confronts you with the facts.
- Yes, you can look at yourself critically and change following lessons.
- [I want more to] talk calmly and think about what I’m going to say, so that it all makes sense.

The same number of students wrote that the peer consultation with video had made them discover that they had a better command of (specific aspects of) teaching than they had previously thought. They also – again – noted that through this approach, they could identify points for improvement in their teaching. They discovered for example that:

- I came quite some way already, but there are also things in my lessons that have to change.
- I have a command of more viewing points than I had expected at first.
- I sometimes underestimate myself.

Also 19 out of 23 or 83% of the students felt that by means of peer coaching with video, they had become better able to reflect on their teaching, in the sense that they could analyse the strong and weak points in it. Two students wrote the following:

- By filming I get a better view of how I teach.
- I can learn a lot from my lessons by filming myself and looking back on them.

The peer consultation had given 18 out of 23 or 78% of the students the feeling that the quality of their teaching had improved. They also noted – again – that they had a better command of (specific aspects of) teaching than they had previously thought. For example:

- I feel my teaching is getting better.
- Peer coaching has given me more self-confidence.

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Finally, 19 out of 23 or 83% of the students formulated new personal learning goals for improving their teaching. These goals fell under three broad categories, i.e. presentation, instruction and interaction. Among the personal learning goals mentioned were:

- Elaborate topics more (in interaction).
- Give pupils time to think. Then call upon an individual pupil for the answer.
- More variation in how I use my voice and perhaps some more enthusiasm.
- Allow everyone to contribute, also those children who do not raise their fingers.
- [Keep] a better overview.

3.3 Summary

The preservice study was aimed at finding out if and what effects occur on the development of teaching competence, when student teachers use digital video recordings of their lessons and structured viewing guides in a peer consultation setting to generate instant visual feedback on their teaching. In this study, two cohorts of student teachers participated from a college of primary teacher education, Iselinghe College in Doetinchem, the Netherlands. In each cohort, students in an experimental group filmed each others’ reading comprehension lessons with “portable video tool kits” (PVTKs), i.e. lightweight simple-to-use recording and playback equipment. In combination with this procedure, they used “structured viewing guides” (SVGs) to analyse and discuss the teaching behaviours they recorded. Structured viewing guides are lists of “viewing points”, i.e. observation items regarding effective teaching behaviours, subdivided in categories.

Students in control groups did not engage in these activities, but received only verbal feedback on their lessons from their mentors. Pre- and post-intervention criterion measures were collected in the experimental as well as control groups. In addition, qualitative data were collected in the experimental groups, i.e. expert ratings of video fragments from student teaching, a retrospective interview with one student teacher and her mentor, video recordings of peer coaching sessions and student-teacher comments and learner reports about the effectiveness of video use.

Comparison between the experimental and control groups yielded clear indications that the students in the experimental groups experienced greater progress towards mastering skills in teaching reading comprehension than those in the control groups. Seven out of 31 measures showed statistically significant gains for the experimental groups. For a further five measures, the experimental groups showed non-significant gains half a scale point larger than the differences found in the control groups. The experimental groups experienced progress notably in making the contents of their lessons concrete, bringing their pupils to engage actively with the subject matter by means of questioning, clarifying their expectations as teachers and encouraging cooperative learning.

The expert ratings of the video clips produced by the student teachers in the first cohort about their lessons indicate that the students actually displayed in those lessons almost all the teaching behaviours which they had selected with the help of the viewing guides for practicing and showing in their video clips. This means that not only did the students experience progress in acquiring specific teaching skills, but this was also corroborated by independent expert judgment.

The interview conducted with one student teacher and her mentor reveals how the use of video can introduce changes the process of mentoring. A benefit of video use appears to be that it can help both student teacher and mentor in making their lesson analyses and post-lesson conferences more concrete.

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and specific. At least in this case, it also appears to have encouraged the student teacher to make discoveries about her own teaching behaviour and to take initiative during the conversation with her mentor.

The analysis of the student teachers’ comments and learner reports indicated that by generating visual feedback on their teaching the student teachers participating in the intervention discovered that they had a better command of (specific aspects of) teaching than they had previously thought and that they could analyse strong and weak points in their own teaching enabling them to determine and focus on targets for improvement. Moreover, the work with the portable video tool kits and the structured viewing guides encouraged them to film their own lessons more often and discuss them with their fellow students with an eye to improving their teaching.
4. **In-service study results**

In this chapter, findings are reported first from the quantitative analyses (section 4.1), then from the qualitative analyses (section 4.2). We build here on an earlier report in which the reciprocal peer coaching project with experienced teachers was evaluated through analyses of the following types of data. Pre- and post-intervention criterion measures from the participating teacher cohorts were compared and the teachers’ assessment of peer coaching with video as an intervention was reported. Also, a content analysis was carried out on statements written by the participants in plenary meeting evaluation forms. The findings from these analyses are summarised in sections 4.1.1, 4.1.2 and 4.2.1 respectively.

The research questions guiding this earlier report were:

- What did the participating teachers learn? More specifically: What effects on their thoughts and actions did they attribute to participation?
- How did the participating teachers learn? More specifically: Which factors, notably the learning environment created for peer coaching and the teacher learning activities undertaken in that environment, contributed to the participants’ professional learning?

In the current report, the following new analyses are presented. Content analyses were made of the posters presented by the participating teachers in the last plenary session of each school year (section 4.2.2) and of follow-up interviews conducted with a representative sample of teachers three to six years after participation (section 4.2.3).

The findings from the in-service study are summarised in section 4.3.

4.1 **Experienced teachers’ competence development**

In this section, quantitative findings are presented about the participating teachers’ competence development (section 4.1.1), their assessment of aspects of peer coaching with video as an intervention (section 4.1.2) and the extent to which teachers’ self-assessments of their classroom work are mirrored in their pupils’ perception of it (section 4.1.3).

4.1.1 **Comparison of pre- and post-intervention criterion measures**

In the project evaluation preceding this report (Brouwer, 2009), pre- and post-intervention criterion measures completed by the participating teachers were compared in order to find out if and how their teaching competence developed under the influence of peer coaching with video (see section 2.2.3 for a description of the two-step procedure used).

From this analysis it became clear that most progress could be noted in the area of the first project goal, increasing variety in classroom activity formats. About two thirds of the teachers succeeded in having...

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4 The full account of these analyses was published in a paper presented at the 2009 AERA annual meeting (Brouwer, 2009).
pupils work more for themselves (cf. criterion variable 5 in Table 3). Also, a large majority succeeded in improving giving precise instructions and implementing cooperative learning (criterion variables 2 and 6). Interestingly, the latter successes were to a considerable extent unintended or serendipitous learning outcomes, as the teaching skills involved had not been explicitly targeted by the teachers at the beginning of the school year. The skills of explaining subject matter stepwise and using instructional dialogues (criterion variables 1 and 4) apparently developed according to different patterns. Five skills turned out to be hard to acquire or develop, i.e. coordinating classroom activity and homework, having pupils comment and assess each others’ work, having pupils debate subject matter together and using ICT in the classroom (criterion variables 3, 7, 8, 10 and 12). A mixture of patterns was found for having pupils present to the group and using games in lessons (criterion variables 9 and 11).

Fewer successes can be noted for the second project goal, increasing opportunities for differentiation. The teachers succeeded moderately in having pupils work more at their own pace (criterion variable 16). They succeeded however to a small extent only in having them work on subject matter with computers (criterion variable 18). Also in the area of differentiation, some teaching skills turned out hard to acquire or develop, notably having pupils work outside the classroom, having them study additional materials and work on additional assignments and topics of their own choice (criterion variables 13, 14, 15 and 17). Standstill predominated in the development of all of these skills.

The third goal of promoting self-directed learning involved tough challenges. For the skills needed for having pupils plan their own work, present part of the lesson and reflect on the use of the school subject for their futures (criterion variables 19, 20 and 22), patterns of standstill and failure predominated. The only skill in this area with which the teachers had success involved promoting interest in their school subject (criterion variable 21). Even so, intended or unintended learning occurred also in these areas.

The above account refers mainly to the development of teacher action. However, it should be noted that the development of teacher thought did not automatically follow the same patterns. For all three project goals, successes in behaviour change occurred to a smaller extent than changes in ideas. However, the reverse turned out to be true for serendipitous learning. This occurred more for action than for thought. When standstill occurred, this was the case more for teacher action than for teacher thought. Failure on the other hand, prevailed more over thought than over action.

4.1.2 Peer coaching with video as an intervention

The learning environment, the learning activities that took place within it and their value for professional learning were perceived by the participating teachers as follows.

When the project began, the steering committee saw it as an important principle that participation should be voluntary and that teachers should be free to choose with which colleague they wished to cooperate in a pair. At the same time, the committee was uncertain whether pairs should be composed of teachers of the same or similar school subjects. The teachers found it quite helpful that they could decide freely with whom they were going to work together. They preferred working with a colleague in the same or a similar school subject. Cooperating with a colleague in a different subject received a lower rating, although not a negative one. Similarly, cooperation with a colleague with the same amount of teaching experience or more experience was preferred. Cooperation with a colleague with less experience was not the favorite option. Finally, we
wanted to know how the teachers felt about working with a colleague who pursued clearly different learning goals. On average, they considered this slightly helpful for their own learning.

Concerning the learning activities in the project we were interested in knowing how frequently the intended observations of lessons actually took place. Also, since the project started as a peer coaching project, not especially as a video project, we wanted to know how frequent the use of video actually was. On average, the participants succeeded in observing colleagues’ lessons and discussing them within their pair almost twice per month. During the school year, between one and two lessons per teacher were filmed. The teachers viewed the video recordings of their lessons one and a half times on average.

The participating teachers gave the following assessment of the use of digital video. Both viewing video recordings of lessons and receiving and giving feedback on them with the help of video were valued quite positively. On average, they valued most the feedback which they received from the colleague in their pair on the video recording of their own lessons. However, they found giving feedback to the colleague in their pair almost equally helpful for their learning. Viewing the video recordings of one’s own lessons was also experienced as quite helpful. The viewing of lesson recordings had slightly more influence on the participants’ reflection on their own teaching than on their changing it. In this respect, self-viewing was slightly more powerful than other-viewing. Such a difference is not in evidence for the influence on changing one’s own teaching. Also, the feedback from the colleague in one’s pair had more influence on the participants’ reflection on their own teaching than on their changing it.

The data reported above on a descriptive level, were also used in correlational analyses. From a correlation matrix for the variables involved, those correlations were selected which were significant at the .05 level and surpassed the level of \( r > .30 \). The resulting relationships – apart from an obvious correlation between age and teaching experience (\( r = .074 \)) – are presented below.

Lessons observed by the teacher pairs were generally also discussed by them (\( r = .80 \)). Filming lessons and viewing the recordings of one’s own and colleagues’ lessons were clearly, though not strongly related to reflecting on and changing one’s own teaching (\( r’s \) ranging between .46 and .70). An interesting finding is that teaching experience was related to the use of other-viewing for changing one’s own teaching (\( r = .50 \)). Apparently, the more experienced teachers in the project were especially willing to benefit from viewing their colleagues’ work. Finally, the usefulness of giving and receiving feedback were related both with each other and with reflection on one’s own teaching (\( r’s \) ranging between .37 and .73). Interestingly, the usefulness of receiving feedback as experienced by the participants was related to the opportunity they had to choose freely with whom they would cooperate in a pair (\( r = .34 \)). Together, these relationships confirm the above descriptive findings about the perceived learning value of peer coaching activities using video.

4.2 Explorations of experienced teachers’ visual learning

In this section, the results of the qualitative analyses in the in-service study are presented.

4.2.1 Evaluation of plenary meetings

The participants’ attendance during plenary meetings was generally high, as shown by percentages ranging from 76 to 83.

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The content analysis of all the available plenary meeting evaluation forms made it possible to produce the following list of conditions that, when fulfilled, the participating teachers considered helpful for their learning.

- It is clear from the beginning what results should ensue from the meeting.
- The background materials about instructional theory (in a reader and/or an electronic learning environment) should remain succinct.
- The meeting is characterized by a good atmosphere and mutual trust in the group.
- The meeting has a good pace, i.e. it is neither too slow nor too hurried.
- There is opportunity for activity by the participants themselves. Not all time should be spent on listening.
- Viewing and discussing video recordings of each other’s lessons are alternated with other activities.
- Concrete cases, video recordings of each other’s lessons and observation points to guide viewing and discussion are recognizably relevant for the theme or topics on the agenda of the meeting concerned.
- Part of the time in plenary meetings is spent on work within pairs.

The content analysis of the available plenary meeting evaluation also resulted in a list of conditions favorable for productive work within pairs.

- The school’s timetable offers not only opportunities for visiting, observing and filming each other’s lessons, but also for following up these activities within a short time span with a discussion of the lesson at hand.
- Post-lesson conferences and discussions take place on the basis of clear observation points.
- The work atmosphere between colleagues is open and characterized by mutual trust.
- Participants know how to work with digital video hardware.
- The sound quality of video recordings is at least adequate.

4.2.2 **Poster presentations by participating teachers**

The content analysis of the posters presented by the participating teachers in the last plenary session of the four school years covered by the project showed that they presented predominantly retrospections on what the work pairs had done together, their experiences during these activities and, more sparsely, statements about how they had developed their teaching repertoires and how pupils in their classes had reacted, if at all. The following account is based on the outcomes of the analysis of the posters looking back on all four school years, as it is on this level of aggregation that the clearest patterns emerged.

Most teacher activities mentioned in the posters referred to the first project goal of increasing variation in pupils’ learning activities (cf. section 2.2.1) (26 statements). On the one hand, teachers had analysed how they had enacted lessons using the direct instruction model. In doing so, they had especially focused on three aspects: how they had given instructions for learning activities, how they had explained the subject matter involved and to what extent and how they had checked and/or had given feedback on their pupils’ homework. A few participating teachers also
analysed their personal interaction with pupils, in whole-group settings as well as while they provided individual support.

On the other hand, teachers had analysed their attempts at introducing, increasing and/or improving group work in their lessons. The teachers involved felt that they were mostly successful in enacting group work, but they repeatedly voiced concerns about the effectiveness of how their pupils cooperated with each other. From these concerns, they derived the conclusion that they needed to structure pupils’ learning activities more by making their instructions more precise.

Far fewer, i.e. six, statements referred to attempts at the second project goal of offering more opportunities for differentiated learning. To achieve this, teachers had begun using computers in their lessons, but how they did this was not specified in the posters.

The smallest number of statements, i.e. three, had to do with the third project goal of increasing pupils’ autonomy as learners, but these too contained little specification.

In recounting their own learning experiences the teachers pointed out in their posters both product and process aspects. Five pairs of teachers felt that their peer coaching activities had helped them become (more) aware of how they functioned during their lessons. One pair stated that they had come to pay more attention to lesson preparation. Secondly, four pairs noted that cooperating with their colleague was a positive experience for them. Finally, three pairs regretted that despite good intentions they hadn’t managed to make as many changes in their lessons as they wanted.

In ten posters, the topic of pupil reactions was found. According to two posters, pupils had noticed little of changes the teachers had introduced in their lessons. Insofar as the teachers did notice reactions from pupils, these were mixed. In four cases, the teachers judged positively about their perception that pupils were actively involved in learning and that they appreciated the variation the teachers had introduced in their lessons. On the negative side, it was mentioned three times that the usefulness of going about learning activities differently was not clear to pupils. One pair of teachers noted that pupils felt negative about having to do more work.

Finally, the posters contained suggestions for improving the concrete outcomes of the peer coaching project in subsequent years.

Four posters stressed the need to prevent scheduling conflicts, so that observing each others’ lessons regularly would be possible. In addition, the teachers felt that the organisation of peer coaching should be changed so that participants would be more obliged to show concrete outcomes of their activity (five statements). Also, participants should give sufficient priority in their agendas to the plenary meetings (three statements). In four posters, teachers pleaded for intensifying cooperation with each other. In three others, it was specified that such cooperation should be sought more often with colleagues from the same school subject. Topics suggested for plenary discussion included differentiation, presentations by pupils in whole-group settings and different strategies for structuring lessons.

4.2.3 Follow-up interviews

As stated in section 2.2.2, a sample of in-service teachers was selected for follow-up interviews three to six years after their participation in the peer coaching project. The selection variables were gender, years of teaching experience, whether teachers had participated in peer coaching during one or two years and the number of changes they reported having made successfully in their teaching (cf. the developmental pattern D “success” relating to teaching action in Table 4).
A comparison of the sample with the whole group of participants showed that both groups were composed in all but the same way. The sample only included more women (70%) than the whole group (46.7%). The average teaching experience was 14.6 years in the sample and 14.1 years in the whole group. In the sample, 40% had participated twice in peer coaching, while in the whole group this percentage was 36.4. The average number of teaching behaviours successfully changed by the teachers in the sample was 6.1 out of 22 (cf. Table 3), the minimum being zero and the maximum 15. In the whole group of participants, on average 4.5 teaching behaviours were successfully changed with a minimum of zero and a maximum of 17. In addition, we checked the distribution of school subjects in the sample versus the whole group. This comparison showed that only teachers of French were overrepresented in the sample (40% versus 11.1% in the whole group). On the basis of these findings we consider the sample reasonably representative for the whole group of participants.

The available sources for this report allowed for the analysis of no more than three out of the ten follow-up interviews conducted. In order to preserve the representativeness of the resulting findings as far as possible we analysed the data from three teachers who had reported either zero, an intermediate (8) or a high (15) number of successful post-intervention changes in their teaching. Even so, the findings reported in the remainder of this section should be regarded as trends beginning to emerge from the available interview data.

In the following account, we first describe in which respects the teachers interviewed have changed their teaching under the influence of their participation in peer coaching. From there, we move to findings about how factors in the person, the intervention and the school context influenced the long-term effects of the peer coaching project. The main findings are illustrated by quotations.

The teachers' interview statements confirm the quantitative findings showing that the first project goal of increasing variety in classroom activity formats was reached to the greatest extent (see section 4.1.1). These effects had to do with two areas of teaching competence: direct instruction and cooperative learning. Teachers reported their participation had led them to take more care in preparing their lessons and to be more precise in their instructions for learning activities. Enacting these changes intensified their interaction with their pupils, particularly during question-answer sequences in whole-class settings.

- Giving clear instructions, for instance at the beginning of a lesson, is something I always did, but now I do that during group work, too. I surely saw the use of that. Generally, I stay alert on the clarity of my instructions, also because I see how important a point this is to learn for the student teachers I supervise. That does trigger you.
- I undertook instructional maintenance work indeed, especially in preparing my lessons.

In addition, the teachers introduced and intensified group work in their lessons. They developed explicit instructions for cooperative learning activities and actively supervised those activities while they were carried out by pupils.

- I certainly learned how to handle group assignments. In chemistry, we hardly use cooperative learning apart from laboratory lessons, so I wanted to do something about that. Together with [colleague in work pair] I developed a group assignment about proteins.
- I learned a lot about how to debrief assignments and to make sure that every pupil contributes to the work. That was definitely a useful result.

In retrospect, the peer coaching project functioned as a precursor to initiatives taken by the school to make the second project goal of increasing opportunities for differentiation concrete. During the peer
coaching project, the participating teachers explored opportunities for a structural use of digital resources during teaching and learning. Following it, the school embarked on a “lap-top project”. In this context, teachers develop Powerpoint presentations for presenting lesson content as well as assignments. These and other digital resources are used to guide and support pupils during learning activities for which they access Internet resources.

- We also put a lot of our material such as Powerpoints in the electronic learning environment, so they can study it at home. Those Powerpoints are mostly produced by colleagues, but I supplement and use them. I like that a lot, also in case pupils miss a lesson.
- To differentiate I have the pupils work with computers. For example in “Physics and society” lessons we systematically use very open assignments where they have to formulate their own research question. Nowadays we have lap tops and Internet in the classroom. That’s a tremendous asset, so they can just take off.
- While preparing for exams ... they make an online test and then they get results and suggestions what they should study further. I also use it to teach pupils to make certain instrumental analyses. There are modules for that on the Internet. I can show it to them with the beamer, but they learn it better when they have to do it themselves. Yes, they’re very busy with that. When you say clearly which assignment they should do with which web site, then a clear majority of the class is actually working on that. When they’re ready, I allow them a bit more freedom. Then they can figure out something addition or do other assignments without the lap top. Another advantage, I think, is that they know how to find it, so they can continue working on it at home.

With regard to the third project goal of promoting self-directed learning, for which the fewest effects were found, the teachers expressed skepticism. They voiced several arguments why they were in doubt about the possibility and desirability of pursuing this goal.

- I give pupils limited autonomy to determine their own learning activities. I am someone who likes to be in control. When they have questions during the lesson, I do allow them to find out things immediately, for instance in the resource centre. When they come back and tell their classmates, I like that. I do maintain my planning strictly. We work with a year and lesson planning which specifies what happens in a lesson and which work should be done. Depending on the grade I do a homework check every one or two weeks and then they must be on target. I stick to that quite closely, also because we do laboratory lessons that you cannot reschedule. For a pupil, doing a laboratory lesson without proper preparation is useless.
- I don’t think that pupils have got more opportunities to determine their own learning activities. With me, they have little influence on that, because you have to cover an awful lot of content, so I have little room for that. Right until the exam I have new content. That’s a problem. I do want to develop some optional assignments, though.
- I have one very clever pupil in the fifth grade, whom I give the opportunity to find out things for himself, as long as the rest of the class isn’t bothered by it. [...] With him and a few other very good pupils I can [differentiate]. I do try and give them more autonomy, but I find for example when [other pupils] think a calculation assignment easy and I make one extra that is more difficult, they don’t feel like it and they won’t do it. I experienced that a number of times and then I don’t take that extra trouble, if they don’t feel the need to hang on.

The above quotations reveal something about the ways in which participation in peer coaching brought about learning effects. They illustrate that on the level of individual teachers, learning effects came about because the cooperation in work pairs and/or the exchanges during the plenary meetings encouraged them to increase their use of teaching approaches in which they already had a degree of competence and to introduce approaches new to them.

At the same time, peer coaching has contributed to intensifying collegial cooperation for curriculum development on the level of groups of teachers teaching the same subjects.

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- What I did retain is the ease with which I look in in others’ lessons and let others look in my own lessons. I already felt at ease with that, but within our group it has become a more normal thing to do, also for colleagues. And it’s the same way for student teachers. That was a step in the right direction generally. The number of colleagues who became opener in that respect has grown.
- I think of all colleagues in our group I am always the one who creates the extra puzzles, quizzes and activities.
- Using those Powerpoints was a result of the contact with colleagues in my second year of participation. That was a busy time, because suddenly we had to teach 20th-century physics. That meant a lot of preparation. Everything was new. [...] Not until last year did we find some space to take stock. With the colleagues we want to make up our minds: what are we doing, shouldn’t we use different forms of teaching to achieve more results in the sense of pupils’ personal development.
- I have been able to strengthen my friendship and cooperation with [the colleague in my work pair]. It does increase the pleasure in your work. There are 150 colleagues in this school with whom I have good relations, but peer coaching helped me to cooperate more closely with somebody with whom you wouldn’t otherwise cooperate. That gives you a surplus.

We now turn our attention exclusively to the issue how teacher learning came about.

The interview statements show that collegial feedback on observed and/or filmed teaching behaviour was an influential stimulus that brought teachers to make changes in their teaching behaviour. Such changes led in turn to pupils’ engaging more actively in understanding subject matter. Then, when teachers found evidence that convinced them that such pupil reactions were a consequence of the changes in their instruction and supervision, this encouraged them to make those changes structural.

- Whether I change my action first and then my thinking or the other way round depends on how big the issue is. When it’s small -- for instance I see someone else write down the homework in the left-hand corner of the blackboard and I appreciate that – I would immediately try out if that has any effect and ask pupils about it after a few weeks. But if it’s something with bigger consequences for my work or work sequence, I would first consider for myself how exactly I’ll go about it. Something like that I wouldn’t do right the next day. Then I need a break to think.
- My inclination is more: when I have new ideas, I try them out and afterwards I’ll find out what the effects and all the ins and outs are. I usually do this in situations where it’s necessary, when I run into things that don’t work out well. That’s my preference.
- When I see a video during peer coaching, I think: that’s [a] nice [way to teach]. Then I’ll figure out where I can put that in [my own] planning. Where it comes I decide quite carefully. I won’t just do it the next day. I don’t like that. Because I want it to turn out well. When you don’t do the same thing all the time, it should turn out well. It must be a consistent thing, otherwise it isn’t fun, then it will go wrong. Then you achieve the opposite of what you want. I want an outcome, not chaos in my class.

Looking back on their learning during peer coaching, the teachers identified a number of factors that promoted or hindered their learning. Their accounts clarify how factors in the intervention, in the person and in the school context interacted in producing a positive or negative impact. Factors with a positive impact were visualisation and feedback. The use of video and the analysis and discussion of the lesson recordings with colleagues produced a type of professional exposure which the teachers experienced as beneficial, because it led to mutual recognition and understanding of the intricacies involved in the work of teaching.

- I must honestly say: before I began, I thought: what do we need this nonsense for, who made this up? But I got on board and found that it does have merit and that you develop yourself faster and see things a lot faster: “Oh, that’s how I do it”. [...] You must expose yourself. That has a tremendous value, because suddenly you go through a process of becoming aware and you from each other: this and that were our goals and such
and such goes wrong, so we have to adjust in certain ways. Well, you achieve that a lot faster when you discuss things together. Because when you work by yourself, you think: this will work out next year and the year after something else is up again. In that way you don’t develop quickly.

- I found it quite stimulating that colleagues had recorded their lessons and actually showed fragments. I liked that a lot. You can hear each other talk about your lessons, but that is sometimes tedious and too general. Giving examples, literally have a look in each others’ kitchens, that’s what stuck in my mind and that means that for me, this was stimulating to participate in. [...] What helps me personally to learn in peer coaching is, I think, the patience to listen to each other and open yourself to it. When you’re going to tell how good you are at something, you may just as well go. You must want to learn or change something yourself.

The exchanges during the plenary meetings provided the teachers with new ideas and perspectives.

- The plenary meetings brought me something, because all the subjects were there together.
- The group setting created by the plenary meetings was useful and necessary, I think. […] Exchanging and studying issues that maybe you hadn’t thought of yourself was valuable. It also pushes you to continue, to stick to appointments.
- In the plenary meetings – I hadn’t expected that – there were presentations by teachers who showed new teaching forms. They also showed that they ran into themselves or their limitations. I found that an eye opener. It was a secure environment. That was also very good about it. […] That makes it easier to participate and simply tell how things went in a lesson and that id doesn’t all run smoothly the way you want a lesson to be completely successful.

Cooperating in a pair with a colleague in the same or a similar subject and having about the same amount of teaching experience created a situation specific enough to address personal learning goals optimally.

- For me, the working in pairs was the main stimulus. Because as a pair you really have a specific goal in mind which is not necessarily the same as the other group members have. All of you together cannot set such a clear and specific goal. Either you set a goal that you can only endorse half-heartedly because it’s too far removed from what you actually want to do yourself. Or it is too general and then nothing comes out either. That’s not SMART, let’s say. […] In smaller groups, you can more easily be responsible for goals. In those [peer coaching] pairs the advantage is that they set their own goals.

Finally, it was considered a positive, indeed an indispensable factor that the school management organised the peer coaching project and provided release time for participating in it.

- My learning was encouraged by the time you got for peer coaching. A few years later [a colleague] and I had enrolled a second time because we wanted to study differentiation, but eventually it didn’t work out. We could participate, but we had to do it in our own time. Then it comes on top of the rest, so when it hangs in the balance, you just don’t do it. With me, it works both ways: when I get hours for it, I have to put in something and there is real space to make something out of it. It just takes time and energy. This time is essential, I think.

Conversely, negative impacts resulted from work pressure and lack of time. Another influential negative factor, also prominent in the questionnaire findings, was scheduling conflicts, which made it impossible or difficult to observe each other’s lessons.

[When I enrolled with another colleague,] we only had parallel lessons which they couldn’t shift, so we cancelled it. That was a shame, because both of us thought we could benefit a lot because we are close colleagues [in the same subject domain]. But we both have a relatively small [parttime] job, so that was probably the reason why it didn’t work out. […] Even with [the colleague with whom I cooperated the first time] we could only attend one of the other’s lessons [per week]. That’s not much. It was a nuisance that you

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couldn’t observe classes in different grades, for instance the second and the fifth. Post-lesson conferencing was no problem, you can always do that during breaks.

Other negative influences had to do with specialisation and role-taking within groups of teachers teaching the same subject, the prevailing culture of collegial interaction and the fact that participation in the peer coaching project was voluntary.

- it would be nice if they [colleagues in the same subject] would produce a quiz. I don’t know how you can change [that they don’t do that]. Not everybody has the same talents, I believe. One colleague can make fantastic assessments … [Another] makes summaries. In a group, you develop specialisations.
- The culture of the school is after all rather distanced. Peer coaching breaks through that a little or maybe a lot. I’d almost say: this should be done here far more often. […] I think there are also colleagues who think: “Peer coaching, no, I don’t participate in that, that’s nothing for me” and who conform to the the school’s culture, whereas … those are exactly the colleagues who should do peer coaching in the first place.
- In peer coaching, teachers participate who are already quite active where it comes to instructional issues. […] It is those who tend to stick to the same thing all the time who don’t come. In this way, it does not become something shared by the whole school.

4.3 Summary

The in-service study aimed at finding out what experienced teachers learn when they engage in a reciprocal peer coaching in which digital video was used as a medium for professional development. Clarification was also sought of the processes and conditions responsible for the outcomes of such teacher learning.

The respondents of this study are four cohorts totalling 45 experienced secondary teachers, who participated in a reciprocal peer coaching project organised in the Urban Gymnasium Nijmegen in the Netherlands. Three project goals were pursued: increasing variety in classroom activity formats, increasing opportunities for differentiation and promoting self-directed learning. The participating teachers worked in pairs observing and filming each others’ lessons, discussing the recordings and preparing subsequent lessons. In addition, they attended between four and six plenary meetings per school year, in which they exchanged and discussed ideas and issues about teaching and viewed and analysed video clips of each others’ lessons.

Comparison of pre- and post-intervention criterion measures showed that the participating teachers’ competence development was most successful with regard to the first project goal, which lay closest to their existing teaching practice. Considerably fewer successes were noted for the second and third project goals. Four patterns were identified in how the teachers developed their teaching skills during the project. Besides intentional learning leading to success or failure, also unintentional processes involving serendipity or standstill played a considerable part in their learning. These different patterns of development occurred to different degrees for the enactment of different teaching skills. The development of teacher thought did not automatically follow the same patterns. For all three project goals, successes in behaviour change occurred to a smaller extent than changes in ideas. However, the reverse turned out to be true for serendipitous learning. This occurred more for action than for thought. When standstill occurred, this was the case more for teacher action than for teacher thought. Failure on the other hand, prevailed more over thought than over action.

At the end of each school year, the participating teachers presented posters to each other describing what they had done and learned in their work pairs. Content analysis of these posters made clear that
the teachers had focused their work on the first project goal of increasing variety in classroom activity formats on two issues. A majority of participants had analysed how they had enacted lessons using the direct instruction model. In doing so, they had especially focused on three aspects: how they had given instructions for learning activities, how they had explained the subject matter involved and to what extent and how they had checked and/or had given feedback on their pupils’ homework. A few participating teachers also analysed their personal interaction with pupils, in whole-group settings as well as while they provided individual support. In addition, the teachers had analysed their attempts at introducing, increasing and/or improving group work in their lessons. They felt mostly successful in enacting group work, but at the same time voiced concerns about the effectiveness of how their pupils cooperated with each other. This experience convinced them of the need to structure pupils’ learning activities more by making their instructions more precise.

Far fewer statements in the posters presented referred to attempts at the second project goal of offering more opportunities for differentiated learning. Teachers had begun using computers in their lessons, but they did not specify how. Similarly, little was specified about how they had worked on the third project goal of increasing pupils’ autonomy as learners.

The teachers found it quite helpful that they could decide freely with whom they cooperated in work pairs. They preferred working with a colleague in the same or a similar school subject. Similarly, they preferred cooperating with a colleague with the same amount of teaching experience or more. On average, the participants observed and discussed colleagues’ lessons within their work pair almost twice per month. During the school year, between one and two lessons per teacher were filmed. The teachers viewed each video recording of their lessons one and a half times on average. They felt that giving as well as receiving feedback on these recordings promote their learning. These descriptive findings were confirmed by correlations found between the variables involved.

Lessons observed by the teacher pairs were generally also discussed by them ($r = .80$). Filming lessons and viewing the recordings of one’s own and colleagues’ lessons were clearly, though not strongly related to reflecting on and changing one’s own teaching ($r$’s ranging between .46 and .70). Teaching experience was related to the use of other-viewing for changing one’s own teaching ($r = .50$). Apparently, the more experienced teachers in the project were especially willing to benefit from viewing their colleagues’ work. Finally, the usefulness of giving and receiving feedback were related both with each other and with reflection on one’s own teaching ($r$’s ranging between .37 and .73). Interestingly, the usefulness of receiving feedback as experienced by the participants was related to the opportunity they had to choose freely with whom they would cooperate in a pair ($r = .34$).

The participants’ attendance during plenary meetings was generally high, ranging from 76 to 83 percent. Content analysis of the plenary meeting evaluation yielded the following list of conditions that the teachers considered helpful for learning during peer coaching with video.

- It is clear from the beginning what results should ensue from the meeting.
- The background materials about instructional theory (in a reader and/or an electronic learning environment) should remain succinct.
- The meeting is characterized by a good atmosphere and mutual trust in the group.
- The meeting has a good pace, i.e. it is neither too slow nor too hurried.
- There is opportunity for activity by the participants themselves. Not all time should be spent on listening.
- Viewing and discussing video recordings of each other’s lessons are alternated with other activities.
- Concrete cases, video recordings of each other’s lessons and observation points to guide viewing and discussion are recognizably relevant for the theme or topics on the agenda of the meeting concerned.
- Part of the time in plenary meetings is spent on work within pairs.

Similarly, the following conditions favorable for productive work within pairs were identified.

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The school's timetable offers not only opportunities for visiting, observing and filming each other's lessons, but also for following up these activities within a short time span with a discussion of the lesson at hand.

- Post-lesson conferences and discussions take place on the basis of clear observation points.
- The work atmosphere between colleagues is open and characterized by mutual trust.
- Participants know how to work with digital video hardware.
- The sound quality of video recordings is at least adequate.

Concerning the issue of what pupils noticed of changes made by the participating teachers in their lessons, the posters presented at the end of the school year suggested that pupils had noticed few of such changes. Insofar as the teachers did notice reactions from pupils, these were mixed. Teachers judged positively about their perception that pupils were actively involved in learning and that they appreciated the variation the teachers had introduced in their lessons. At the same time, the usefulness of going about learning activities differently appeared unclear for pupils. One pair of teachers noted that pupils felt negative about having to do more work.

The results of follow-up interviews conducted with a representative sample of the participating teachers confirmed the finding from the questionnaires that the first project goal of increasing variety in classroom activity formats was reached to the greatest extent. Peer coaching had encouraged the teachers to make changes in their teaching. These changes involved predominantly direct instruction and cooperative learning, particularly giving (more) precise instructions and specifying and supervising group assignments. Effects of peer coaching relating to the second project goal of increasing opportunities for differentiation took the form of developing and using digital resources for teaching and learning. Regarding the third project goal of promoting self-directed learning, for which the fewest effects were found, the teachers expressed skepticism about the possibility and desirability of pursuing this goal.

The above learning effects came about because the cooperation in work pairs and/or the exchanges during the plenary meetings encouraged the participating teachers to increase their use of approaches in which they already had a degree of competence as well as introducing approaches new to them. Collegial feedback on observed and/or filmed teaching behaviour was an important factor influencing this development. An important criterion for teachers to decide whether to make changes in their teaching structural were their observations of how the changes made influenced pupil learning.

Factors in the intervention and the school context that promoted teacher learning were: cooperating in a pair with a colleague in the same or a similar subject and having about the same amount of teaching experience; the opportunity to share lesson recordings, discussing them and giving and receiving feedback in an atmosphere of mutual trust; sharing new ideas and perspectives during plenary meetings; and receiving release time.

Factors that hindered teacher learning were: scheduling conflicts, which made it impossible or difficult to observe a variety of each other’s lessons as desired; divisions of labour and the culture of collegial interaction prevalent in the school. Finally, the fact that participation in the peer coaching project was voluntary left colleagues who did not participate free to ignore needs for professional development.

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5. **Discussion**

In this concluding chapter, we draw together the findings from two studies of peer coaching with digital video engaged in by student teachers in a college of primary teacher education (2009-2011) and by experienced teachers in a secondary school (2004-2008), both in the east of the Netherlands. In section 5.1, answers to the research questions guiding this report are formulated. In section 5.2, we discuss the theoretical implications of our findings and conclusions. Section 5.3 contains recommendations for using video in preservice teacher education and professional development. The report is concluded in section 5.4 with suggestions for further research.

### 5.1 Conclusions

The research questions guiding this report are (see section 1.1):

A. In which respects and in which ways can collegial learning with DV help teachers improve the quality of their instruction?

B. Can effects of DV use be observed not only in teachers themselves in the form of broader and richer skills repertoires, but also in pupils’ reactions to teachers’ instructional behaviour in the sense of more adequate learning behaviour and/or better learning results?

Research question A addresses both the outcomes and the processes of collegial teacher learning with video. In answering this question, we are particularly interested in knowing if and in which respects the participating teachers have improved the quality of their instructional behaviour by enriching their repertoires of teaching skills. In addition, insofar as this improvement has come about, we want to find out which conditions and factors promoted or hindered qualitative change in teachers’ content-focused interactions with their pupils. The available evidence from the preservice and in-service studies (summarised in sections 3.3 and 3.4 respectively) leads us to the following conclusions about these topics.

The preservice study has yielded clear indications that targeted practice by student teachers and focused visual feedback on it, provided in a setting of collegial learning, can promote their competence acquisition. Both their self-assessments and the expert ratings of their lesson clips support this conclusion. A further point to note is that the student teachers selected particularly such skills for practicing that shape teacher initiative in classroom interaction with pupils, i.e. giving clear instructions, asking questions and organising cooperative learning. It should be borne in mind that the student teachers in this study were first-year students taking first steps in the teacher role. In such a stage, it is quite an accomplishment to succeed in enacting learning processes that involve pupils in focused engagement with and dialogue about the meaning of written text. These student teachers progressed to the point where they could begin to learn to ask – besides starting questions that direct pupils’ attention at the subject matter – probing questions that can help pupils elaborate their understanding of subject matter.

It is equally interesting to find that in teaching behaviours having to do with the cognitive activation of pupils and with encouraging cooperative learning, the students in the control groups were not only outperformed by the students in the experimental groups, but even felt that their skills in these areas fell slightly behind over time.

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The preservice study has also yielded evidence about conditions and factors that promoted student teachers’ learning processes. The design of the intervention combined the following elements: literature study focused on effective teaching behaviours specific for reading comprehension prior to student teaching; setting personal learning goals for student teaching and evaluating it according to those goals using instant visual feedback and consultation with mentors and peers. The students’ video clips and the expert ratings of them clearly show that the viewing guide introduced as part of the intervention was extensively used by the student teachers. From this finding, we infer that it contained a considerable number of viewing points which they experienced as useful for improving their teaching. The procedure used in the intervention provided foci for student teachers’ learning from practice and lent a high concreteness to the feedback they received. As shown by the the student teachers’ comments and learner reports, it encouraged them to discover their strong and weak points and to engage in more filming of their lessons and in discussing the resulting visual records with peers. The intervention motivated them towards planning for and engaging in new cycles of focused personal learning as a teacher.

From the evidence cited, we conclude that pinpointing teaching behaviours on the basis of scientific literature and providing opportunities for targeted practice as well as highly concrete, subject-specific feedback on this practice, as was done here, has the potential of promoting a personally relevant process of acquiring effective teaching skills.

The in-service study has shown that the experienced teachers who used peer coaching with video have progressed in raising the quality of their direct instruction, notably by making their instructions for pupils’ learning activities more precise and by enacting group work. They moved forward to the point where they began to search for ways to make pupils’ cooperation with each other more effective and to provide more opportunities for differentiated learning. Different patterns could be identified according to which their thought about and action during teaching developed, i.e. success or failure at implementing specific teaching approaches intentionally, serendipitous discovery of new ideas and practices or standstill, i.e. lack of development with regard to specific teaching skills or approaches. Serendipitous learning and close cooperation with a colleague, freely chosen to form a work pair and preferably in the same subject and with approximately the same teaching experience, were shown to be factors which clearly contributed towards the experienced teachers’ learning. Also helpful for reflecting on and changing instructional behaviour were giving and receiving visual feedback among colleagues and teachers’ amounts of teaching experience. Necessary conditions for teacher learning to occur were facilitation in work time and scheduling that allows mutual observation and discussion of lessons.

The evidence from the preservice and the in-service studies together indicate that teachers’ repertoires of instructional skills are amenable to change in goal-directed ways. Peer coaching with video, if facilitated and enacted on the basis of knowledge about effective teaching, can bring teachers to acquire and develop teaching skills suited to the cognitive activation of learners. The studies reported here also suggest that student teachers and experienced teachers may take different routes to accomplish their learning. Whereas student teachers benefit from highly structured guidance and opportunities for pursuing personalised learning goals on the basis of such guidance, experienced teachers appear to appreciate a larger measure of autonomy in deciding what learning goals to work on, with whom and how.

Research question B addresses the issue if and what kinds of consequences collegial teacher learning with video has for the learning processes they induce in their pupils and ultimately for the outcomes of
their pupils’ learning. The available evidence from the preservice and in-service studies leads us to the following tentative conclusions about these topics.

The expert ratings of student teachers’ lesson clips in the preservice study show that in their lessons, they actually used all the teaching skills they targeted for practice. In their lesson clips it can be seen that this had an impact on their pupils’ learning activity. From the literature about effective teaching, we know that the teaching behaviours involved can as such promote pupil learning. However, our preservice study does not include data about the outcomes of pupil learning. It may therefore be expected, but it could not be determined if the student teachers have indeed promoted pupil learning.

The in-service study includes more data about pupil learning. To begin with, the teachers noted in their poster presentations that pupils did not necessarily notice much of changes they introduced in their teaching and insofar as they did, their reactions were mixed. Either pupils were enthusiastic about more variation in lesson activities or they appeared to feel indifferent about or even resist activation. At the least, the latter does not disprove improvement in the use of effective teaching behaviours on the part of their teachers. Perhaps it even suggests it.

The follow-up interviews conducted with the experienced teachers lead us to conclude that pupils’ reactions to changes in teachers’ actions are an important reason for teachers to decide whether or not and how to introduce and structurally retain such changes in the longer term. Teacher learning in the form of enhancing and broadening teaching repertoires is encouraged by collegial cooperation and feedback. Such professional development in turn promotes more active engagement with the subject matter in pupils. Evidence of this engagement ultimately convinces teachers of the extent to which and the respects in which they will change their actions.

Together, the preservice and in-service studies suggest that peer coaching with video can assist student as well as experienced teachers in taking initiatives to activate learners and accomplish forms of teaching and learning which are more characterised by responsiveness and dialogue than direct instruction alone.

5.2 Theoretical implications

The research findings reported in the preceding chapters and our conclusions from them raise a number of theoretical issues. In this section, we discuss implications of our findings and conclusions for firstly the extent to which teacher behaviour is changeable, secondly consequences of changes in teacher behaviour for pupil learning and achievement, thirdly how changes in teachers’ behaviour come about under the conditions of daily work and finally individual differences in these processes.

Our first research question “In which respects and in which ways can collegial learning with DV help teachers improve the quality of their instruction?” assumes that teacher behaviour is amenable to intentional change. This assumption is not self-evident, as we know that much of teacher behaviour is routinised and “unconscious”. This could not be otherwise as teachers have to rely on highly automated patterns of (re)cognition and response in order to be able to function in their work environment, which is inherently very complex and dynamic (cf. Miller, 2011). This means that teachers, in order to change their behaviour, need to slow down as it were and view their own behaviour from somewhat more distance than they normally do. Such reflection is hard to realise in the face of daily workload and it is probably even harder to draw perceptible consequences from it. Perhaps this is a major reason why so
little research is available demonstrating that teacher education and professional development are capable of influencing the acquisition and development of teaching competence (Cochran-Smith & Zeichner, 2005 and Desimone et al., 2009 respectively).

Nevertheless, evidence does exist that preservice teacher education and professional development can make a difference (cf. Darling-Hammond, 2000; Brouwer & Korthagen, 2005 and Garet et al., 2001; Franke et al., 2001 respectively). Evidence also exists that structured and targeted use of video can promote changes in teachers’ action (see the review of microteaching research by Klinzing, 2002). Even in the face of less than optimal coherence in teacher education programmes and a frequent gap between the messages emanating from teacher education institutions and the reality of student teaching in schools, preservice teachers do acquire knowledge and skills useful for being a teacher. Even in the face of unfavourable work conditions and institutional traditions, experienced teachers do help equip pupils for work and life. Both groups do so while carrying with them “apprenticeships of observation” (Lortie, 1975) and facing the expectations from pupils, parents, colleagues and school leaders as well as constraints set by political forces and public opinion. All these influences tend to discourage teachers from questioning habitual behaviour and routines. Still, the possibility of change in teacher behaviour exists.

The findings reported here are consistent with this observation. What is more, considering the obstacles mentioned above, we find the outcomes of both the preservice and the in-service studies encouraging. Both have yielded clear indications that combining reciprocal peer coaching with structured visual analyses of teacher action can promote the acquisition, development and diversification of repertoires of effective teaching skills. From our review of 21 empirical studies of teacher learning with digital video we had derived the expectation that this combination is capable of generating changes in teachers’ action in the classroom (cf. section 1.2.1). This expectation has been confirmed. We attribute the effects of reciprocal peer coaching with video as a strategy for teacher education and professional development to its potential for making visual representation functional for social meaning-making.

Another point emerging as relevant from both our literature review and the studies reported here is the period of time needed for effects of visual teacher learning to unfold. This period appears to span at least one school year. The in-service study shows that certain changes in teacher behaviour, notably those involved in the second and third project goals (offering more opportunities for differentiation and increasing pupils’ autonomy as learners) can be hard to achieve. This finding can be attributed to the conditions under which teachers regularly work, especially the fact that most teaching takes place at fixed times in fixed places in fixed groups. Such a context generates routines and role expectations which can only change gradually. Indications supporting this assessment arose in the third and fourth project years, when the teachers – including seven who participated a second time – were beginning to come to grips with the challenge of increasing opportunities for differentiation by exploring strategies and techniques for using blended learning environments.

The student teachers in the preservice study were involved in literature study, student teaching and peer coaching with video during the whole first year of their programme. Comparing the rate of their progress with that of the experienced teachers is hardly possible, but as stated before we find it encouraging that they already succeeded in enacting forms of dialogical teaching. Perhaps their use of video has accelerated their learning. They may also have benefited from a lesser workload than the experienced teachers. Other factors influencing their progress may have been that they had graduated from the highest level of secondary education and were freshmen still untrammelled by occupational socialisation, who could be obliged to perform quite faithfully the learning activities as designed in the intervention.

Our second research question “Can effects of DV use be observed not only in teachers themselves in the form of broader and richer skills repertoires, but also in pupils’ reactions to teachers’ instructional...
behaviour in the sense of adequate learning behaviour and/or better learning results?" addresses the impact of changed teacher behaviour on the learning processes engaged in by pupils and – contingent on this engagement – its ultimate effect on pupils' learning results. This causal chain is hard to research, but this report does contain some indications of impact on pupils’ learning processes, but none about effects on their learning results.

As stated in section 5.1, our studies indicate that peer coaching with video has contributed to the acquisition and elaboration of specific teaching skills. What conditions, factors and/or processes are responsible for these changes was explored especially in the analysis of follow-up interviews in the in-service study.

The causation involved in the interaction processes specified here is of a highly mediated nature. Until more evidence about this issue becomes available, we think it would be premature to question the benefits and utility of investing in teacher learning and teacher work conditions. Absent evidence is not the same as negative evidence. Moreover, it is plausible to expect that improved teacher action will promote pupils’ learning. Quality of instruction has been shown to be an important lever for raising school achievement (Barber & Mourshed, 2007).

The mediated character of causation indicated by our studies is in line with the expectation we visualised in Figure 2. The content-focused interaction between teacher and learners and the development of teachers’ instructional repertoires do indeed develop in close interdependence. Collegial learning with DV can indeed exert a modifying influence on this relationship, but neither more nor less than this. It would be unwarranted to expect that peer coaching with video per se were capable of bringing about significant change in teacher action. For such outcomes to come about it will be indispensable to embed the intervention in an institutional policy that takes teachers’ needs and motives into account. For further R&D work, it will be productive to focus on how interactions between teacher, learners and subject matter develop over time and to do so proceeding from a contextual and genetic view of causation (cf. Brouwer, 2010).

A final implication that we would like to point out on the basis of our findings has to do with group and individual differences. Indications for differences were found both between and within the groups of teachers studied. It appeared that especially student teachers could benefit from structured guidance, while especially experienced teachers need release time and a measure of autonomy to pursue their personal learning. Further R&D work should allow for such differences to manifest themselves and to be taken into account.

The same argument applies to differences between individuals. The in-service study in particular indicated that relations between thought and action in teacher development are complex and dynamic. This points towards the importance of attending to and creating opportunities for teachers to engage in personalised learning, i.e. to set their own learning agenda and to decide how to work on it (cf. about the issue of learner control in visual teacher learning Yusko & Brouwer, 2009 and Brouwer & Yusko, 2009).

5.3 Practical implications

From the findings and conclusions in this report, a number of consequences can be derived for the practice of teacher education and professional development. The following recommendations are brief and not exhaustive. They are presented against the background of components of the Visual Teacher

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Learning model (see Figure 1). Special attention is paid to conditions and procedures that need to be in place, before any productive impact on teacher learning can be expected.

**Change environment**

In preservice as well as in-service settings, time should be programmed and tools provided for carrying out the learning activities required. For preservice teacher education this means planning introduction and training sessions where goals, contents, coaching and IT procedures are set forth and practiced by students as well as mentors. Also, facilitation and support based on educational expertise should be guaranteed. This can be provided by external and/or internal personnel, whichever is available and feasible.

Crucial success factors in the preservice study were careful incorporation of the intervention in the existing curriculum and involvement of mentors in the schools. In the in-service study, the value of the three principles guiding the project – volunteering, egalitarianism and ownership and voice – were clearly borne out. Creating a learning environment in which peers can interact personally on the basis of mutual trust, then, is of utmost importance. The chances of promoting teacher learning with transfer potential to improvements in teachers’ practice will be increased if teachers are brought together locally and an atmosphere of trust and collegiality is created (cf. Borko et al., 2008). In our experience, this can be encouraged by making participation voluntary allowing participants to choose their own partners to work with and to decide about their own agenda (cf. section 4.3).

**Perception**

The expert ratings of the students’ video clips in the preservice study confirmed insights derived from an earlier study of lesson viewing (Brouwer, 2010) about the content that should be shown in teacher-produced video and the technical quality it should possess, if it is to enable peers to learn from it. To be understandable and interpretable for colleagues who were not present, video clips of lessons should:

a. show the interaction between teacher, pupils and subject matter in a clearly visible and audible way,

b. retain the chronological sequence of the lesson,

c. show the instruction by the teacher,

d. show different perspectives of different actors,

e. give context information (using voiceovers, subtitles, interviews and the like),

f. take into account conventions in visual language (concerning duration, image composition, viewing direction, zooming and panning etcetera) and

g. use not only images, but also text (in the form of (sub)titles).

Titles and subtitles can have a quite directive impact on viewers’ attention and meaning-making. However, even if the above “clip features” as we call them, are taken into account in teacher video production, the amount of context information available or unavailable to viewers from other sources than the video itself will probably have a considerable influence on what they will notice in and interpret from it.

**Learning activities, feedback, interpretation, reflection and enactment**

In both preservice and in-service settings, it is important to ground practice and exercise by participants in an understanding of relevant theoretical sources, i.e. they should have opportunities and incentives to study practitioner-oriented accounts of research findings about effective teaching in the subject domain at hand. On this basis, a next step to be taken by participants is to use this knowledge base for selecting personally relevant learning goals. Viewing guides should be provided for this purpose, which can be used in preparing, carrying out and reflecting on new endeavours during teaching. In other words, teachers should be given and take the opportunities for going through the whole cycle of preparing,

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staging and analysing experimental teaching. Guidelines and exercises useful for this kind of work can be found in Allen & LeBlanc (2005), Martin-Kniep (2004) and Humpert & Dann (2000).

5.4 Limitations and further research

We conclude with a discussion of limitations in the reported studies and suggestions for further research.

Limitations in the preservice study are twofold. First, because of a lack of resources, the self-report criterion measures collected in the experimental groups could be checked against expert ratings only in the first cohort. Second, there were differences between the experimental and control groups that could not be controlled for. On entry into teacher education, the experimental groups had a higher graduation level from secondary education than the control groups. In addition, the questionnaire items were partly focused on activities that the control groups by definition had no experiences with. The meaning of some items may therefore have been hard to grasp for students in the control groups.

The in-service study has two limitations which need to be addressed. In the first place, it is based solely on self-report data on a group level. Although self-report data are not per se without value (cf. Ericsson & Simon, 1980), we do intend to supplement both the preservice and the in-service studies with analyses of the video recordings that we made of conversations in plenary and small-group peer coaching sessions. Such analyses should enable us to assess the substantive depth of peer collaboration by teachers around video recordings of their work. Focal points for these analyses can be derived from the Lesson Analysis Framework proposed by Santagata and Guarino (2010) comprising the following aspects: identifying lesson learning goals; analysing student thinking and learning; constructing hypotheses about the effects of teaching on students’ learning; and using analysis to propose improvements in teaching.

In addition, the remaining follow-up interviews with experienced teachers in the in-service study will be analysed. This may contribute towards reconstructing how visual teacher learning unfolds over time on an individual level.

Finally, pupil data collected in experienced teachers’ classes in the in-service study remain to be analysed. Specifically, we hope that descriptive analysis of post-intervention measures from pupils in two teacher cohorts’ classes and comparison of these data with measures from the teachers involved will shed light on the issue if and what effects of teachers’ participation in peer coaching with video were noticed in their teaching by pupils.

Investigations into teachers’ visual learning have more than once grown from and then branched off from video studies of classroom interaction such as the pioneering TIMSS studies. In our view, both types of research could and should continue to inform each other. In particular, video studies of classroom interaction can further clarify of what concretely effective teaching action actually consists. Studies of visual teacher learning, on their part, can clarify how effective teaching competence develops.

The strength of combining these strands of research lies in the possibility of designing, piloting and evaluating strategies for teacher education and professional development which are maximally grounded in an understanding of how learners learn subjects with the assistance of teachers. As researchers and teacher educators come to understand better what kinds of teacher action promote learners’ understanding – not just memorisation and reproduction – of subject matter, a sizable contribution would be made not only to a knowledge base for teaching (cf. Hiebert et al., 2002), but also to initiatives for improving teacher education and professional development.

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The knowledge produced by research into visual teacher learning can gain strength, when replication studies are undertaken and/or studies build on each other explicitly, as is already happening in studies of “noticing” (cf. Sherin et al., 2011). In terms of the Visual Teacher Learning model, “noticing” comprises mainly the components of Perception and Interpretation, although wider definitions of this concept also refer to Feedback and Reflection. We think it would be wise to restrict the concept of noticing to attending and interpreting, so that the influence of Feedback and Enactment can form research topics in their own right. In the studies reported here, we have tried to bring these components to the fore and also explore if and what consequences peer coaching with video may have for individual teacher development in the longer run. A longitudinal perspective on how teachers integrate results of their professional learning in their daily action is a fruitful one to take. Equally productive, we think, is to consult learners more systematically about what they experience as educative teacher behaviour (Oldfather, 1995).

Peer coaching with video has a potential which merits further investment in developing and researching it as a strategy for teacher development. On empirical grounds it may be too early to say, but we attribute theoretical plausibility to the expectation that visual teacher learning will open new avenues for supporting teachers in developing a more informed, diagnostic stance in their work and making their daily interaction with learners more educative and responsive.

Erickson (2011, p. 23-28) relates of teachers’ “incorrigible” tendencies to focus their attention exclusively on what they need to know to take immediate action in the classroom, to do so intuitively and to frame their perception in story lines shaped by their own earlier experience. But is what teachers do really incorrigible? Sometimes, it is probably unavoidable for teachers to “work on your automatic pilot” as they call it. At other times, teachers do look carefully and what’s more, they learn to do so.
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Appendix

Follow-up interview questions used in in-service study

Note:
Numbers denote questions about new topics.
> signs denote follow-up and/or probing questions about topics already addressed.

Research question 1:
Which effects does participation in peer coaching with digital video have in the longer run on the development of teaching repertoires?
Interview questions 1 through 5 are meant to determine WHAT, if any, ARE effects of participation in peer coaching with digital video.

1. You participated in peer coaching with digital video in the school year..... - ...... (and ...... - ...... ).
   I’d like to know what you learned then. Please tell me.

2. It is now ..... years since you participated in in peer coaching with digital video. What has remained in your teaching at this moment of what you learned at that time?

3. (If available, show video fragment and/or poster presentation of respondent for stimulated recall).
   To revive the times when you participated in peer coaching with digital video I want to show you a video fragment.
   > Now that you see this, do you think you changed in your work, since this was recorded?
   > (encourage to tell freely about oneself)
   > I also want to to show you the poster that you presented in the last plenary session of the school year ... together with ... [colleague in work pair].
   Now that you see this, do you think you changed in your work since you presented this poster?

4. (Underlying this question are the three general project goals of peer coaching with digital video.)
   Let’s have a look at the questionnaire [post-intervention measures analogous to pre and post questionnaires completed during participation] that you filled out. I’m especially interested in the items where you marked “temporarily”.
   (Check for each item:) Why did you mark “temporarily” here?
   (Say where applicable: “under the influence of (your participation in) peer coaching with digital video”.)
   •  4.1 (about Diversifying teaching repertoire / qualitative development of existing skills:)
     > Which skills that you already possessed / used before you participated in peer coaching with digital video have you used more/less since then? Please explain with examples.
     > Did you begin to use existing skills/approaches differently? If so, how and in what situations?

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For instance, did you “polish” certain skills in direct instruction or did you do other “instructional maintenance work”?

• 4.2 (about Expanding teaching repertoire in the classroom / adding new skills:)
  > Which new instructional skills/approaches did you begin to use routinely in your lessons?
  > Did you develop new routines in your classroom? If so, which ones?

• 4.3 (about Cognitive activation of pupils / learning with deeper understanding:)
  > What kind of learning do you try to achieve in pupils?
  > Which instructional skills/approaches do you find (most) suited to bring pupils to learn with understanding?
  > After participating in peer coaching with digital video, do you feel you succeed better in making pupils learn with (more) understanding?
  > If so, what makes you think so?
  > If not, why is that?

• 4.4 (about Social activation of pupils / better cooperation of pupils with each other and with the teacher:)
  > What kind of cooperation with pupils do you like best?
  > Which kinds of behaviours do you think are (most) suitable to achieve that kind of cooperation?
  > After participating in peer coaching with digital video, do you feel you succeed better in achieving productive cooperation with pupils?
  > If so, what makes you think so?
  > If not, why is that?

• 4.5 (about Increasing autonomy / encouraging pupils to take (more) responsibility for learning:)
  > Which sorts of opportunities do you give pupils to determine their learning activities by themselves?
  > Can you bring pupils to take responsibility for their own learning?
  > If so, in which way(s)? How do you work on that?
  > Do you have pupils work with computers in order to make (more) differentiation possible?
  > If so, could you give an example?

5. (about Wellbeing during work as a teacher, in particular managing own energy and motivation during work and for continuing one’s teaching career:)
Did you acquire certain skills/approaches under the influence of peer coaching which have made your work as a teacher more pleasant?
  > If so, which skills/approaches especially? Could you give examples?
  > Has your work become less taxing because of what you learned through peer coaching?
  > Do you feel your work has become nicer because of what you learned through peer coaching?
  > Has peer coaching helped you continue in teaching? Could you please explain?

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**Research question 2:**

*How do effects of participation in peer coaching with digital video come about?*

Interview questions 6 through 9 are meant to determine IN WHICH WAY(S) and UNDER THE INFLUENCE OF WHICH FACTORS any effects of participation in peer coaching with digital video, especially on professional action, DEVELOP.

6. So far, we discussed if and in which respects your action as a teacher has changed under the influence of peer coaching with digital video.

   - **6.1** If such changes occur, how do they come about in your experience? Does your thinking change first and then your action? Or does it work the other way round?
     > Participants in peer coaching sometimes said: When I get new ideas for my teaching, I first consider them and only after that will I try them out. Others said: I first try them out and then I’ll find out why they work. How does that work for you? Please explain.
     > In which situations do you first try out a new idea and then find out why it works?
     > And in which situations do you first consider a new idea and try it out later?
     > Do you prefer one approach over the other? (If so) why do you have that preference?
     > Where does that preference come from?

   - **6.2** Over what period of time and at what pace do you change your action?
     > How long does it take you to make a new skill/approach your own?
     > What helps you make such a new skill/approach a standard part of your daily action?
     > Do you sometimes have the feeling that you fall back upon old habits?
     > (If so:) Why is that?
     > And what might you do about that?

7. (About (development of) own PERSON as professional:)

   Which factors within yourself promote or hinder your learning through peer coaching with digital video?
   > What helps you personally learn during peer coaching? Please explain.
   > And what hinders you in learning during peer coaching?
   (Insofar as not mentioned by the respondent him/herself:)
   > Are there any routines that help or hinder you? If so, which ones and how do they work?
   > Do you have a certain work style that helps or hinders you? If so, which one and how does that work?
   > Are there any other factors that help or hinder you in learning through peer coaching? Please explain.

8. (About the INTERVENTION, also based on results of earlier research):

   - **8.1** (about effective components of peer coaching with digital video:)
     Looking back on your own work during the last few years, has your participation in peer coaching with digital video paid off for you?
     > What, in your opinion, were “effective components” of peer coaching with digital video?
     > What did you find useful in cooperating in pairs?
To which activities did you pay most attention with your work mate: observing each others’ lessons; discussing each others’ lessons; preparing lessons together; other activities...?

Why did you pay much attention to just that/those activity/ies?

• 8.2 (about impact of video use:)
  > How did you feel about being recorded on video?
  > How did you feel about it in the beginning? Was that different later on? (If so) how?
  > What did you learn from seeing your own lessons again?
  > Did you view the recordings of your own lessons on a surface level or also repeatedly and using specific viewing questions and viewing points? Did that make a difference to you? (If so,) what kind of difference?
  > What was it like for you to be able to see (instead of only talk about) lessons during peer coaching?
  > Participants in peer coaching mentioned “having a look into each others’ kitchen”. Was that of any use to you? (If so,) what use?
  > Did you ever adopt approaches from colleagues that you saw on video and tried out in your own lessons? (If so,) what impact did that have on you in the longer run?
  > Did you begin to look differently at your own work because of using video? (If so,) what kind of different look did you develop: on pupils, on what they had to do with the subject matter, on your own role in this?

• 8.3 (about counterproductive components of peer coaching with digital video:)
  Were there also components in peer coaching that hindered your learning?
  > (If so:) Which elements?
  > Please explain.
  > During peer coaching, did you cooperate with a colleague with less work experience?
  > (If so:) What impact did that have on your own learning?
  > Did you cooperate with a colleague from a (completely) different school subject?
  > (If so:) What impact did that have on your own learning?

9. (About CONTEXT, also based on results of earlier research):
• 9.1 (about Factors in the school context which promote learning effects):
  Which factors in your work situation promote your learning during peer coaching?
  > In which way(s) does this help you?
• 9.2 (about Factors in the school context which hinder learning effects):
  Which factors in your work situation hinder your learning during peer coaching?
  > In which way(s) does this hinder you?
  > During peer coaching, did you run into any scheduling problems that prevented you from observing your colleague as intended?
  > (If so:) What impact did that have on your own learning?

10. (Final question:)
  Would you like to raise any issues that are important to you in connection to peer coaching with
digital video?

11. (Stop the video recording and thank the respondent. Afterwards, write down all remarks made by the respondent now and/or during saying goodbye. Such additions in an informal setting can be quite meaningful!)

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About the author

Dr. Niels Brouwer (1950) is a translator, teacher, and educational psychologist. He has worked as a teacher of English, Dutch, and social studies in various types of secondary schools and in adult education and holds tenure as an associate professor at the Radboud University Nijmegen. In 1989, he achieved his PhD degree with a longitudinal study of the organization, curriculum-in-use, and learning effects of preservice teacher education programmes in Utrecht University, the Netherlands. Since then, he has worked as a teacher educator, project coordinator and researcher in a variety of work settings in the Netherlands. Connecting practice and theory is central to his work.

Both locally and nationally, Niels Brouwer has been active in projects for innovation, quality assurance and research in teacher education. In 2002, he published a Dutch handbook for prospective and experienced teachers with an associated web page. In 2006, he was the recipient of the AERA Division K Exemplary Research Award for the article based on his dissertation “Can Teacher Education Make a Difference?” in the Spring 2005 issue of the American Educational Research Journal, co-authored with Fred Korthagen (http://www.aera.net/uploadedFiles/Divisions/Teaching_and_Teacher_Evaluation_(K)/Newsletters/summer06.pdf). In 2009, he received the ATE award for distinguished research in teacher education for the article “Promoting versatility in mentor teachers’ use of supervisory skills” in Teaching and Teacher Education about research by Frank Crasborn and Paul Hennissen, two of his doctoral students (https://www.surfmedia.nl/medialibrary/item.html?id=147549).

Currently, Brouwer’s main research theme is the use of digital video in preservice teacher education and professional development. In 2009, he organized several symposia and a preconference about this topic within AERA (http://academic.csuohio.edu/yuskob/aera2009.htm) and the European Association for Research Learning and Instruction (Earli).