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Video-Stimulated Recall as a Facilitator of a Pre-Service Teacher's Reflection on Teaching and Post-Teaching Supervision Discussion

—*A Case Study from Finland*

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Abstract

The use of video in learning to teach is not new. The vast body of research shows that both pre-service and in-service teachers benefit from analyzing video lessons conducted by experienced teachers, their peers, or themselves. In this narrative case study, we analyze one post-teaching supervision discussion about a mathematics lesson. The study provides an insight into a unique setting where teaching practice took place, i.e. one teacher training school in Finland. We aim to demonstrate one pre-service teacher's learning process in the post-teaching discussion supported by the recursive use of video-stimulated recall (VSR). VSR was used first, as a tool for encouraging reflection on the lesson during the supervision discussion, after which the pre-service teacher was interviewed while watching a video of the supervision discussion. We argue that the recursive reflection on different kinds of videos may help pre-service teachers better learn from their own teaching experiences and from the advice of the experienced supervising teacher. In addition, arguably, the recursive use of VSR may be a fruitful method for educational researchers studying teacher education.

Keywords: video, supervision discussion, reflection, mathematics teaching, pre-service teacher education

1. Introduction

Educational research had documented the various purposes and uses of video in learning and teaching. This study is positioned in the line of research addressing the use of video in learning to teach, more precisely, in post-teaching supervision discussion of pre-service teachers' own lessons (e.g., Baecher, McCormack, & Kung, 2014; Baecher & McCormack, 2012). In the context of mathematics education, the use of video has been shown to be beneficial for in-service mathematics teachers as a means of continuing their professional development (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Sherin & Han, 2004; van Es & Sherin, 2008). The use of video has also been shown to be beneficial for pre-service elementary and pre-service mathematics teachers, allowing them to analyze their own and others' teaching (Santagata & Yeh, 2013; Sherin & van Es, 2005; Star & Strickland, 2008).

On the other hand, some researchers question the effectiveness of video technology in the teacher education context (see e.g., Wang & Hertley, 2003). Blomberg, Renkl, Gamoran-Sherin, Borko and Seidel (2013) criticize studies using video as providing insufficient description of the application of the video to support pre-service teachers' learning. The authors (2013) believe that this missing link determines how effective video really is in teaching and learning. With this case study, we respond to this criticism by carefully documenting the use of video during one Finnish pre-service teacher's practice teaching and the post-teaching discussion with his supervising teacher about one mathematics lesson. We also document the effectiveness of the recursive application of VSR from the viewpoint of a pre-service teacher.

Teaching practice provides pre-service teachers with opportunities to acquire practical experience of teaching, but also to analyze their own teaching in discussions with more experienced supervising teachers. Arguably, video recordings are an important tool in the supervision of practice teaching as they provide the opportunity for more focused post-teaching discussion, allowing pre-service teachers to explore their own methods by actually being able to see them in the way that others (e.g., supervisors) do. However, Baecher et al. (2014) assert that

there is still much to be understood regarding the facilitators of video-supported reflection on the lesson. Building on the latter under-researched aspect, this case study provides one example of the ways video may facilitate pre-service teachers' reflection during post-teaching supervision discussions. The study will also display the relationship and interaction between a pre-service teacher and a supervisor, as well as the qualities that a supervising teacher in this process needs (Gelfuso & Dennis, 2014). Agreeing with Santagata, Zannoni and Stigler (2007), field experience of teaching may not necessarily be the most fruitful or might provide pre-service teachers with only a one-sided repertoire of what teaching and learning is. Compared to earlier research, this study provides a view into a unique setting: a teacher training school in which Finnish pre-service teachers conduct their teaching practice. This setting allows pre-service teachers to see the connections between what they are taught in university courses and what happens in practice (Kaasila, Lutovac, & Lauriala, 2014).

This paper contributes to the body of knowledge by documenting the systematic and recursive use of video stimulated recall in teaching practice. We report the findings of a case study that considers one Finnish pre-service teacher's learning process during a supervision discussion on his practice teaching in the teacher training school environment. This study uses video recording for two-fold application of video stimulated recall. First, VSR was used as a tool (Seago, 2003) in order to promote the development of one pre-service teacher's reflective knowledge on his first experience of teaching mathematics. Second, VSR was used as a research method for exploring this pre-service teacher's learning process, supported by supervision discussion in teaching practice. We see that video recordings are particularly useful for researchers in their interpretations and will provide some discussion on their use in teacher education research. Accordingly, the main research question addressed is the following: *What kind of learning process supported by the supervision discussion and the recursive use of video stimulated recall does a pre-service teacher undergo after his first experience of teaching?*

2. Related Work

2.1 Video as a Facilitator of Learning to Teach

Video recordings of teaching have been used widely for the purposes of pre-service and in-service teachers' learning and professional development (Rich & Hannafin, 2009; Sherin & Han, 2004; Sherin & van Es, 2005; Star & Strickland, 2008; Wang & Hertley, 2003). These studies had informed us about the multiple benefits of video for the process of learning and teaching, and especially its ability to display the various aspects of teaching that would otherwise be left unnoticed by teachers (Davis & Walker, 2005; Sherin & van Es, 2005; Star & Strickland, 2008; van Es & Sherin, 2008).

We see it is crucial that pre-service teachers develop an understanding of their own teaching and themselves as teachers while they are learning to teach (Kaasila et al., 2014). For that purpose, video can be particularly useful in learning to teach, as it can facilitate reflection on teaching (e.g., Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008; Star & Strickland, 2008; Wang & Hartley, 2003). In addition, video has also been shown to help pre-service teachers make more specific observations focusing on pupils' learning (Rosaen et al., 2008; Santagata et al., 2007). Much has been written about pre-service teachers learning to teach based on analysis of lessons conducted by others (Kurz, Llama, & Savenye, 2004; Santagata & Angelici, 2010; Santagata & Guarino, 2011). To our knowledge, however, only a few studies examine pre-service elementary teachers analyzing their own mathematics teaching together with their supervising teachers supported by the use of video. For example, Santagata and Yeh (2013) explored the ways in which a video- and practice-based course may affect pre-service teachers' teaching and analysis of it, and showed that such a course helped display pre-service teachers' thinking and conduct evidence-based lesson analysis. In addition, Bartell, Webel, Bowen and Dyson (2013) showed that with the use of video, pre-service teachers' analysis of pupils' learning improved.

2.2 The Use of Video in Post-Teaching Supervision Discussion

Davies and Walker (2005) recommended guidance when video is used to aid teachers' learning. Arguably, in the teacher education context, a post-teaching supervision discussion on practice teaching is a situation in which the use of video can be effectively combined with guidance. Powell (2005) showed that dialogues supported with VSR provided teachers with a focus for exploring their own practices and led to better articulation of their thinking process, as well as of their emotions. Further, we see that facilitating pre-service teachers' reflective processes with video and situated in the post-teaching supervision discussion has the power to integrate the teaching of knowledge and skills and the learning of reflection. In such a process, the enhanced reflectivity helps pre-service teachers to see pedagogical alternatives (Kaasila & Lauriala, 2012). We also see that the use of video in the post-teaching supervision discussion has the potential to create a tense situation or a crisis for pre-service

teachers, which has been argued as a necessary condition for teacher development and change (see e.g., Meijer, 2011).

It is important to note that supervising teachers are essential in the process of learning to teach, and may promote or even hinder it. Baecher et al. (2014) argued that post-teaching discussion between a pre-service teacher and a supervisor is of central importance for the learning process; however, the authors also acknowledged that these discussions are often far from dialogical. Moreover, pre-service teachers' reflective processes are often overshadowed by the supervisor's views and speech. Further, Baecher and McCormack (2012) suggest that video recording lessons may develop the interaction between supervisors and pre-service teachers in a more dialogical way, as each of the parties has the chance to watch the video, analyze it, and make their own video review. In all, video recordings have been shown to support collaborative learning (Seago, 2004).

2.3 Finnish Teacher Education and Teacher Training School

It has been well documented that pre-service teachers see field practice as more important and meaningful for their development as teachers than university courses (Feiman-Nemser, 2001). Indeed, what is being taught and how in teacher education often create a gap between studies and teaching practice. As Santagata and Yeh (2013) pointed out, there is a need for a stronger link between university courses and practice teaching. In addition, when pre-service teachers practice their teaching in field schools, they are often provided with a mismatch between theory and practice, and they often conclude that university courses do not provide them with useful knowledge.

Teacher education in Finland is regarded as research-based, promoting pre-service teachers' own inquiry though a teacher-as-researcher approach (Jakku-Sihvonen & Niemi, 2006; Toom et al., 2010). Pre-service teachers' are assisted in exploring their own becoming as teachers and are encouraged to undergo change, such as belief change (see e.g., Kaasila et al., 2014). The university courses are directly linked to teaching practice in training schools (Toom et al., 2010). Teacher training schools in Finland are a special setting where pre-service teachers practice their teaching in an innovative, safe environment. The latter is crucial, especially for first-time teaching. Training schools operate in partnership with universities, and thus also have higher professional staff requirements. This means that supervising teachers need to demonstrate that they have the competence to work with pre-service teachers (Jakku-Sihvonen & Niemi, 2006). The tight connections between courses and practice in training schools further foster this research-based approach to educating future teachers (Kaasila et al., 2014). Arguably, teaching practice in training schools allows pre-service teachers to connect the knowledge obtained in the teacher education setting to school practice by analyzing their own teaching, engaging in post-teaching discussions with supervising teachers and peers, and also reflecting and reporting on their experiences in a teaching portfolio (Toom et al., 2010).

Regarding the use of video in teacher education, Blomberg et al. (2013) suggested it should be aligned with the central aims of teacher education programs and can only be fully effective in a well-conceptualized environment. Similarly, we see that Finnish research-based teacher education together with its essential element–teacher training school–provides a conceptualized learning environment which allows for inquiry orientation and innovative approaches to learning and teaching, such as recursive use of VSR. In addition, Finnish teacher training schools usually enable the use of new technologies, such as the *Mobile Multimodal Recording System*, which we describe in the method section.

In what follows, we provide some information on education, particularly two mathematics education courses a pre-service teacher in this study–Jani–took prior to his teaching practice. *Mathematics education I.* (3 ECTS) aims to develop pre-service teachers' pedagogical knowledge and emphasizes the central learning outcomes, such as pre-service teachers' ability to plan mathematics teaching by taking into account the curriculum and different learners, critically evaluating the application of various learning tools to teaching, and understanding and applying different learning theories when planning mathematics teaching. Some of the contents addressed in the course are: mathematics learning theories and mathematics as a discipline; mathematics learning difficulties and the model of support; affect, attitudes and beliefs towards mathematics, etc. Pupil-centered teaching methods are also addressed in this course; one goal is to promote students ability to plan pupil-centered lessons. *Mathematics education II.* (4 ECTS) focuses more on knowledge of the subject matter and pedagogical content knowledge. After passing the course, pre-service teachers should be able to explain and evaluate the key goals, content, teaching methods, and assessment of primary mathematics and apply this knowledge to their teaching. The content considered in the course includes: teaching percentages, teaching algebra, teaching statistics and graphs, teaching estimation, and problem-solving and its teaching. One of the central aspects of this course is

students' wider coursework, where they use different kinds of teaching methods, and have to justify the choice of a particular method.

3. Methodology

3.1 Data Collection

In this paper, we present one case from our pilot study on video-supported post-teaching supervision discussion. The research subjects of the wider research project are 15 fourth-year pre-service elementary teachers from the Faculty of Education of the University of Oulu in Finland and seven supervising teachers from Oulu University Teacher Training School. Here, however, we examine one case: a supervision discussion between a pre-service teacher named Jani and his supervising teacher, Sari. Jani has a strong background in mathematics on the basis of his school experience, but he had not taught mathematics before the teaching practice started. Sari is an experienced supervising teacher who is also qualified to teach mathematics.

The data collection consisted of three phases (see Table 1). In the first phase, we video-recorded Jani's first mathematics lesson in teaching practice. Jani taught fractions in the third grade, which is one of the key topics in elementary school mathematics (Santaga & Guarino, 2011). In the second phase, Jani and his supervisor Sari engaged in a post-teaching discussion where they addressed the pedagogical events in the above-mentioned video. The post-teaching supervision discussion was also video-recorded. In the third phase, we interviewed Jani and Sari separately on the basis of the video of the supervision discussion. Jani was asked to describe his views of the critical events during the post-teaching discussion with the supervising teacher. We also asked him to summarize his views of Sari's supervision and its meaning for his learning process.

Table 1. Phases of data collection

Phases	Data collection
1	Video data on the pre-service teacher's first mathematics lesson.
2	Video data on the supervision discussion: the pre-service teacher and the supervisor talk on the basis of the video of the pre-service teacher's lessons.
3	Separate interviews with the pre-service teacher and supervisor on the basis of the video of the supervision discussion.

While collecting the data, we used the Mobile Multimodal Recording System (M.O.R.E.), which can be used in different locations in the classroom. This means that we can see the social activity in the entire classroom. The system can record at least 16 tracks of audio signals and has a wireless microphone set for every person being monitored (pre-service teacher and pupils). The external microphones enable small-group interactions to be recorded, including ones that would normally not be available (Borko et al., 2008). The recording system was developed by Media Team Oulu and the Learning Research Laboratory (LearnLab) at the University of Oulu.

3.2 Data Analysis

For the purposes of this narrative case study (Lieblich et al., 1998; Kaasila, 2007; Lutovac & Kaasila, 2014), we chose to address and analyze three critical excerpts from the post-teaching discussion between Jani and Sari. We chose the first excerpt, the beginning of the discussion, in order to lay the framework and provide the context for the two later excerpts. The second excerpt was chosen by the pre-service teacher and the third excerpt by the supervising teacher. They were asked independently to choose the video clips that were the most meaningful for them; for Jani's learning and for Sari's supervision. For us as researchers, these video excerpts were fruitful, as they clearly showed interaction between Jani and his pupils, as well as interaction between pupils. As suggested by Sherin, Linsenmeier and van Es (2009), these video excerpts also captured Jani's and the pupils' thinking. We analyzed these excerpts in terms of the focus of the post-teaching discussion, the pre-service teachers' role, the supervisors' role, the kind of relationship between the two being displayed, whether there are critical points present in terms of Jani's learning, etc. We also sought meaningful expressions, and possible arguments that both participants would use in order to defend their views and be convincing. In order to obtain additional information about the interpretations we made of the above mentioned excerpts, we analyzed the pre-service teacher's interview. In this analysis, we paid attention to what he learned during the post-teaching discussion with the

supervisor. We were also interested to know about the facilitators of Jani's learning process from his own point of view.

4. Results

Here, we first consider the three excerpts from the post-teaching supervision discussion and finally, we present the pre-service teachers' view on his own learning process supported by the supervision discussion and recursive use of VSR.

4.1 Excerpt 1: The Beginning of the Post-Teaching Supervision Discussion

Sari prompted Jani's reflection with an open-ended question to invite him to talk about his own views regarding the lesson.

Sari: "Please, tell me what you liked about this lesson."

Jani: "It went OK, but the only question that I began to think about was the following: 'Did it include too much teacher-centered work?' I see that it did quite a lot. My preparation for the lesson was quite challenging because I was insecure about how much content I can include in the lesson."

Sari: "OK. If you see that the lesson included too many teacher-centered parts, could there have been something that you could have left out?"

Jani: "Not necessarily! Maybe a good teacher would have been able to get pupils to be more active, to turn my teacher-centered lesson into a more pupil-centered direction… But I did not trust myself enough to accomplish such a magic trick."

Sari: "Actually it is not a magic trick at all. It is related to [a teacher's] skill at handling a situation where a pupil is giving surprising answers. You have good proficiency in mathematics, so you would have handled it."

Jani seemed to be satisfied with the lesson overall, but he immediately began to reflect that his lesson might have been too teacher-centered. This suggests that he has been exposed in his courses to this issue. It could also suggest that Jani felt his practice did not match his beliefs. Jani also revealed the insecurity he experienced while preparing for the lesson. This is not a surprise, as first-time teaching is not only intellectually demanding for pre-service teachers, but often also emotionally demanding. Next, the supervisor effectively grasps what Jani said and asks him to reflect on possibilities for decreasing teacher-centeredness. Jani's reply is interesting: in his view, only a "*good teacher*" would be able to do such a "*magic trick*" as to move the lesson in a pupil-centered direction. Although it was evident that Jani is aware of the importance of pupil-centered instruction, he did not believe he could successfully conduct the lesson in such manner in his first time teaching. Sari also remarks on his metaphorical utterance and tries to instruct Jani about the kind of teachers' skills needed for conducting a lesson in a pupil-centered way. In addition, Sari tries to set the ground for Jani to see that his predisposition for mathematics teaching is good as he has a strong mathematical background, and thus he has perhaps better potential to conduct a more pupil-centered lesson. From the dialogue above, it is evident that Sari leads the discussion in an assertive, but supportive way.

In the interview, Jani related the following:

"I had not taught mathematics at all before this teaching practice. I did not have enough trust in my skills to make greater use of pupils' actions, because as a young teacher, I had a fear that it simply would not work. I was afraid that if I moved my teaching in a pupil-centered direction and made more use of [the pupils'] own actions and problem-solving, the lesson would be chaotic. I did not trust myself... I trusted pupils' abilities to discover the content. I was thinking that the method that I used helps pupils to understand the content better. But if I had tried a pupil-centered teaching in my own way with my limited experience, I would not have been confident that they would have understood as well."

The interview with Jani revealed that that he indeed saw himself as inexperienced, which is likely what all pre-service teachers experience when teaching for the first time. In this sense, he was unsure and afraid to apply certain ideas he believed in practice. His aim was that the pupils would understand the content, and he was afraid that by taking different approach to teaching it, he would hinder their understanding.

4.2 Excerpt 2: Video-Supported Discussion on One Episode in Jani's Lesson That He Saw as Particularly Meaningful for His Learning Process

Sari: "Here you could have given the pupils more time to think. It makes the lesson more pupil-centered. Please wait until all pupils have had a chance to think!"

Jani: [Does not react]

Sari: [Showing with her hands what Jani should have done] "Here you could have asked all the pupils to write a division line."

Jani: "OK."

Sari: "How do you see this event? Would you do it in the same way?"

Jani: "I agree with you that I should give everyone a chance to do it."

Sari: "One of the most essential things is that a teacher must be able to manage in a situation where no one is raising their hand. But if you want to get the pupils to think, you should give them more time to do it. You could reduce teacher-centeredness by waiting until a pupil comes up with the answer. How do you see it? Should you give the answer immediately?

Jani: "Of course not!"

Sari: "So what would you do?"

Jani: "It is possible to ask them what they are thinking."

Jani and Sari are watching a teaching episode in which Jani revealed the solution to the problem to the pupils too quickly. Sari starts the discussion about the episode by instructing Jani to wait until all the pupils solve the problem, rather than giving the solution himself. Arguably, she displays her pedagogical thinking in order to explicitly show to Jani an alternative way to act in such teaching situations. Jani does not respond. Sari repeats her advice that pupils should have more time to think about the solution and tries to make sure that Jani internalizes her advice by asking "*How do you see it? Should you give the answer immediately?*" She also tries to guide Jani to handle uncertain classroom situations, such as when no child raises their hand, and advises him that, especially in such situations, he should not provide the solution too quickly. At the end of the dialogue, it seems that Jani began to understand what Sari was saying. In the excerpt above, we also see the central role that the supervisor plays when pre-service teachers' analyze their own teaching. Sari was guiding Jani to see what he would perhaps not be able to notice on his own, but she also provided him with possible alternatives to his actions.

In the interview Jani said:

"I understood what Sari meant by "*Give pupils more time to think*". It makes the lesson more pupil-centered. I made a clear mistake because I gave the answer too soon... I understood from Sari's talk that when the pupil gave the right answer, I did not give him any direct feedback, but instead I gave the feedback by pressing a button on the Smartboard and it gave the feedback to the pupil. I made a mistake. I should have praised the pupil first, and after that used the Smartboard."

The excerpt above shows that Jani was now better able to understand Sari's feedback. He was watching the discussion with Sari, and it seems that he was now able to look at the teaching episode in a more critical way. He was now willing to acknowledge that he made a mistake and he was also able to see what alternatives he could have chosen. Jani continued:

"I believe very strongly in more pupil-centered teaching, but as my lessons in some way show, I don't have enough experience that I could believe that it works. I noticed that my lessons would have been more pupil-centered if I had known the pupils better. Sari has taught pupils for many years and knows very well what kinds of methods are relevant. I agree with her that by using these kinds of small things, it is possible to change the lessons in a more pupil-centered direction. I also agree that it is a good point that a teacher should be able to handle a situation where nobody raises their hands to answer."

The data above reveals again how beliefs and practices may not be aligned. Although Jani did believe in pupil-centered instruction, he felt that as a novice teacher, he was unsure whether it would work in practice. While watching the supervision discussion, Jani began to reflect that by being more experienced, and especially knowing pupils well, he would have been able to choose more appropriate teaching methods. In addition, once again, Jani agrees with Sari's feedback.

4.3 Excerpt 3: Video-Supported Discussion on One Pisode in Jani's Lesson That Sari Saw Particularly Meaningful for Her Supervision

Sari: [A pupil is asking a question in the video clip] "What are you thinking here?"

Jani: "What a good question! A very good question! I can't say anything else!"

Sari: "When a pupil is asking something, it is a unique situation… If a pupil is really interested in something, it should always be reasonable to make use of that situation. The pupil's question was like a diamond! I wrote it up this way."

Jani and Sari are watching a teaching episode that reveals that Jani is focused on his own thinking, and is not able to react to pupils' insights and questions. This suggests, naturally, that as a first-time teacher, Jani was nervous and was unable to attend to what the students were saying. Jani certainly must have known that he should pay more attention to the students' thinking, as this is much emphasized during his studies, but obviously he was not yet able to apply this in his practice. As teacher educators, we know this is a common phenomenon, especially in the first teaching experiences. In the discussion with Sari, Jani immediately acknowledges Sari's observation and admits to his mistake. Sari emphasizes the importance of making use of pupils' questions and comments.

In the interview, Jani said:

"This was one of the best remarks about the lesson, and very important for myself too when I think about my teacher education studies: When a child is interested in something, they should always at least be praised by saying, 'What a brilliant question!' Maybe I froze a bit and was thinking that they don't need to know the answer yet. As Sari pointed out, it was like a knockout blow from the pupil. I was a bit ashamed. But afterwards I thought what a great learning experience this was for me. The aim of teaching practice is that people should learn from their mistakes."

In the interview, Jani reveals that he indeed was aware that he should have paid more attention to the pupils. He describes his feeling of shame by using the expression "*Like a knockout blow from the pupil*." However, Jani acknowledges the meaning of that experience for his learning. Jani's speech reflects well the self-development rhetoric that is often present in Finnish pre-service teachers' talk (Lutovac & Kaasila, 2014).

4.4 Jani's Reflection on His Own Learning Process

In the interview, Jani reflected on his learning process and summarized the most important lessons he learned from the post-teaching discussion with Sari. They were the following:

"First, give the children space to think. They are able to discover things if you give them enough time. Don't tell them the solutions; elicit them from the children. They have good ideas–talk to them. Second, when a pupil is motivated to talk about something, it is good to make use of this."

The upper data shows that Jani seems to understand and had begun to internalize Sari's advice on the teaching episodes they had watched. Jani reflected on the Sari's method of supervision in the following way:

"Sari's aim is to supervise so that I examine my teaching in a critical way, and that I pick up on my own the things that have been good and bad. She emphasizes discussion and interaction… She is really focused on whether the pre-service teacher has understood the feedback. In her supervision, the goal to promote growth as a teacher is always present, and it is an important thing… Sari's supervision included a clear focus. From the perspective of a pre-service teacher, it is good to go back to the discussion, because immediately after the lesson I was nervous and in a very emotional state and also because the discussion was videotaped. Let's say that I understood the great part of Sari's supervision in that moment, but afterwards I began to reflect more on what she meant. I see that her supervision practices have been mostly good… Sari's supervising includes a lot of storytelling and discussion."

Jani described Sari's supervision as dialogical and with a clear focus. Perhaps the crucial aspect of what Jani says is the emphasis he places on being able to watch the supervision discussion. He reveals that although he understood and agreed with Sari's feedback, it may be difficult to internalize all feedback in circumstances as emotional as, for example, a post-teaching discussion, and especially after the first time teaching. In this line, Jani saw the recursive use of VSR as useful:

"When a pre-service teacher is making many mistakes, as this video shows well, it is possible to begin to understand the views of the supervisor… I also began to understand through these examples. The body language that was present in the video was also useful. It shows the events when I began to internalize the things discussed… I agree that this use of video could become a permanent part of supervision in the future. When I was watching the video, I noticed a lot of new things related to my teaching and body language."

Jani first said that on the basis of the video of his lesson, he was able to comprehend Sari's feedback. Second, Jani also related that being able to see the supervision discussion made him learn more about himself as a teacher.

Arguably, as Jani himself recognized, the video indeed showed how Jani began to internalize what he was discussing with Sari.

5. Discussion

Our findings show that recursive reflection on different kinds of videos helped a pre-service teacher better learn from his first-time teaching experience and from the advice of the experienced supervising teacher. In line with extensive research about pre-service teachers' beliefs and practices, Jani's learning process showed well that a mismatch often exists between beliefs and practice (e.g., Hoyles, 1992; Kynigos & Argyris, 2004), especially in the case of inexperienced pre-service teachers. In our view, it is not surprising that Jani struggled to attend to students' thinking and questions and doubted his ability to successfully lead a pupil-centered lesson. As research shows, when pre-service teachers begin to teach, their attention is mainly on themselves: what they say and do (see e.g., Conway & Clark, 2003; Hagger & Malmberg, 2011). In such an affective state, pre-service teachers often do not recall afterwards the details of the instruction; therefore, video-based reflection certainly has great advantages over memory-based reflection.

Moreover, building on Conway and Clark (2003), we see that the recursive use of video and post-teaching discussion helped Jani to reflect from inward towards outward. This means that Jani shifted the focus of his reflection from himself to the pupils and their thoughts and questions (Rosaen et al., 2008), as well as to how his teaching decisions affect pupils' learning (Santagata & Guarino, 2011). Arguably, the use of video for reflective purposes not only permits seeing what might had been missed or forgotten, but it also gives a chance to reflect with a different viewpoint. For example, while watching the video and discussing with his supervising teacher, Jani was able to observe the lesson from the perspectives of the pupils and supervisor. He was able to see himself as a teacher in a somewhat similar way as the pupils or supervisor did. However, at the same time, the process of reflecting outwards facilitated in Jani what Conway and Clark (2003) labeled an "inward journey". The fact that the video was used in his first-time teaching experience gave Jani a great opportunity to begin the process of self-awareness. Being able to actually see the mismatch between his beliefs and practice enabled Jani to gain self-knowledge and further stimulated the need for self-development. Indeed, self-development rhetoric has been often displayed in studies of Finnish pre-service teachers (Lutovac & Kaasila, 2014). Arguably, the use of video to reflect not only on his own teaching but also on the post-teaching discussion with his supervisor facilitated the reflective journey from inward to outward and back to inward.

We also observed that the relationship between the pre-service teacher and the supervising teacher was a significant aspect of the pre-service teacher's learning process (Baecher et al., 2014; Kaasila & Lauriala, 2010). This demonstrated well the central role a supervising teacher can play in becoming a teacher. It helped Jani question his practices and reach new understandings. We see that the post-teaching discussion was in part traditional, but in part it also involved dialogical elements. For example, as suggested by Alexander (2006), the dialogical elements were evident in the fact that the discussion was purposeful, as it was well acknowledged by the pre-service teacher, and it was also supportive. Both Jani and Sari listened to each other, and alternative viewpoints were considered. We see that Sari's supervision practices could have been more conversational; however, she was in a positive sense highly instructive by directing Jani towards her thinking about the lesson. As suggested by Ghousseini and Sleep (2011), Sari provided Jani with a lens for viewing and analyzing his own teaching. Sari reflected out loud about her own pedagogy and justified her views.

Building on the discussion between the pre-service teacher and the supervisor in this study, we conclude that video-based teaching practice together with the post-teaching discussion would benefit all pre-service teachers. In addition, we also see that post-teaching supervision discussions after the first-time teaching deserve special attention. They should be handled in a sensitive manner and provide opportunities for quality reflection. It has been argued that pre-service teachers' reflection should reach to deeper levels, such as on their beliefs, identity or mission (Korthagen, 2004). However, we do believe that too much or too deep reflectivity after the first-time teaching does not necessary yield greater benefits, but it might be overwhelming and too much too handle for a student who is just beginning to learn to teach. Instead, we argue, supervisors should draw attention and guide students to reflect on the central aspects that arise from teaching and those aspects that students bring up. Moreover, the benefit of video-based teaching will allow for the exploration of beliefs and other issues later, as videos can be watched repeatedly.

The clearly displayed link between teacher education and teacher training school settings is perhaps the biggest contribution of our findings. This was clearly evident in the competence of supervising teacher to conduct a post-teaching discussion. However, this competence is not necessarily common for supervising teachers in field schools. Due to the fact that Sari teaches in a teacher training school, she is well informed about the goals and

emphasis of the teacher education unit where Jani is undergoing his education. For example, particularly pupil-centered instruction is greatly emphasized in Finnish teacher education and mathematics education courses too, and most supervisors in training schools are aware of and comply with this emphasis. Therefore, it is not surprising that in her supervision, Sari greatly highlighted issues around pupil-centered teaching and directs Jani's reflection in a similar manner as a teacher educator would. This is not only in line with the current research on teaching, but it also allows pre-service teachers to see in practice what they have learned at university. Therefore, arguably, a supervisor like Sari who is able to conduct fairly dialogical post-teaching discussion and is aligned with the main goals of teacher education may have the power to minimize the aforementioned gap.

On the basis of this case study, we see that the recursive use of VSR alongside the M.O.R.E camera system offers many benefits for studies of post-teaching supervision discussions. For example, it was crucial for both participants that they were able to choose from the video-recorded lesson those events that were the most meaningful to them. Both Jani and Sari were able to pay more attention to pupils' questions and problem-solving, as well as Jani's and the pupils' body language. For example, in the third excerpt, one pupil's question that Jani overlooked was one of the central discussion prompts. Without the use of the M.O.R.E camera system, this situation would not have been captured or recalled and there would have been no opportunity to reflect upon it. Second, when Jani watched the video of the post-teaching discussion, he again noticed important aspects of communication and body language that were very useful stimulators for his reflection. On the basis our findings, we conclude, that the recursive use of VSR has great potential to facilitate pre-service teachers' learning process by capturing valuable learning experiences, but also for enabling more fruitful post-teaching supervision discussion.

Finally, we also argue that the recursive use of VSR has methodological benefits for educational researchers concerned with teacher education. The recursive use of VSR as a method may provide grounds for reconsidering validity in teacher research. Many of our original interpretations of the video-recorded lesson changed after having an insight into video-recoded post-teaching discussion and the interview based on the latter video. We claim that the development and use of more innovative research methodologies will also help researchers in their efforts to produce more valid interpretations, thus making better use of the knowledge obtained. Arguably, further research attention could be placed on exploration of methodological benefits of VSR.

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