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Tablets as a digital tool in supervision of student teachers' practical training

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ABSTRACT

In the project “Tablets in Practicum Supervision”, the tablet has been tested as a tool for observation and supervision in Norwegian teacher education. The study incorporates 14 practicum supervision groups and focuses on how the use of tablets can influence the quality of the supervision and the coherence between teaching, observation and supervision. Throughout the supervision process, the groups have used tablets to produce and share texts, pictures and video recordings. The use of tablets has resulted in eight aspects of quality improvement: improved observations, stronger motivation, improved feedback, increased sharing of opinions, improved coherence, improved structure, improved preparations, and increased reflection.

Keywords

Group based supervision, ICT, observation, Teacher education

INTRODUCTION

In the public debate, a question often addressed is how the quality of Norwegian teacher education can be improved in order to enhance students' competence to master the teaching profession (Norwegian Ministry of Education and Research, 2014). One of several focus areas is the improvement of supervised practicum training in schools, which accounts for about 100 days of the students' teacher training. The quality of the practicum training is claimed to be of decisive importance for the students' competence development (e.g. Børsheim, 2013). International research shows that most student teachers share the opinion that the practical knowledge gained through classroom experience and through interaction with supervisors and fellow students is of most value (Shulman, 2004; Townsend & Bates, 2007). This is supported by research carried out within Norwegian teacher education programmes (Jahreie, 2010; Fosse, 2011).


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Although the quality of practicum training appears to be decisive for the development of student teachers' competence, there is limited Nordic research on the development of the quality of practicum supervision in teacher education (Haugan, 2011). Similarly, the documents of intent defining the premises for practicum supervision emphasize the significance of practicum supervision (Norwegian Ministry of Education and Research, 2010), but provide few guidelines on how to specifically carry out or improve supervision (Haugan, 2011).

In Nordic practicum supervision, the ideal of reflectivity has been pivotal (Schön, 1983; Handal & Lauvås, 1983, 1987). Reflectivity is identified as perhaps the most important dimension through which skilful teachers develop, and can thus be regarded as a fundamental challenge in teacher education (Shulman & Shulman, 2004). However, several research studies suggest that reflectivity is a demanding ideal (e.g. Lunenberg & Korthagen, 2003; Orland-Barak, 2005; Townsend & Bates, 2007; Solstad, 2014).

The reflective challenge in practicum supervision emphasizes the relevance of issues such as the quality of observations and the observation material, which are prerequisites for reflection (Neufeldt, Karno, & Nelson, 1996). The importance of using written supervision forms has, in this respect, been strongly emphasized for a long time in the Nordic region (Handal & Lauvås, 1983). However, the potential that more systematic observation and more active student participation may have in observation work has not been emphasized much. The same applies to the significance of systematic "quality feedback" for students' learning processes (Hattie & Timperley, 2007), as well as the importance of sharing students' and supervisors' experience and reflection through participation in communities of practice (Wenger, 1998).

Furthermore, the reflective challenge in teacher education can be related to the use of technology in supervision. Technology seems to be used only to a small extent in the actual supervision process (Hixon & So, 2009), and research on the potential of technology in practical supervision work is virtually absent, one exception being the extensive international research within teacher training, and other professional training, documenting the value of digital videos (e.g. Fukkink, Trienekens, & Kramer, 2011; Moreno & Valdez, 2007; Sherin & Han, 2004; Van Zoest & Stockero, 2008). However, in most teacher education programmes where video is used, it is done in so-called microteaching on campus, not in practicum supervision in schools (Tochon, 2008).

TABLETS IN PRACTICUM SUPERVISION

Based on the reflective challenges described above, the project "Tablets in Practicum Supervision" has emerged. The objective of the project has been to explore and develop the tablet as a tool for group-based observation and supervision during practicum periods in teacher education.

The project is a collaboration between the University of Agder and the University of Tromsø, initiated in 2012. The approach has been open and exploratory, and the research question addressed in this article is: *How do students and supervisors, respectively, perceive the quality of group-based practicum supervision in teacher education when tablets are used as tools for observation and supervision?* There has been particular focus on how tablet technology affects and interacts with the three basic related activities of supervision (fig. 1): (student teachers') teaching, observation (of student teachers' teaching) and supervision.

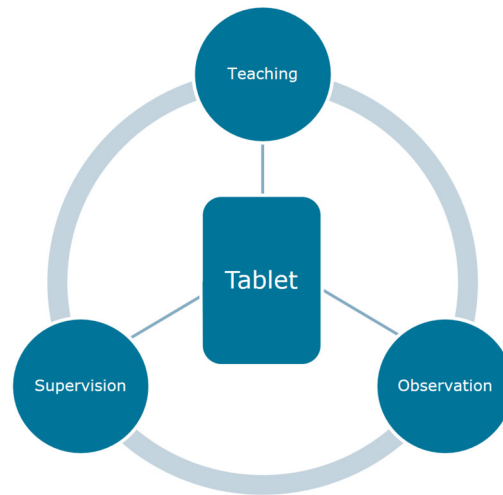


Figure 1: Tablet as a digital tool in teaching, observation and supervision.

Throughout the practicum period, the practicum supervisor and students in 14 practicum supervision groups (3–4 persons) have used one tablet (iPad) each, and by using the tablet and a set of apps¹, they have worked continuously in the following manner²:

TABLE. 1: THE USE OF TABLETS THROUGHOUT THE SUPERVISION PROCESS.

Point in the supervision process	Student and supervisor actions
<i>Before teaching</i>	The student who will be teaching has shared his or her supervision form with everyone in the group.
<i>During teaching</i>	Both the students and the practicum supervisor have taken observation notes, in addition to pictures and video recordings of the teaching and teacher activities. This is shared with everyone in the group.
<i>Between teaching and supervision</i>	Participants have prepared for the supervision by reviewing each other's observation material, thinking about and discussing the material.
<i>During supervision</i>	The group has discussed the teaching based on notes and presented pictures and video recordings.
<i>After supervision</i>	The students have had the opportunity to continue their observations, reflections, reading and discussions based on the observation material.

1. Evernote, Skitch, Moxtra, FreedomMIC CloudOn, Dropbox and the film/photo functionality of iPad.
2. Further information, <http://www.praksisveiledning.no>

Reflectivity, situated learning and feedback as challenges in practicum supervision

Three core perspectives are recurrent in discussions of quality in practicum supervision related to teacher education: reflectivity, situated learning and qualitative feedback. These perspectives will be addressed in the following, and will be related to the use of technology.

In recent decades, Nordic teacher education and practicum supervision has been strongly influenced by the ideal of *reflectivity* (Handal, 1980; Handal & Lauvås, 1983, 1987), and the same professional ideal is found in many Western countries (Neufeldt et al., 1996). More recently, reflectivity is linked especially to Donald Schön's (1983) concept of the reflected practitioner. Reflective supervision involves a heavy emphasis on student autonomy, and is regarded as key to enabling the student to handle the challenges posed by the constant changes and the complexity of the teaching profession. Furthermore, Shulman and Shulman (2004) have identified reflectivity as one of the four main dimensions through which skilful teachers develop, and the reflective dimension is claimed to be the most important (Brantley-Dias, 2008; Posner, 2005; Schön, 1983). However, research studies express concern over students' real ability to approach the reflective ideal. It has, for example, been pointed out that reflection can be superficial, subjective, instrumental (Lunenberg & Korthagen, 2003; Solstad, 2013) and may lack integration of theoretical knowledge related to practice (Finne, 2013; Shulman, 2004; Townsend & Bates, 2007).

Although the word reflection is used with complete naturalness in supervision literature and public documents, it is pointed out that the concept is often used loosely and imprecisely (Emsheimer, Hansson, & Koppfeldt, 2005; Neufeldt et al., 1996). Furthermore, reference is made to the fact that the concept, when looked at more closely, has a multidimensional character: It has to do with various qualitative preconditions for reflectivity, various qualitative attributes of reflective processes and various qualitative implications of reflectivity (Neufeldt et al., 1996).

A criticism against the discussion of reflectivity has also been that too little attention is devoted to the social aspect of student learning in practice (Usher, 1979). This criticism often refers to Lave and Wenger's (1991) social learning theory, in which it is emphasized that student learning is situated and cannot be seen separately from the practical context within which the profession is exercised. A central element is so-called *communities of practice*, which are informal cooperative learning groups that work together to develop competence. The working alliance formed by these groups consists of three main elements: a) mutual engagement, b) joint enterprise, and c) shared repertoire (Wenger, 1998). Learning to function as a member of a professional learning community is in itself described as a main dimension through which skilful teachers develop (Shulman & Shulman, (2004). In principle, students can participate in various communities of practice during practicum periods. The most important community of practice, however, is the supervision group, consisting of one or more supervisors and usually several students.

A third core perspective is *qualitative feedback* (Hattie & Timperley, 2007; Debuse et al., 2007). In more recent years, the importance of constructive feedback for people's learning has been extensively documented, which is commented on as follows in a research review:

Of all the factors that make a difference to student outcomes, the power of feedback is paramount in any list. The overall effect-sizes of feedback from over 1000 studies based on 50,000+ students reveal that feedback is among the highest of any single factor, and it underpins the causal mechanisms of most of the factors in the top 10–20 factors that enhance achievement. (Hattie, 2009)

In higher education, the importance of feedback quality for students' work on written assignments is especially well documented (Mathisen, 2012). It has been shown that feedback quality cannot be taken for granted. For example, it can be vague, unclear as well as confusing (Crawford, 1992; Goldstein & Kohls, 2002), inconsistent and contradictory (Fregeau, 1999) and even dysfunctional (Cohen & Cavalcanti, 1990).

Student teachers today exist in so-called technology-rich environments (Lund & Hauge, 2011). This is reflected in the considerable testing and research carried out on educational use of Information and Communications Technology (ICT) in instruction in higher education in general (Price & Kirkwood, 2013) and in teacher education in particular (Johnson et al., 2015; Røkenes & Krumsvik, 2014). However, strikingly little attention and research is devoted to how technologies can be used as mediating artefacts (Lund & Hauge, 2011; Säljö, 2010) in practicum supervision groups.

Despite the fact that little attention is devoted to the use of modern technology in practicum supervision in teacher education, video observation is nevertheless widely used internationally (Fukkink, Trienekens & Kramer, 2011). In particular, there is a 30-year tradition for microteaching, where student teachers practice teaching other students on campus using video observation (Tochon, 2008). Video seems to be used far less as an active observation tool during supervised practicums, although there are examples of this (Bryan & Recesso, 2006). The value of video observation for students' and professionals' learning is certainly widely documented. For example, a review of several hundred experimental studies shows that video feedback has a statistically significant impact on professionals' interaction skills within a number of vocational areas (Fukkink, Trienekens & Kramer, 2011). Furthermore, the fact that the use of video can enhance student teachers' ability to reflect on practice is documented more and more strongly (Moreno & Valdez, 2007; Van Zoest & Stockero, 2008).

The tablet has a function as an artefact due to its multifunctional and multimodal character (combinations of text, pictures, video and sound), which in the current project has been used to register, share and communicate video, pic-

tures and text in supervision groups. Thus far, there is no research that shows how this type of technology can influence the quality of practicum supervision in teacher education.

METHOD AND MATERIAL

The project's long-term research design falls within the broad category of pedagogical design-research (Van den Akker et al, 2006), the findings of which will form the basis for the future design of the use of tablets and similar technologies in supervision.

This article is delimited to early exploration of students' and supervisors' perceptions of quality in the project. Therefore, qualitative interviews were emphasized. The data collection took place during the period from autumn 2012 to spring 2014, encompassing a) open, low structured, individual interviews with all supervisors, b) open, low-structured focus group interviews with both supervisor(s) and students in the 14 groups, and c) open, qualitative questionnaires, which were answered anonymously online by all students (43) and supervisors (17). The supervisors volunteered based on invitations, via studies in supervision pedagogy and the universities' practicum administration. The students represented both the first and the second year of the teacher education programme.

Focus group interviews were chosen to gain access to abundant data on the participants' experiences (Morgan, 1997). For the same reason, between-method triangulation (Denzin, 2009) using individual interviews, focus group interviews and qualitative questionnaires was prioritized.

Any method of collecting social research data will involve reactivity (Hammersley, 1995). The relationship between supervisor and students is asymmetrical and it is therefore reasonable to be aware of the risk that students' statements in a group interview context can be radically coloured by the presence of the supervisor (and the researchers). This consideration was another major reason for using between-method triangulation (Denzin, 2009), by combining group interviews with anonymous qualitative questionnaires.

All data material was available as text, including transcribed interviews. The analysis was carried out in two phases – first “line-by-line coding” followed by gradually more “focused coding” – resulting in the categories presented in the article (Charmaz, 2006). During both phases, two researchers worked in parallel on the coding for the sake of reliability (Guest, 2012).

Findings

The main finding of the study is the great potential that students and supervisors perceive the tablet to have when it comes to improving the quality of practicum supervision. The quality aspects highlighted below are, for the most

part, common to students and supervisors. For this reason, students' and supervisors' experiences are mainly presented collectively. First, we will present a) aspects of perceived quality, and then b) the challenges experienced by students and supervisors.

a) Higher quality in the supervision process

Students and supervisors generally explain that the use of tablets has enhanced the quality of the practicum supervision, compared to previous supervision. Specifically, eight characteristic and related topics are highlighted:

1. *More valid, abundant observations*

Firstly, one of the most characteristic aspects of quality enhancement described by students and supervisors is that the observations are more convincing or valid, as illustrated by the following quote:

Student: If a mistake was made, like last year, when I said that I could not calm them down, we had no evidence to prove it. Here we have the evidence on the iPad ... It is easy to know what to do differently when we have the examples on film ...

This student stresses that the supervision has improved through the use of tablets to validate the observations in the group. In several interviews, discussions are centred on the challenge associated with the fact that supervisors and fellow students may have different perceptions of what they have observed. A particular problem expressed is the fact that observations fail to convince the student who has been teaching, and the potential of the tablet for contributing to shared perceptions is highlighted. For example, one student, contrary to the supervisor's opinion, thought she had performed rather poorly in her handling of a teaching situation. When watching the video recording, however, the student concluded that she actually handled the situation well.

Secondly, the observations are described as more abundant and conveyed by more parties than previously. As one student said: *The observations are broader ... the pictures speak volumes*. Such descriptions are often referred to in the data as a crucial basis for more extensive reflection (cf. finding a-8).

2. *Greater engagement and concentration*

Another obvious quality aspect is that the students in particular are described as more engaged, concentrated, attentive, motivated, enterprising, involved or eager in the supervision process than earlier:

Supervisor: Yes, in a way I experienced them to be more concentrated in their observations since ... they know that we will see it right away. Often, I have experienced (before) that they take some notes, although not a whole

lot; they are mostly concerned about remembering what happened. And often, ... the feedback from the students has been “well, it was a good lesson; you remembered such and such, and I thought you did well”. And that was about it.

Both supervisors and students often express that they perceive greater engagement and concentration when tablets are used. The students describe improved motivation and engagement even more clearly, for example: *It made me more engaged in the supervision setting. ... It was also more fun.* Besides, several of the supervisors experience their own engagement to be strengthened, as illustrated by the following quote: *I have never observed this well ..., I think. Since we shared everything, I had to be attentive. ... It makes you more attentive during the observation part, and consequently also more zealous during the actual supervision.*

3. More clear and honest feedback

Students and supervisors also clearly express that the use of tablets helps improve the quality of the feedback, particularly with regard to two aspects: clarity and honesty. A typical statement from a supervisor is that the tablet *enables a more direct approach to a given situation as well as the opportunity to speak the same language from the very beginning, since the reference base is much clearer.* One student expresses the same point as follows: *It is easier to understand what the practicum teacher and fellow students mean when they can show examples of what they are saying.* Both statements thus illustrate perceptions of clearer communication and mutual understanding during the supervision process.

Furthermore, the students in particular are very concerned about the value of receiving more honest, direct or unfiltered feedback. This applies especially to the feedback from the supervisor, but even more so to the response from the fellow students. The fact that the students continuously share feedback through their observation notes via the tablets is regarded as mainly positive by the students; one student expresses this as follows: *You need sincere feedback on how you did, not the kind that has been weighed back and forth.* One of the students describes the quality of more honest feedback in the following characteristic manner:

Student: The feedback was sincere and honest, since it was written at the “time of the act”.

4. More extensive sharing of observations and views

A related quality improvement aspect is that the use of tablets has contributed to observations and views being shared to a greater extent and more frequently than before, a point highlighted by both students and supervisors. This applies especially to the students' contribution, which one student comments on as follows:

Student: In a way I feel like there is more activity between us students ..., because now we must all share our thoughts with each other. In addition, I think we have more to contribute to each other since we are writing our comments during the lesson.

More extensive sharing is, first of all, mentioned in relation to the supervision sessions: Previously all we talked about was that ... it went well, whereas we now address the observations in more detail, since we share them with others. Second, more extensive sharing is described in various spontaneous contexts, before and after the supervision sessions, especially through digital sharing of observation notes. As expressed by one supervisor:

Supervisor: There has been more cooperation. They have communicated a lot among themselves about the lessons, and some of this is probably reinforced due to the sharing of notes. They have also watched each other's films, independently of the supervision.

According to several students, the digital sharing of notes mentioned in the previous quote provides insight into observations and views for which there is no time to discuss during the actual supervision session.

More generally, project participants express in various ways that a *culture of sharing, or less "secrecy"*, as one supervisor puts it, has developed in the group. Several students emphasize that the extensive sharing has made them more curious about how other students perceive the teaching. A number of supervisors also state that the extensive sharing has given them more insight into the students' thoughts regarding the teaching, and that different observations can be made, as illustrated in the quote below:

Supervisor: Reading fellow students' comments regarding the teaching has also given me different insight into their world of thoughts. They may not be equally aware of the fact that I have also observed their observations.

5. Improved coherence and continuity

Both students and supervisors explain that the use of tablets contributes to improved coherence and continuity during the students' practicum period. The main reason for this is that the tablet enhances the participants' memory. The improved quality of the supervision through enhanced memory concerns, first of all, better coherence between observations and conversations. One student expresses it this way:

Student: It makes for good coherence when you have it all on film, notes and pictures. Then it is not so easy to forget what you have observed, and the supervision goes more smoothly.

Second, the participants stress the importance of strengthened memory for coherence and continuity throughout the training period. It is especially emphasized that the use of tablets makes it easier to distinguish between impressions from a high number of lessons during the practicum period, and students emphasize in particular that it makes the assessment of their own development easier. For example, a supervisor states that *it has been easier to follow up on the student – easier to go back and see what we have talked about.*

Moreover, some students and supervisors comment that students can have a tendency to remember negative feedback the best, whereas the tablet has helped the students to more easily notice and remember the positive feedback received over time:

Supervisor: ... They also said that it was easier to feel a sense of accomplishment since they could also see the positive comments and not only remember the things that perhaps went wrong.

Both supervisors and students also explain that tablet access to the observation material leads to more spontaneous, continuity-conducive conversations of a supervisory character, especially between the students, in addition to the planned supervision.

6. Improved structure and simplification

Both supervisors and students state that the use of tablets has also contributed to a simpler, more structured everyday life during the practicum period, which a student expresses as follows:

Student: I am very happy to get rid of all the paperwork, because last year we had to ... copy up half a rainforest every day and put it somewhere, ... you can simply go to the website and download the material there and then. I can send the plan in the evening, so they can look at it in the evening instead of ... in the morning ...

Many supervisors in particular emphasize the simplification of their work as the main difference from previous supervision:

Supervisor: I think everything related to it (the supervision) has become much easier ... perhaps a little easier to keep my focus on the goals they have set, because I am no longer clutching a stack of paper ... is the greatest advantage, as I see it so far. ... (I) will miss it, because my job as a practicum teacher is so much easier. All the practical aspects of it, that is. Everything is right here.

Both quotes above illustrate a widespread claim that improved structure and simplification through the use of tablet computers has made a substantial contribution to better quality in the supervision process. In line with this, many

participants have a pessimistic view of engaging in supervision without the tablet. One student, for example, comments that it would be like *going back to the Stone Age*. A supervisor with little experience with the use of tablets prior to the project comments that *(I) do not ... understand how I would go back to the old system ... this way is so much easier*.

7. Improved preparations for supervision

Students and supervisors express that students prepare for supervision better than previously. Many students explain that, whereas they previously did not prepare much or not at all, they now read each other's notes before the supervision, and they reflect and sometimes discuss among themselves before the supervision. Many students also watch video recordings, and some choose a rather thorough approach, like this student:

Student: I look through all the films I recorded during the lesson and reflect on these. ... Often, I also notice other things in the film/picture that I did not see when I was using the camera. I feel like I am much more prepared for the supervision, and more active in fellow students' supervision instead of just sitting there waiting for my turn to receive feedback.

Some supervisors express uncertainty with respect to the question of whether they prepare more. However, several supervisors say that the tablet's simplified opportunities for preparations (cf. finding a-6) do contribute to improved preparations.

8. More reflection and greater learning outcome

The students' learning process is described by supervisors and especially by students as more reflective and involving reflection at a somewhat deeper level. The students more generally express a feeling of reflection at a deeper level, while the supervisors experience a deeper level of student-reflection during the supervision sessions.

Participants describe the experience of the supervision process as more reflective in many different aspects related to the use of tablets (cf. findings a1–7). Three explanations of more reflectivity are frequently mentioned: More time to think, the disciplining effect of producing shared observation materials and the observation materials triggering reflection. This is discussed briefly below.

Firstly, students and supervisors very often relate increased reflection to the fact that the students have more time to think about questions and views when these are communicated through the tablet before the supervision session:

Supervisor: Yes, to try to compare this to before, it used to be that when I asked ... questions about it, they began to think about it there and then but they did not always arrive at good answers. Now, however, they have had

a chance to think it through, they have been able to use some time. ... In retrospect, I have seen that when they have the time to think through what they did ... and ... (what) other ways they could have done it, I think. ... we have been able to have more conversations and discussions than previously.

Participants comment that having more time to think about questions and views contributes to deeper individual reflection. However, they equally emphasize that it contributes to more widespread reflective dialogues between peer students before the supervision sessions.

Secondly, the participants emphasize that producing shared texts and selecting video clips and images forces reflection, so to speak. As one student puts it: *When you are writing notes for someone else, you tend to reflect more, because your notes will be seen.* Participants frequently express similar views that the continuous sharing of the observation materials disciplines them in their observation activity, and that this in itself strengthens their own reflection.

Thirdly, the participants typically describe that the widespread sharing of observation materials contributes to triggering more reflection, wonder, questions, as well as more and better discussions. One supervisor puts it like this: *Things become more direct. A kick start for the supervision session.* In particular, it is extensively commented that the direct and concrete character of the observation materials helps to stimulate both individual and communal reflection.

More generally, the students in particular express a greater learning outcome from tablet-assisted supervision than previously, as summarized by one student: *The greatest difference, I would say, was the learning outcome. I feel like I learned much more about myself as a teacher.*

b) Challenges

In addition to the mentioned aspects of higher quality in practicum supervision, students and supervisors point out several challenges related to the use of tablets.

1. A need for customized software

Both students and supervisors identified the software (apps) as the area with the most evident potential for improvement when it comes to the use of tablets. In the project, several programs not specifically designed for the purpose are used. The programs are, to a large extent, described as adequate but they are also associated with significant limitations and problems. Incidentally, software problems were stated as a main reason why two of the fourteen groups used the tablet markedly less than other groups. All participants had a range of views regarding what the ideal software should look like. A general desire was for a customized “all-in-one” program that covers all the functions for which

several programs are currently used, with capabilities for collaborative writing and time-line orientation, as well as searching and video-editing capabilities.

2. Improved utilization of the tablet's potential in supervision

A large number of supervisors express that they see a greater potential for tablet usage than what they manage to achieve during the supervision. This is, in part, related to the limitations of the software but also to a need to develop supervision strategies. The supervisors are not very specific with respect to what and how the supervision should be improved, but some main challenges are repetitive: In particular, how to adapt the use to students and year levels, how to vary the use of tablets during supervision, how to handle the multitude of observations during supervision, as well as how to structure the supervision process and better guide the students through the process. Almost no students express views on this challenge.

3. Doubts concerning the use of tablets

Some supervisors express concerns regarding the use of tablets, especially with respect to the extent of their use. First, concerns are expressed in a couple of groups that *a one-sided focus on the tablet* and the observer role could result in the students not taking sufficient time to get to know the pupils. It is also expressed that, during supervision, it is important to leave room for talking about issues not so closely related to what is observed in the classroom.

Another doubt is related to some students' and supervisors' concern about their lack of technical competence prior to the project. However, all of these participants comment that they are surprised at how intuitive and simple the tablet is to use. The student who expressed the strongest prior concern comments on her experiences as follows:

Student: I just about cried when I found out. ... Yes, but that is because my technical interest is in general far below average ... it was like "oh my goodness, practicum is stressful enough, and on top of it all I won't be able to do it" ... it went very well; it took perhaps three days ... now, I am so delighted that I got to have it ... I just think it is very, very useful.

A third doubt is related to concerns regarding how the use of tablets in the classroom affects students and especially pupils. However, the overall impression is that both pupils and students quickly adapt to the use of the tablets and that students and supervisors express surprise at how little attention is given to the use of the tablets. Students express to a limited extent that the tablet affects them negatively, but they do express that it helps them focus better, and that they are, nevertheless, influenced by being in an observation and evaluation situation.

TABLE 2 SUMMARY OF FINDINGS.

Overarching categories	Subcategories
<i>a. Perceptions of higher quality in the supervision process</i>	<ol style="list-style-type: none"> 1. More valid, abundant observations 2. Greater engagement and concentration 3. More honest and clear feedback 4. More extensive sharing of observations and views 5. Improved coherence and continuity 6. Improved structure and simplification 7. Improved preparations for supervision 8. More reflection and greater learning outcome
<i>b. Perceived challenges</i>	<ol style="list-style-type: none"> 1. A need for customized software 2. Improved utilization of the tablet's potential in supervision 3. Doubts concerning the use of tablets

DISCUSSION

The present article seeks to answer the question of how students and supervisors perceive the quality of group-based practicum supervision in teacher education when tablets are used as tools for observation and supervision. In the following, we will discuss the eight main findings of perceived quality improvement in light of the three core perspectives on quality in practicum supervision mentioned previously in the article: reflectivity, situated learning and high-quality feedback. Challenges will also be discussed.

The findings indicate that the tablet has a significant potential for enhancing reflectivity in practicum supervision. This can be elaborated in light of the conceptualization of aspects of reflectivity described by Neufeldt et al. (1996). In general, reflectivity can be linked to three main aspects: characteristic attributes of a) conditions for reflectivity, b) reflective processes, and c) consequences of reflectivity.

A fundamental precondition for professional reflectivity is that there is a *trigger* for reflection (Neufeldt, Karno & Nelson, 1996). The study indicates that supervision using the tablet contributes to observations serving as a far greater trigger for reflection than supervision without the tablet. In particular, the observations or “triggers” are perceived to be more valid and abundant (finding a1), feedback based on observation is perceived as more honest and clear (finding a3), and the observations are shared to a greater extent (finding a4). In other words, the findings indicate that the supervision contains more and qualitatively better “triggers” than previously, and that text, pictures and video all contribute to initiating reflectivity.

Most clearly, the findings depict strong *reflective processes*, overlapping several of the four *typical* attributes of reflective processes (Neufeldt, Karno & Nelson, 1996): In particular, the findings indicate that more attention is given to the students' actions, emotions and thoughts in interaction with the pupils (e.g. findings a2–5). Another attribute of reflective processes is a reflective stance and, in this respect, the findings indicate clearer intent (findings a2–3 and a5), more active inquiry (e.g. findings a1, a2–4), greater openness to various types of understanding (e.g. findings a4 and a8), and increased willingness to be vulnerable (e.g. findings a3–4). A third aspect of reflective processes is “sources of understanding”. It is uncertain to what extent the reflections are related to pedagogical theory. However, it is clear that they are based on experiences made by the students directly, and/or indirectly, via the observation material on the tablet (e.g. findings a1, a3–5). A last attribute of reflective processes according to Neufeldt's conceptualization is “depth”. As with the conceptualization, the findings indicate more thorough and meaningful reflection (e.g. findings a1–5, a7–8).

The third main aspect of reflectivity, “consequences of reflectivity” (Neufeldt, Karno & Nelson, 1996), also corresponds to the findings, which, to a great extent, indicate a more changed perception of teaching situations and changed behaviour (e.g. finding a8). Another attribute of implications of reflectivity is long-term growth. This is more difficult to assess, since this study does not follow the students over time.

Compared to Neufeldt's broad conceptualization, the findings indicate that the use of the tablet has made a powerful contribution to reflectivity. Furthermore, there is reason to claim that the findings of the study point to aspects that are not clearly captured by the conceptualization. Firstly, *motivational and emotional* attributes of reflective processes have limited space within the concept. It is true that attributes such as willingness to be vulnerable and perceived meaning are mentioned, but the strong significance the tablet has had for reflective engagement and concentration (finding a2) is not captured quite so clearly.

Secondly, the conceptualization captures the *social* or sociocultural dimension of reflectivity to a limited extent. In this regard, an objection against Neufeldt's concept is that it has a relatively one-sided individualistic orientation. A central aspect of the findings is the very significance that shared reflective starting points (triggers) and various social attributes of reflective processes have for the quality of the supervision. In particular, according to the conceptualization, a distinct shared attention and a shared reflective stance (with shared intent, shared active inquiry, mutual openness and mutual willingness to be vulnerable) are reflected in the findings (findings a1–5 and a7). Moreover, these limitations in Neufeldt's conceptualization correspond to criticism raised against traditional research on learning, in which the cognitive and content-related aspects of learning are given most attention, whereas the social aspect is less predominant, and motivational and emotional aspects of learning have been

rather neglected (Illeris, 2003). More specifically, criticism is, as mentioned, raised against a lack of attention to the social aspect of students' learning in practice (Usher 1979). Lave and Wenger's (1991) social learning theory captures such central findings in the study: The significance of the use of tablets in practicum supervision (findings a1–8) portrays strong communities of practice, with a strong working alliance, characterized by a) stronger shared mutual engagement, and b) stronger joint enterprise in the supervision groups. It is also reasonable to assume that the groups can develop c) a greater shared repertoire for practice, routines, tools, and symbols, etc. (Wenger 1998), although the existing data material does not give grounds for describing this clearly. In most groups, however, it is described very clearly that a strong culture of sharing is developed, where pictures, video recordings and most of all texts are shared and woven into more active, continuous reflective processes than what the participants have experienced without the use of tablets. In other words, the study provides indications of not only the tablet's impact on students' individual reflections, but also, at least as much so, the potential tablets as artefacts can have for sociocultural learning processes in groups. Hence, the tablet has shown potential for enhancing the supervision groups as communities of practice or working alliances (Bordin 1983).

Feedback from the supervisor and fellow students is perceived to be of fundamental significance (findings a1–5 and a7–8), and the quality of the feedback is often linked to its multimodality, through the use of multiple sources such as writing, conversation, pictures and video. Similarly, former studies confirm that students prefer feedback in the form of sound or video rather than only in the written form (McLaughlin et al., 2007). Furthermore, the feedback mentioned in the interviews deals both with deeper reflection on practice and, not least, more skills-oriented aspects of the exercise of the profession. One-sided focus on more demanding reflectivity (c.f. Neufeldt et al., 1996) can cast a shadow over the fact that learning simpler skills is also a very important part of student teachers' practical learning. In the same manner, reflectivity is commonly linked to critical aspects of a student's own practice. However, the respondents also mention the significance of feedback as positive confirmation that the student is on the right track.

The supervisors in the study clearly express that they see a greater potential for the use of tablets than that which they are able to exploit. They also express that technology influences the manner in which they supervise (finding b2). It is reasonable to assume that the potential documented in this study can be even greater, given that the supervisors' competence in using the tablet as a tool increases over time. Besides, the development of customized software (finding b1) is likely to accentuate the opportunities.

In the "Method and material" section of this article, it was questioned whether reactivity in the interview situation could colour the data material. It should be noted that the statements provided by students and supervisors during interviews compared to those provided in anonymously answered questionnaires

do not differ particularly from each other in terms of how positively or negatively the expressed experiences are.

SUMMARY AND CONCLUSION

The aim of the project has been to explore the possible potential of tablets in practicum supervision related to teacher education. More specifically, the present article answers the question of *how students and supervisors, respectively, perceive the quality of group-based practicum supervision in teacher education when tablets are used as tools for observation and supervision*. The findings show that both students and supervisors have experienced the tablet to be of radical significance when it comes to increasing the quality of the supervision, compared to their previous experience with supervision without the use of tablets. Correspondingly, the findings also indicate qualitatively stronger coherence between teaching, observation and supervision.

More specifically, both students and supervisors relate the positive significance of the use of tablets to eight aspects of quality improvement: They experience the observations to be more valid and abundant, supervisors and students become more engaged and concentrated, and the feedback more honest and clear. In addition, the participants experience more extensive sharing of observations and views, improved coherence and continuity during the practicum period, and better structure and simplification of the observation and supervision work. Students and supervisors also experience enhanced preparations for supervision (especially student preparations) and, in addition, the supervision becomes more reflective and provides greater learning outcomes. The aspects of qualitative improvement are, for the most part, common to students and supervisors. Students, however, perceive greater engagement and concentration, as well as more honest feedback, even more so than supervisors do.

Comprehension of the tablet's potential for improving the quality of practicum supervision is elaborated by viewing the main findings in light of three established, complementary perspectives on quality in practicum supervision: Firstly, compared to Neufeldt's broad conceptualization of the reflectivity concept (Neufeldt et al., 1996), the findings indicate a strong potential as a tool for enhancing individual student reflectivity. Secondly, the tablet shows strong potential as a tool for situated learning (Wenger, 1998), for strengthening the supervision group as a community of practice, with a markedly stronger character of working alliance and sharing culture. Thirdly, the tablet shows potential as a tool for striving for more feedback of a higher quality (Hattie & Timperly, 2007).

In addition, participants point out two particular challenges for better exploitation of the potential: Supervisors and students express a need for customized software, while supervisors emphasize the importance of improved use of supervision strategies. Some supervisors and students also express doubts concerning the use of tablets, although, in most cases, the doubts subsided during

the practicum training. Overall, this gives reason to believe that the potential of the use of tablets (or similar technologies), in practicum supervision can be even greater. In particular, it is reasonable to assume that customized software, development of an understanding of and competence in handling the genre, as well as reflective capacity to handle doubts and concerns, can contribute to strengthening the quality of the practicum supervision even further.

LIMITATIONS AND FURTHER RESEARCH

The limitations of the study point to opportunities for further research on the use of tablets in practicum supervision: First of all, the study is not based on systematic observations of the supervision sessions. An observation-based study can provide a better basis for studying how the design of the supervision, the supervision interaction and the content of the supervision are affected – and how the use of tablets may be improved. The present study is based on a relatively large qualitative material. An even greater trial can provide a better basis for studying differences with regard to how the supervision is carried out and how it should be adapted. In any such greater implementation study, specially developed software should be used, based on the findings of this study. This may reduce the implementation barrier represented by practical user problems.

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