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Exploring the use of technology designed to support the supervision process in teacher training placements

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Abstract

The practicum supervision process in teacher education comprises various cyclic experiential learning activities (e.g. planning, observation and supervision conversation). Research has documented considerable challenges relating to this process, but also that digital technology can help. In the study, a software program designed for practicum supervision (MOSO) is tested in three Scandinavian teacher education programmes in which groups of student teachers are supervised by a mentor teacher. Throughout this process, the participants continuously alternate between individual reflection, and analogue/digital collaborative reflection. The aim of the study is to contribute knowledge about the experiences of using this technology, and data was collected through qualitative survey and focus groups. The software contributed to improving the quality of the practicum supervision process, for example by: safeguarding supervision on lesson planning; improving observations, feedback and recollection; and facilitating more reflective and collaborative student teachers. The study also identifies important challenges when using such technology.

Keywords: Supervision process, teaching placements, practicum, mentor teacher, student teacher, MOSO

Introduction

There is international consensus that the supervision process for school placements, in which one or more student teachers are typically supervised by a local mentor teacher, are fundamental to student teachers qualifying for the teaching profession (e.g. Ezer et al., 2010). However, research has identified a number of challenges in the supervised learning process, while also documenting that technology can help support the process (Bjørndal et al., 2023). This article serves an example of a study of how the use of a software (MOSO – Mentoring and observation software) can influence this process.

The supervision process student teachers go through in the practicum is characterised by cyclical activities (cf. Figure. 1). Experiential learning literature contains many different cyclical models of the

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learning process (Fowler, 2011). The supervision literature contains a large number of similar models or concepts, consisting of activities normally found in the teacher education practicum context (Acheson & Gall, 1997; Kayıkç et al., 2017). This study is based on a model of the supervision process, consisting of five learning activities illuminated in empirical studies (Bjørndal et al., 2023):

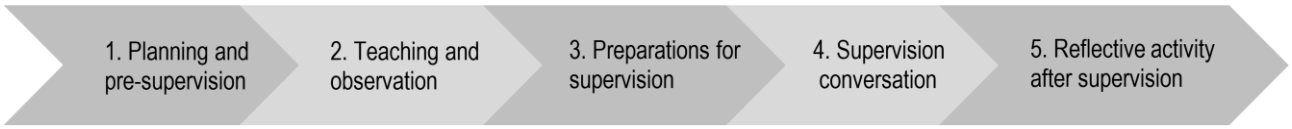

Figure 1: The five activities of the practicum supervision process.

The project has involved the testing of a social media inspired software (MOSO) designed for supporting supervision during the school practicum. The aim of the research project has been to contribute knowledge about the experiences of student teachers and mentor teachers when using such digital technology in practicum supervision (groups), compared to such experiences without the technology, and this is done by answering two research questions:

1. How and to what extent did the student teachers and mentor teachers experience that the use of MOSO influenced the quality of the activities in the supervision process?
2. What kinds of challenges did they experience when using MOSO as part of the supervision process?

Theoretical framework: Experiential learning theory

Experiential learning theory is considered the most central theoretical basis for designing the practicum and understanding how – and how well – the practicum supervision process works (Fowler, 2011). This theory draws on a number of scholars including Dewey, Habermas, Kolb, Levin, Freire, Mezirow, Piaget, Rogers and Schön (Kolb & Kolb, 2008; Roberts, 2011). Although there is significant variation in the understanding of experiential learning, it is nonetheless characterised by several common features (Kolb & Kolb, 2008). For instance, all share the beliefs that learning: a) is best understood as a process, b) always includes re-learning, c) requires solutions for the incompatibilities between dialectically opposing modes of adaptation (action – reflection and experience – abstraction), d) is a holistic process of adoption, e) is a result of transactions between people and their environment, and f) includes continuous knowledge processing. Three related core aspects of experiential learning are particularly relevant to this study: cyclical learning activities, individual reflection and collaborative reflection.

A. Experiential learning as a cyclical process of different activities

One common feature of experiential learning theory is the cyclical understanding of the learning process, and the literature includes a long series of more or less detailed, general models that contain a varied number of sequential activities or phases, generally involving observation, feedback, reflection, action and more (Fowler, 2011; Moon, 2004).

The literature on teaching practicums is strongly influenced by theories of experiential learning, and learning is understood as a complex and long lasting cyclical process, in which the student teacher repeats sequential activities such as planning, teaching, observing, receiving (and often giving) feedback, reflecting and participating in dialogue and so on. Such activities must be of good quality and well connected in order to create a good learning process (Acheson & Gall, 1997; Handal & Lauvås, 1987; Roland, 2017). In other words, it is the totality of the learning activities and how they work together that determines how well the experiential learning process works. The model for the reflective supervision process used in this Scandinavian study divides this holistic cyclic process into five activities normally found in such a practicum context (Figure 1).

B. Individual reflection in experiential learning processes

Reflection is considered as fundamental to experiential learning processes (Fowler, 2011; Moon, 2004), and can broadly be understood as *the internal transformation of experience* (Kolb, 2015, p. 49). The various activities in the supervision process, of which this study highlights (cf. Figure 1), are all part of the student teachers' reflective transformation of experience.

Schön's (1983) concept of the reflected practitioner has had a major influence on the practicum supervision literature, emphasising the mentor teacher's facilitation of the student teacher's independent reflection on their experiences during the practicum. Reflection is considered the main factor when it comes to preparing the student teacher for the profession (e.g. Handal & Lauvås, 1987; Posner, 2009). Schön's (1983) work offers an important distinction: Between, on the one hand reflection-in-action, which concerns reflection while the student is teaching. This is very challenging, as the situation normally requires fairly immediate action and gives the student teacher very limited space for reflection. And on the other hand, reflection-on-action, meaning supervision conversations before or after teaching, offering a far larger reflective learning space (Kolb & Kolb, 2008).

The term reflectivity is often used rather vaguely, and no unifying definition exists (Beauchamp, 2015). In any case, there is agreement that the term has a multidimensional character (Beauchamp, 2015; Neufeldt et al., 1996). Based on a much referred interview study of reflectivity-experts' conceptualisations (including Schön's), Neufeldt et al. (1996) suggests that reflection-in-supervision is characterised by a number of different qualitative conditions for reflectivity, characteristics of reflective processes and consequences of reflectivity. Here it can be emphasised that ideal reflectivity presupposes the condition of a 'trigger event' which 'represents new information to the practitioner and provides an opening for reflective process to begin' (Neufeldt et al., 1996, p. 6). Reflectivity is also characterised by an ideal understanding-seeking process, including a reflective stance, involving active and questioning investigation, openness to different types of understanding and interpretations, as well as a willingness to make oneself vulnerable. Reflective processes are also characterised by the striving for in-depth (meaningful and important) understanding rather than superficial understanding.

C. Collaborative reflection in experiential learning processes

In recent decades, theories about reflectivity, as well as those on teacher education practicum supervision, have faced criticism for being too individualistic (e.g. Bryant et al., 2004). A stronger focus has been placed on collaborative reflective learning through the experiential learning processes, often referring to Lave and Wenger's (1991) concept of 'community of practice' which has also been included in experiential learning theory (e.g. Kolb & Kolb, 2008). Their concept is about the learning that takes place when an informal group of professionals actively collaborate to solve tasks and share experiences in work contexts. Such a community of practice is defined by three qualitative aspects, as outlined by Lave and Wenger (1991): a) A jointly negotiated understanding of the enterprise; b) A mutual engagement that shows itself in the interaction patterns between the parties, enabling them to relate to each other, establish norms and build mutually supportive relationships; and c) Development of a shared repertoire of resources used in the interaction to advance the joint enterprise, such as artefacts, tools, techniques, ways of acting, common concepts, mental categories etc. The theory has been widely used to argue in favour of creating more space for collaborative reflection, especially through paired and multiple placements in practicum (Sorensen, 2014).

Research on experiential learning in teacher education practicum

Research on five activities in the practicum supervision process

An international review of 76 qualitative research studies shows that each of the five mentioned activities of the supervision process (Figure 1) are associated with their own distinct challenges (Bjørndal et al., 2023), some of which are highlighted below: (1) Many student teachers work too little with planning,

mentor teachers often do little to stimulate reflective planning, and time constraints prevent feedback on and collaboration on planning. (2) Student teachers can be insufficiently observed, and the observers' may gradually decrease how much they notice during the practicum period. The validity of the observations is also challenging, as it can be difficult for the mentor teacher to document the observations, and while peer student observations may have value, they may also be simple, superficial and/or uncritical. (3) Reflective preparations for supervision may be important, but time constraints can contribute to little or no preparation. (4) Student teachers may perceive the feedback they get in supervision conversations (the follow-up conversation between mentor teacher and student teacher(s) after teaching, at the school) as unclear, superficial, insufficient, negative and unhelpful, and they can experience difficulty remembering the teaching situations and understand related feedback. They can also be rather passive and not very reflective, in rather monologic supervision conversations. Paired or multiple practicums may contribute to collaborative reflection, but relational problems, competition and limited competence can restrict their value. (5) Reflective activity after the supervision conversation may be limited.

Research on the use of different digital modalities to support practicum reflection

In recent years, a number of studies have documented that digital technology has a significant potential when it comes to enhancing the student teachers' experiential practicum learning (Bjørndal et al., 2023; Nesje & Lejonberg, 2022). The technology used in this study (described in the next section) is multimodal, as modalities such as (micro-) texts, images and (micro-) videos are used, similar to microblogging in social media (such as a feed in Facebook etc.).

In spite of the significant attention to and considerable testing of social media technology in many teacher education programmes in recent years, the empirical research documentation in the practicum context has been limited (Goktalay, 2015). All the same, it is indicated that social media can contribute to immediate feedback (Goktalay, 2015), more reflective practice (Hramiak et al., 2009), more committed, active and collaborative student teachers (Caner, 2010), and a stronger community of practice among peers, mentor teachers and university supervisors (Goktalay, 2015; Rutherford, 2010).

There is limited research on the use of micro-video recordings (used in this study) during practicum. However, the documentation on the use of longer recordings is extensive. Such video recordings have long been documented as enhancing various qualities of practicum supervision, such as by contributing to clearer and more convincing feedback (Rosaen et al., 2008; Sumru, 2010), deeper reflection on performance (Baecher & McCormack, 2015; Nagro et al., 2017) and a better ability on the part of student teachers to notice and remember (Rosaen et al., 2008) and analyse teaching (Santagata & Guarino, 2011). Several studies also show that video recordings can contribute to student teachers being more committed and actively reflective (Baecher & McCormack, 2015; Goldman, 2007) and that video can help collaboration in analyses and discussions of practice (Baecher & McCormack, 2015; Youens et al., 2014).

The research on digital text as a modality for reflection on practicum experiences also deals with longer texts for the most part, and micro-texts (used in this study) to a lesser extent. Student teachers have long used portfolios as a tool for reflecting on their own long-term development (Parker et al., 2012). E-portfolios can encourage student teachers to reflect more deeply and engage in more multifaceted reflection (Parker et al., 2012; Toom et al., 2015), and may support active collaboration between student teachers (Boulton, 2014; Evans & Powell, 2007). Online blogs or microblogs may include multimodal content (text, images and video) and allow groups to read and comment on one another's texts. Studies indicate that longer and shorter blogs can stimulate deeper and more continuous reflection and learning (Bener & Yildiz, 2019; Boulton & Hramiak, 2012; Hramiak et al., 2009; Krutka et al., 2014), facilitate the exchange of feedback from university teachers (Harland & Wondra, 2011), as well as from their student peers (Bener & Yildiz, 2019). Blogs may also support qualities associated with communities of practice (Bener & Yildiz, 2019; Harland & Wondra, 2011; Krutka et al., 2014), and multimodal microblogs may

support individual and collaborative activities through the whole practicum supervision process (Mathisen & Bjørndal, 2016; Wennergren et al., 2018).

The use of digital technology to support reflection on practicum experiences also involves certain challenges. Video observation can for example be highly time-consuming and individual use of video can contribute to an overly negative self-assessment (Baecher & McCormack, 2015; Endacott, 2016; Kleinknecht & Gröschner, 2016) – even short video recordings can be in danger of overloading novice viewers (Erickson, 2007). Even more time and resources are required to support portfolio development (Lin, 2008; Parker et al., 2012). Blog-texts often have a rather descriptive character and offer a limited level of reflection (Harland & Wondra, 2011; Jones & Ryan, 2014; Luik et al., 2011), and it can be challenging to maintain the blog-writing and responses to it over time (Bener & Yildiz, 2019). Furthermore, in order for student teachers' reflections to be sincere, it may be important to maintain some privacy in smaller forums (Boulton & Hramiak, 2012). One study also indicates a lack of a micro-blog-software adapted to the practicum supervision process as a challenge (Authors, 2016).

An explorative study of technology-supported practicum supervision

Description of the technology and the participants use of it

On the basis of earlier research (Mathisen & Bjørndal, 2016), the University of Agder developed a prototype of MOSO, a program originally designed to support the practicum supervision process. The software was subsequently tested and developed in collaboration with eleven Scandinavian universities and university colleges.

MOSO is a cross-platform program (PC/MAC, smartphones and tablets) that gives the participants of a group (e.g. student teachers and mentor teachers) the opportunity to contribute and communicate online by way of a 'feed', similar to social network forums like Facebook (see the example in Figure 1). Every lesson or activity has a feed consisting of the participants' multimodal feedback on plans and teaching in the form of text, pictures and short video clips.

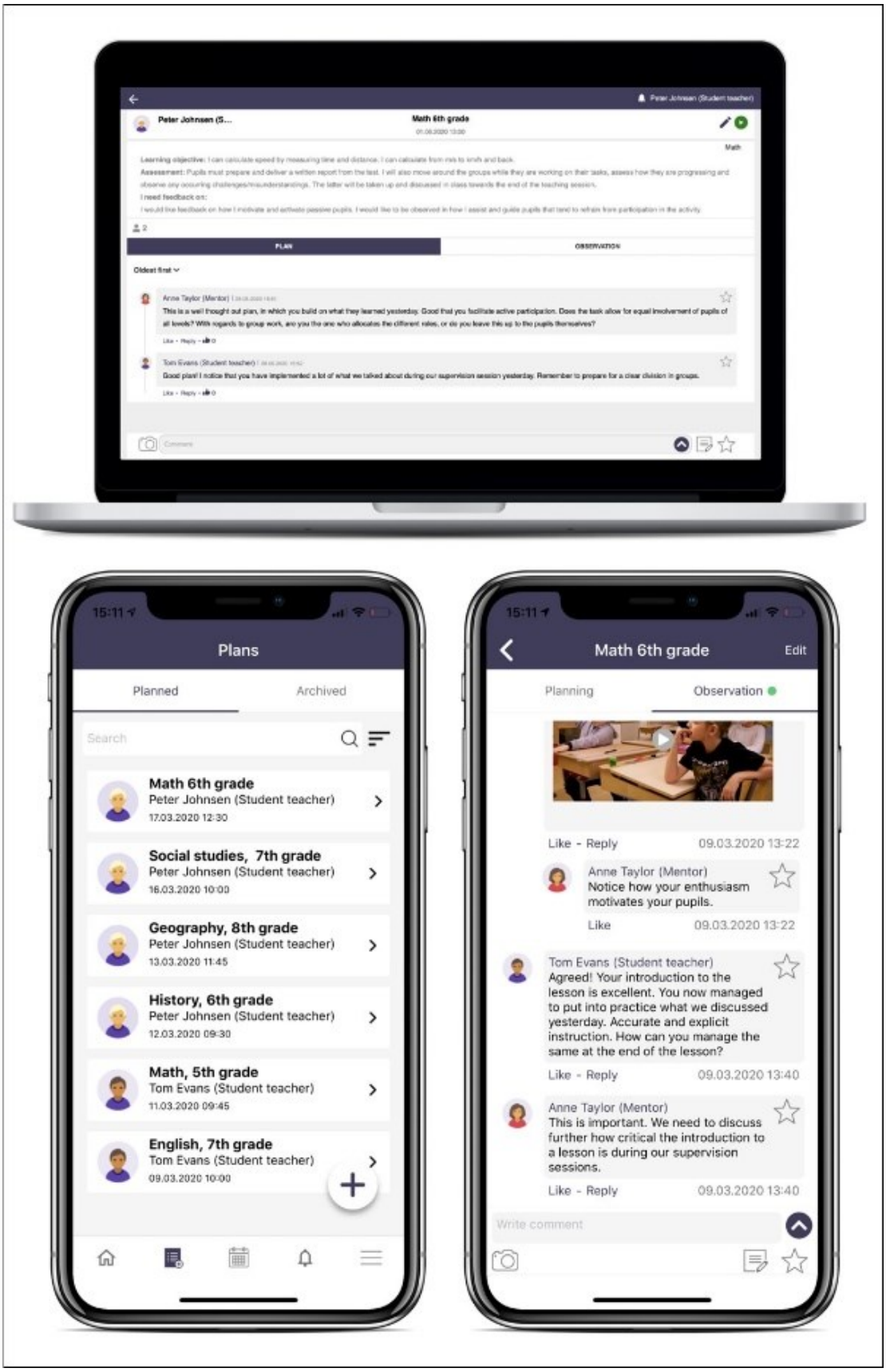

Figure 2: Example of planning, overview of scheduled lessons and observation using the software.

In this study, the software was used throughout the supervision process, to support and connect continuous alternation between individual and collaborative reflection (Figure 3).

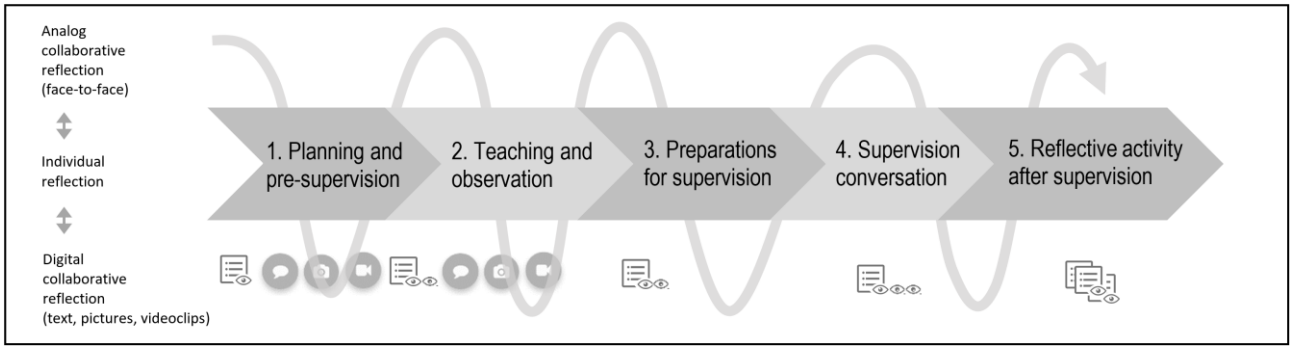

Figure 3: The practicum supervision process as continual alternation between individual and collaborative reflection (analogue and digital).

The participants' descriptions of the software used throughout the process are summarised below (analysed through the same procedure as described in the method section).

1. Planning and pre-supervision: The participants shared their teaching plans digitally, and often agreed on deadlines for sharing plans and giving digital feedback. A few groups did not provide digital feedback because this was already shared face-to-face. The plans often contained personal development goals, questions and a desired observation focus. The mentor teachers generally reviewed the plan, provided brief written feedback and sometimes followed up face to face, while the fellow students normally just read the plan before teaching.

2. Teaching and observation: Typically the observers (mentor teacher and student teachers) would provide most of their feedback in brief texts, supplemented by pictures and sometimes short video recordings (maximum 90 seconds). The extent to which the observers had an open or more predefined observation focus, and whether the observation assignments were distributed within the groups, varied (e.g. responsibility for filming). Moreover, the observations were often interactive, as the observers also had the opportunity to read and comment on one another's observations.

3. Preparations for the supervision conversation: Prior to the supervision conversation, both mentor teachers and student teachers usually went through the observation feed (cf. Figure 2). The observed student teachers normally gave a lot of thought to the feedback they received, and the feeds even prompted spontaneous conversations before supervision, especially among student teachers.

4. Supervision conversation: Several of the groups talked through almost the entire feed, while others focused mostly on specific sections that either the student teacher who had carried out the teaching or the mentor teacher wanted to discuss (the software allows these to be marked with an asterisk). In some of the groups, the feed was used less systematically, and in a few cases only to a limited degree.

5. Reflective activity after the supervision conversation: Both the mentor and student teacher(s) can at any time search and use the archived observation-feeds for reflection. Most of the participants did not use the feeds as actively after the supervision conversation. However, in some cases, the student teachers reviewed the feeds before planning a new lesson or in subsequent supervision conversation, such as in comments on the student teacher's progress. A few of the student teachers also looked through the feeds individually or jointly in order to assess their own development or write their university assignments.

Context of the study

The study was conducted in three teacher education programmes (4–5 years long) in Norway (2) and Sweden (1), during three weeks of professional training. The programmes require the mentor teachers at the school to have completed or must be currently enrolled in mentor teacher education. All participants

were offered brief training in the use of the software and technical support was available during the project. The research questions are limited to the participants' experiences of the supervision process using the software, in contrast to their experiences without the use of such technology. Most of the mentor teachers had many years of experience as a teacher and mentor. The student teachers were enrolled in the first (16%), second (76%) or third year (8%) of the programmes. Even the 1st year students had at least some experience of supervision without the software (either in a previous semester of their teacher education study, without MOSO, or during the practicum period in the project).

Method

Data material and collection method

The mentor teachers in the study accepted the invitation to take part in the study, sent by the administrative office of one of the teacher education programmes (2 programmes) or a forwarded email or personal invitation through the heads at the schools (1 programme). Student teacher participation in the study was either voluntary (1 programme) or mandatory (2 programmes). Participation in data collection was voluntary for all participants and informed consent was obtained in keeping with the research requirements, which included informed consent and participant anonymisation in the data material and publications in accordance with the EU General Data Protection Regulation (approved by the Norwegian Centre for Research Data). No data was collected directly from the classroom setting or the software.

The project was carried out over the course of one year and involved 36 practicum supervision groups (12 groups per programme). The groups consisted of one mentor teacher (several in a few cases) and two or three student teachers (one student teacher in a couple of cases). A total of 56 mentor teachers and 112 student teachers took part in the study. In total, 84% of the mentor teachers and 88% of the student teachers completed an anonymous (mainly qualitative) online survey structured to answer the research questions (cf. survey questions, Appendix 1).

All of the mentor teachers in two of the programmes and around half in the third programme were invited to participate in focus group sessions after the practicum period ended. The mentor teachers invited their student teachers to join the focus groups, and one (in some cases two) from each group volunteered. A total of eight focus groups were established in which a total of 35 mentor teachers and 45 student teachers took part, headed by one or two researchers, with discussions lasting a minimum of two hours. The goal was for the focus groups' contributions to lead to richer data material and, in keeping with established focus group approaches, the sessions were open and loosely structured around the study's research aim and questions (Barbour, 2008), and the related model of the study (cf. focus group guide, Appendix 2).

Thematic analysis: experiences of a complex supervision process

The analysis in this study involves the qualitative text responses from the survey and the transcripts of the focus group sessions (Norwegian and Swedish language). The systematic inductive thematic analysis primarily followed six steps (Braun & Clarke, 2012): In step 1 (familiarisation with the data), the researchers working at three departments offering teacher education programmes compared their overall impressions of the transcripts and open ended survey responses. They concluded that their data were similar and that, for the most part, the participants' assessments in the focus groups did not deviate significantly from the survey. To limit the quantity of textual information, the data material from the two teacher education programmes in the same language (the 24 Norwegian groups) was first analysed in more detail. The textual content from both of the focus groups and the qualitative answers from the survey was sorted into a document for each part of the process, and the content of the documents was further grouped based on the research questions. This yielded text materials which we categorised into 10 thematic analyses (see Table 1).

Table 1: Thematic analysis within 10 areas of the study.

Supervision process / Research questions	1. Preparation for teaching	2. Teaching and observation of teaching	3. Preparation for supervision conversation	4. Supervision conversation	5. Reflective activity after supervision conversation
A. Experienced influence on quality of the activities of the supervision process	Text material 1b	Text material 2b	Text material 3b	Text material 4b	Text material 5b
B. Experienced challenges during the supervision process	Text material 1c	Text material 2c	Text material 3c	Text material 4c	Text material 5c

Initial codes were then generated in step 2 (generating initial codes). For step 3, (searching for themes) all text was coded line by line before more focused themes were identified within each of the 10 areas. Next, in step 4 (revising the themes), the interpretations of codes, themes and subthemes were checked against and revised in relation to the transcripts – the Swedish researchers verified the themes through a more comprehensive reading of the Swedish data material. The themes generated were then verified in the material as a whole, adjusted and (re)defined in step 5 (defining the themes), before representative quotes were selected from the three programmes in step 6 (preparing the analysis report). Table 2 gives an example of the connection between the text from one of the 10 areas, the line-by-line coding and the main theme and subthemes generated, while Table 3 below presents the themes uncovered during the thematic analysis:

Table 2: Example of coding and connection to main theme and subthemes.

Transcript from focus group no. 5, lines 96–100	Codes with reference (transcript no., line no.)	Theme generated to answer research question 1 (experienced influence on the quality of the activities of the supervision process), within the activity no. 3: Preparations for the supervision conversation.
MENTOR TEACHER: All in all, I think it's very helpful to have comments and pictures and video and they all complement each other well. One day a week, I had six lessons in a row and had to spend time at the end of the day going through each of those lessons… It's hard to remember what takes place in each class, but MOSO makes this possible. It was easier to just… We spent 10 minutes beforehand simply reviewing everything and it all came back to me. I thought that was very helpful.	Useful to combine text, pictures and video in order to remember classes, T5,96 Easier to remember classes before supervision T5,99	Better recollection of teaching situations

Table 3: Main themes identified in the 10 areas of the analysis.

	1. Planning and pre-supervision	**2. Teaching and observation**	**3. Preparations for supervision conversation**	**4. Supervision conversation**	**5. Reflective activity after supervision conversation**
Research question A: Experienced influence of quality	Ensuring feedback on plans. More thorough lesson planning. Student teachers more comfortable before teaching.	Student teachers more concentrated and active observers. More concrete and chronological organised registrations of observations. Richer collaborative observations. More attention to observation competence.	Ensured reflective preparation for supervision conversation (especially student teacher). Better recollection of teaching situation. Promoting peer discussions. Prioritising topics for supervision conversation.	Easier to recollect teaching situations and understand feedback. More direct or honest feedback. Student teachers more comfortable and engaged in dialogue. Deeper discussion within prioritised themes. Better structure.	For some student teachers, active use leads to more reflection, especially on their own progress. (Mostly limited use)
Research question B: Experienced challenges	Getting feedback from peers. Getting richer feedback from mentor teacher. Clearer agreement on time for feedback. Need for technical improvements.	Need to limit observation focus and distribute observation tasks. Dilemma in classroom, in prioritising observation or students. Capturing relevant video recordings. Handling discomfort with the use of technology. Sometimes inferior observation quality before getting used to technology. Need for technical improvements.	Too limited time for preparation.	Too extensive feed(back). Too restricted by the feed. Strategies for handling extensive feed(back)	Limited time (Few statements)

Findings: experienced quality and challenges in the supervision process

The presentation of the findings below follows the five steps that the supervision process described earlier (cf. Figure 1). In each of these steps, themes have been analysed with regard to the study's research questions, focusing on the participants' experienced 1) influence on the quality of the activities through the supervision process and 2) challenges using the software through the process (summarised in Table 3). The perceptions of the student teachers (STs) and the mentor teachers (MTs) were so similar that they will be presented jointly, but a few variations are given as comments for some of the themes.

1. Planning and pre-supervision: experienced quality and challenges

The participants emphasised that the use of the software improved the quality of their teaching preparation in several ways, compared to earlier experiences of supervision without use of the software. Many stressed that it ensured that the student teachers would get some feedback and approval on their plan, and that this had not always been the case in the past: *They told me that it was the* first *time they had ever received pre-supervision* (MT). An important reason was that much teaching planning was completed after school hours, and several student teachers pointed out that they experienced a lower threshold for asking questions: *If I had to send an email ... I don't think I would have bothered* (ST). Others claimed that the software resulted in more thorough lesson planning: *I put a lot more effort into the planning … Before, you could simply provide the plan on a post-it note* (ST). Many student teachers also felt more comfortable with their upcoming teaching practice: *The next day, I know I have a good lesson plan … (and) I don't need to stress in the hallway trying to find the mentor teacher* (ST).

One of the challenges experienced was getting student teachers to provide each other with feedback: *They assumed this was my responsibility* (MT). A few student teachers also indicated a need for richer or more detailed feedback from the mentor teacher: *The feedback I received was more or less a 'like'* (ST). Others saw a need for clearer agreement on the time for delivery of feedback on plans. A few participants said, for example, that sometimes there was too much pressure to respond quickly: *You carry your practicum training in your pocket ... It beeps with every entry and you're* expected *to immediately respond* (ST). The participants occasionally faced technical problems, leading to less frequent use of the software, especially at the start of the project when a prototype of the software was being used. The participants made detailed suggestions for improvement of the software (regarding different parts of the supervision process) that are not mentioned here, as the software was continually being developed throughout the project period.

2. Teaching and observation: experienced quality and challenges

The software influenced the quality of the observation of the teaching in several ways. The student teachers in particular were described as being more concentrated and active observers: *The observers used to sit at the very back of the classroom, getting lost in their own thoughts ... Now ... they have to concentrate fully and play a more active role* (ST). This was explained as owing to the student teachers being better prepared as a result of reading the lesson plans, and especially the visibility of the feedback-contributions: *You immediately noticed if someone simply sat there staring out into space* (MT). Another explanation was that the group developed a more committed working relationship: *It created a stronger bond between us … because we were working together* (ST).

Observations recorded while using the software, most often recorded as text, were commonly described as more specific, which contributed to a better understanding of the observations. The use of pictures has also been indicated as important when it comes to concretising observations. In one case, for example, pictures were taken of a pupil's concrete assignment after he was taught mathematics: *This was how the student understood the instructions* (ST). The observation could also be concretised by video clips: *A short video clip or picture made it more real, not just a feeling* (ST). Another frequent comment was that the text, pictures and video complemented each other in making the feedback concrete and understandable, and that the participants appreciated how the software organised the multimodal

observations from several observers in chronological order: *We used three iPads at the same time. Everything was in chronological order and it all worked perfectly* (MT).

Several participants also draw attention to the quality of the collaborative observations, because the observers could see and comment on each other's observations while observing, and that this could contribute to richer and more nuanced observations. One related finding was that using the software highlighted the importance of developing observation skills: *I experienced a major change because you have to stay focused ... the comments are* modelled *… which improves your ability to observe* (MT).

The participants described a number of challenges, especially in regard to limiting the focus of the observation and dividing up the observation tasks. One such dilemma was whether student teachers should concentrate on observing or whether they should also help the pupils. In some of the groups, this was dealt with by switching responsibility for who is doing the observing and balancing how much the software should be used during the lesson: *You have to simply put your phone down sometimes* (ST). Another challenge experienced by many was getting a relevant short video recording: *A bit of the challenge with filming was capturing the relevant moments* (MT). Another challenge was to handle discomfort with – mainly the student teachers' – use of the technology. One mentor teacher stated, for example, that one of the student teachers was very anxious about reading through the observation feed, especially videos. Though, most of the student teachers found that as they got used to the technology, they accepted relatively quickly that the benefits were greater than the initial embarrassment. Ways of dealing with this included waiting to film new student teachers, limiting the filming to specific parts of teaching, or letting the teaching student choose the focus of the video recordings. A few users also commented that sometimes the observation quality was inferior until the user had become accustomed to using the software: *There was perhaps a bit too much focus on the smartphone/computer at the start* (ST).

3. Preparations for the supervision conversation: experienced quality and challenges

The participants reported that they have usually done little to no preparatory work before supervision conversations in the past. Using the software, they said, helped ensure that some preparations were made, in particular by the student teachers who were teaching, and who would be curious to see the feedback immediately after teaching – thus, they started thinking about the feedback right away: *I now realise that the time between teaching and supervision was extremely important* (ST). Many mentor teachers also reported that they prepared somewhat more, and that they, for example, devoted attention to the student teachers as observers while preparing: *I read through the comments ... which helped me incorporate their observations and thoughts into the supervision conversation* (MT).

It is clear that the greatest advantage of using the feed as preparation was that it helped the participants remember the teaching situation prior to the supervision conversation: *One day, I had six lessons in a row… It's hard to remember… but we spent 10 minutes beforehand simply reviewing everything and it all came back to me* (MT).

The participants also frequently stressed the fact that reviewing the feed often promoted more peer dialogue before the supervision conversation, especially among student teachers: *We student teachers actually start the supervision conversation long before it officially begins* (ST). Many of the participants emphasised as well that preparation based on the feed made it easier to prioritise the most important topics before the supervision conversation: *I tend to ... comment on everything ... so it's good for me to limit myself* (MT).

As preparations based on the feed (reflection and peer discussion) were highly valued, it was correspondingly noted by several of the participants that too little time during practicum could restrict opportunities for such preparation. Several of the student teachers therefore emphasised the need for more time to prepare, with one student teacher clearly requesting this of their mentor teachers: *Allow more time to review the comments*.

4. Supervision conversation: experienced quality and challenges

Most of the participants emphasised that using the software strengthened the supervision conversations in several interrelated ways, compared to earlier experiences. One key aspect was that the participant found it easier to remember specific teaching situations and understand the feedback related to them, with several participants further specifying that the combination of text, pictures and video clips made this easier.

> ST: There is such an incredible number of things to remember… During the supervision conversation, you end up simply saying: 'Everything went well', unlike the situation now, where you have concrete things to talk about.

Several of the participants also commented on the fact that the feedback was more honest or direct, and the mentor teachers felt it was easier to give critical feedback when it was communicated digitally early on in the practicum: *It was harder before to ... give feedback, because I was worried that the recipient would be upset or hurt ... Now it is much easier because … the recipient has the opportunity to think about it* (MT).

The participants made it clear that the student teachers engaged more actively in dialogue with the mentor teacher than previously: *Last year ... I felt that a huge part of the supervision conversation was spent on going over your notes* (MT) and *I would just sit and wait to receive comments on my lesson* (ST). Many mentor teachers generally expressed that creating dialogue with student teachers had been a major challenge in the past: *Before, when I asked, 'What are your thoughts on this?' most of them could not answer because they were caught off guard* (MT). In contrast, the participants frequently reported that using the software made the student teachers engage more in the dialogue: *I … find that it is the student teachers who do most of the talking now* (MT).

This more active participation in dialogue on the part of the student teachers was explained by several factors. The main factor being that many student teachers felt that using the feed to prepare made them more comfortable participating in the supervision conversation, because they knew what the discussion topics would be: *It ... provides some peace of mind in the supervision situation because you know what to expect* (ST). They also noted the fact that they had the opportunity to think it through, individually and through peer-discussions: *The ball was already in motion* (MT). Another explanation included the activating effect of constantly sharing observations in real time: *They are forced into a more active role ... since everything is transparent* (MT). Some mentor teachers also stated that using the tool was helpful to motivate less active students in the conversation: *I can ... help them get started: 'I see you've written … Can you elaborate on that a little more?*' (MT). The participants often stated that using the feed also prompted deeper discussion within certain prioritised themes: *You achieve greater depth in a way and can more easily filter out trivial matters and focus on the more important challenges* (ST).

Some of the participants emphasised that the chronological feed contributed to better structure in the conversation. Other participants, however, reported that this often posed a challenge in that the feed could be rather long for a supervision conversation, and a few of the mentor teachers found that some of the student teachers' feedback was not that relevant: *There were lots of comments on every little thing* (MT). This was mainly an issue in the groups that went through the entire feed during the supervision conversation. In some of these groups, a few participants felt that the feed could dictate the conversation: *The chronology can be a bit too dominant* (ST), while a large part of other groups used the feed more flexibly and discussed prioritised topics (e.g. by marking a comment with an asterisk).

5. Reflective activity after the supervision conversation: experienced quality and challenges

For the most part, the participants did not use the feeds as actively after the supervision conversation, except for some use in their planning of new teaching activities, subsequent supervision conversations, self-evaluation of progression over time and in writing university assignments (cf. part XX). However,

those student teachers who did use it actively emphasised that the archived feeds played a significant role in their reflecting on their own progress: *This lets you see your own development from a different angle* (ST). There were few specific statements about challenges of this part of the process in the data material, but some commented the limited time available during practicum.

Discussion

The aim of this study has been to contribute knowledge about the experiences of student teachers and mentor teachers in using a digital software technology (MOSO) during the teacher education practicum supervision. The study has investigated how and whether they experienced that the use of the software has affected the quality of the supervision process (compared to their practicum experiences without such technology) and introduced any challenges (cf. summary of findings in Table 3).

The potential of using the technology to support reflection in the supervision process

Overall, the study shows that in several parts of the practicum supervision process, the reflection-on-action (Schön, 1983) has expanded. This is in line with general research findings that indicate that digital technology – using different modalities – can strengthen reflection during one's teacher training (Bjørndal et al., 2023; Nesje & Lejonberg, 2022), such as the use of digital text (e.g. Toom et al., 2015), video (e.g. Baecher & McCormack, 2015), and multimodality (e.g. Bener & Yildiz, 2019).

Neufeldt et al.'s (1996, pp. 5-8) conceptualisation of 'reflection' can help to explain the finding of a more reflective process. According to this concept, a basic prerequisite for reflection is the reflective 'trigger' condition. The study documents that the software helps to trigger individual and collaborative reflection throughout the whole supervision process, to a greater extent than in supervision without the use of such technology. The same feedback is reused and continues to trigger reflection throughout the process, for example: when the observers watch each other's digital feedback while observing together (1), when the student teacher(s) watch this feedback as preparation for the supervision conversation (2) and perhaps also discuss it with fellow students (3), when elaborated on in the supervision conversation (4), and after the supervision conversation, where some students reflect further on the feedback either independently (5) or sometimes together with their peers (6). This differs from a normal situation where 'feedback triggers' are commonly shared orally and only once in the supervision conversation. Another important aspect is that the multimodal nature of the digital feedback helps the participants remember the teaching situations and understand the 'feedback triggers' better, which previous studies on multimodal feedback in practicum supervision have also indicated (Mathisen & Bjørndal, 2016; Wennergren et al., 2018).

Another main characteristic of reflection is an 'understanding-seeking process', characterised by several features, that can also help to explain the finding of expanded reflective activity in the study (Neufeldt et al., 1996, pp. 6-7). Firstly, the study revealed indications of a reflective 'stance', in particular, highlighting that the students adopt a more active and questioning investigative approach throughout the whole supervision process, although this is less likely to be the case in the planning and post-supervision phase. Another indication of a reflective stance is their openness to different types of understanding and interpretations. The findings indicate that the software-use provides better conditions for exploring different understandings. This is especially so as the software enables more feedback – often more direct or honest – provided by several participants, through a more dialogical process. A third indication of a reflective stance is the participants' willingness to make themselves vulnerable. Several findings support the claim that use of the software can make the student teachers more comfortable with reflective activity, especially as a result of their preparation before the supervision conversation. However, this may be a two-sided issue, as certain aspects of the software-use can also be experienced as uncomfortable for some students, especially before getting used to it (cf. Findings, part 2). An understanding-seeking process is also characterised by in depth rather than superficial understanding. It is reasonable to assume that the

student teachers' more active, autonomous and repetitive processing of multimodal feedback, over a longer period of time, and especially by prioritising feedback-focus for the supervision conversation, provides a larger space for more in-depth reflection. Other studies in teacher education have indicated that it is precisely this – having a greater degree of learner control, which the aforementioned features in this study do involve – is a decisive prerequisite for stimulating deeper or more critical reflection (e.g. Beauchamp, 2015).

The participants generally experienced that the software-use enabled more collaborative reflective activity through the process, especially more collaborative observation (cf. Findings, part 2), informal collaborative preparations before supervision sessions and more active student teacher participation in supervision conversations. The collaborative potential was least utilised in the phases of feedback on teaching planning and after the supervision conversations. However, overall the participants describe their collaboration in ways that align with the main characteristics of 'communities of practice' (Lave & Wenger, 1991): In fact, it is very clearly documented that the software-use contributed to a stronger mutual engagement in interaction (between fellow student teachers or between these and their mentor teachers). The findings also indicate that the software was used actively as a shared resource to advance the joint enterprise, particularly in enabling the possibility to constantly share and (re-)use plans, provide feedback and support collaborative reflection. Earlier studies have documented that social media technology can support collaborative reflection and substantiate qualities associated with community of practice in practicum (Caner, 2010; Goktalay, 2015; Rutherford, 2010) - this study has confirmed these findings, and it has particularly shown that one particularly important potential the software could have for future practicum placements, is how it can strengthen the student teachers reflection through the process by a constant alternation between traditional (analogue) and digital collaborative activities (cf. Figure 3).

Use of the software has helped remedy several of the widespread challenges common to the supervision process, as pointed out in international studies. Key examples of these include: limited supervised teaching planning, limited observation as well as several other observation challenges, limited preparations for the supervision conversation, and supervision conversations that are characterised by monological mentor teacher contributions (Bjørndal et al., 2023). The software-use has particularly contributed to reflective activity in often less visible, but indeed valuable, parts of the supervision process (Bjørndal et al., 2023), that being the preparation for the supervision conversation.

The challenges of using the technology to support reflection in the supervision process

The study also documents several central challenges of using such technology throughout the supervision process. Important challenges include dealing with some students' discomfort with the video observation component (cf. Baecher & McCormack, 2015), the danger of information overload (cf. Erickson, 2007) in the feeds, which may reduce reflective depth, and students' dilemma in regard to whether to prioritise their observation task or helping the students. Other challenges are the experienced need for clearer agreements on deadlines for feedback on plans, observation focus and division of labour during observation. Many students also experienced challenges in making better use of the technology's potential, for example how to get fellow students to comment on each other's teaching plans, receive more thorough mentor-feedback on plans, take more relevant video recordings, and prioritise more time to work reflectively with the feeds during the process.

Many of the groups developed strategies for dealing with the various challenges, which strengthened the experienced quality of the supervision process. For example, they achieves this by: introducing filming gradually, restricting the filming to one observer, limiting the observation focus, letting the student who teaches choose the focus (handling discomfort), distributing observation tasks (increasing quality of observation and reducing dilemmas regarding whether to observe or help students), prioritising certain elements of the extensive observation feeds during the supervision conversation (reducing danger of

information overload and ensuring reflective depth), and ensuring time to prepare before the supervision conversation.

Limitations

The positive findings of this qualitative study, conducted within three similar Scandinavian teacher education contexts, does not automatically allow them to be generalised for application to other teacher education contexts. For example, experiences may vary depending on whether practicum supervision is carried out in groups of several student teachers (the main case in this study) or with only a single student teacher. The mentor teachers' high level of teaching and supervision experience, the extent of their further education in supervision and the level of practical support provided during the project may help to explain the positive findings. Moreover, the mentor teachers in this study volunteered to test the technology. The findings may have been different under other conditions. The positive feedback by the student teachers in the focus groups may also have been influenced by the presence of their mentor teacher and the researcher(s). Nevertheless, the data from the anonymous online survey, which had a high response rate, confirms the focus group data.

Despite the reservations about generalisation, the current study undoubtedly indicates considerable potential for strengthening the supervision process during the teacher education practicum, especially since the findings build on extensive and method-triangulated data material, drawing on the experience of a large number of mentor teachers and student teachers in three teacher education programmes.

Implications for teacher education and need for further research

The study's findings are relevant to both teacher education programmes and mentor teachers who would consider using such technology. First, it can inform the specific design of the various activities in the practicum, both in terms of the potential for learning and the handling of challenges. The promising findings in this study – where most mentor teachers were experienced mentors and had already completed or were in the process of completing their mentor education – would also make it reasonable to hypothesise that mentor teacher qualifications are crucial when it comes to maximising the potential of such technology, a claim that should be investigated further in future studies. The study clearly shows that the technology is used in different ways, and also indicates that certain strategies work better than others. This would be important to explore further in studies that include observational data from the supervision process, which this study does not include.

Conclusion

This study documents that the use of a social media inspired software – integrated into a traditional practicum supervision process in groups – has the potential to strengthen the quality of the process. A key finding is that the student teachers took a more active, reflective and collaborative role in their experiential learning process, compared to what the student teachers and mentor teachers had experienced in practicum supervision without the technology, as well as compared to the image of the practicum component typically drawn by international research. The study indicates that there are promising opportunities to reduce some of the main, traditional challenges in various parts of the practicum supervision process, even if the study does have distinctive features, meaning that one cannot expect identical findings in any other context. Furthermore, the study documents challenges that are important to be aware of, while also showing examples of the participants developing strategies to deal with said challenges. In order to utilise the potential of this type of technology, two elements are crucial: firstly, further research is needed on appropriate supervision strategies to ensure the optimal use of such technology in different contexts, and secondly, that the level of mentor teachers' supervision competence is improved, not least with regard to their being able to combine traditional analogue and digital approaches in a productive way.

Conflict of interest statement

The software underpinning this study was initially developed by the University of Agder, building upon prior research by Mathisen and Bjørndal (2016), two of the four authors of this article. Subsequently, the software has undergone commercialization, with these authors contributing to its development and holding ownership shares in the associated company.

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