ORIGINAL RESEARCH

Metapholio: A Mobile App for Supporting Collaborative Note Taking and Reflection in Teacher Education

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Abstract

Mobile technologies open up new ways of fostering reflection in teacher education. With the intention of tying reflection closer to the actions in the classroom, facilitating multimedia recordings, providing prompts for reflection and fostering discussions between pre-service teachers, experienced teachers and university mentors, we developed the "Metapholio" app and tested it in the context of teaching internships. This app supports pre-service teachers in collecting noteworthy moments in the classroom by providing functionalities for individual and collaborative note taking. Notes can be created in the form of written text, photography, audio recordings and video recordings. Each note can be commented on and discussed with invited peers, experienced teachers and university mentors, who can also record moments themselves. Furthermore, the app makes it possible to select notes and attach them to more general written or spoken reflections on teaching and learning. Theoretical frameworks and writing prompts that are part of the app serve as scaffolds for such reflections. Peers, teachers and mentors can be invited to join the conversation on reflections. With the help of this app, pre-service teachers can, moreover, create their own multimedia mobile portfolio, which acts as a hybrid space for professional development in teacher education.

Keywords Teacher education · Mobile learning · Reflection · Microblogging · Note taking

1 Introduction and Description of the Emerging Technology

Teacher education programs typically rely on a combination of academic education and clinical practice experiences (Darling-Hammond 2017). As regards the linkage of these two components, teacher education looks back on a long tradition of emphasizing the importance of professional reflection (Clarke and Hollingsworth 2002; Dewey 1904; Fendler 2003; Korthagen et al. 2006). Teachers at all career stages are expected to reflect on classroom experiences and to attend to practical problems in a deliberate and scientifically informed way. By doing so, they are not only meant to expand their expertise and but also

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to integrate theory and practice. In contrast to other disciplines with a strong connection between academic education and practical training such as medical education, teacher education faces a considerable extent of ambiguity with respect to its theoretical knowledge base, which makes reflection all the more important (Biesta 2007). Research has shown, however, that it is very challenging to design reflective activities in teacher education that live up to these high expectations (Beauchamp 2015; Zeichner and Liu 2010). Even with systematic scaffolding, reflection often remains shallow and does not yield the intended effects on teacher learning and practical classroom teaching. This can be put down to two major problems in particular: First, novice teachers have difficulty noticing relevant moments in their professional practice that might serve as starting points for in-depth reflection. "Professional vision"—a combination of "professional noticing" and "professional interpretation"—has therefore been a core topic of research on teacher education in the past years (Goodwin 1994; Van Es and Sherin 2002). Second, pre-service teachers struggle to apply theoretical knowledge to practical problems and hence tend to engage in intuitive rather than evidence-based practice (Burn and Mutton 2015). So as to overcome these difficulties, numerous approaches have been put forward, which range from providing theories that are more closely aligned to practice (e.g. by "What-works" Clearinghouses) to involving practitioners in the creation of a joint knowledge base that serves as a middle ground between theory and practice (Zeichner et al. 2015). In order to enhance these developments, digital technologies have increasingly been explored in terms of how they might contribute to supporting reflective teacher training activities, especially with the help of digital video, portfolios, weblogs and, recently, mobile devices (Kori et al. 2014; Krutka et al. 2014). In particular, mobile note taking and microblogging apps have shown great promise because they can be used instantly and discreetly in practical situations (Baran 2014; Könings et al. 2016). Owing to this simple and flexible handling, mobile devices can serve as useful tools for promoting professional noticing, which, in turn, serves as a starting point for professional reflection. Moreover, digital devices offer the possibility of supplementing and stimulating reflective activities with a selection of theoretical prompts and social media functionalities that facilitate discussions with peers, experienced teachers and university mentors. While note taking and microblogging with mobile devices in general can be considered commonplace nowadays, these functionalities are yet emerging technologies in teacher preparation programs, especially in the context of teaching internships. In the next sections, we set forth the rationale behind the conception of the Metapholio app, explain its core functionalities and outline prospective developments.

2 Relevance for Learning, Instruction, and Assessment

Personal mobile devices are highly suitable tools for mobile note taking and reflection. Note taking can be done by means of standard apps (e.g. the camera app or the note taking apps included in most operating systems), common note taking apps (e.g. Microsoft Onenote, Evernote) or social media apps (e.g. Facebook, Whatsapp, Twitter, Instagram). Although these general-purpose apps and platforms provide a wide variety of functions, there are still some aspects that point to the need for an integrated development of a specific app that is tailored to the purposes of teacher education. In order to provide a scaffold for the reflection processes of pre-service teachers, the app needs to provide a limited but purpose-built set of specific functions which model the fundamental steps of the reflection process. Against this background, we developed the mobile

app *Metapholio* (www.metapholio.ch), whose functions facilitate (a) the collection of so-called "moments", (b) reflection on these moments and (c) the sharing and discussion of both moments and reflections. The design of this app was strongly informed by insights of educational research:

- Noticing is an essential skill that pre-service teachers need to acquire if they are to develop "professional vision" (Goodwin 1994), which, in turn, is a core component of "reflection-in-action" (Schön 1983). With the intention of supporting professional noticing and accountable reflection-in-action, the app turns personal mobile devices like smartphones and tablets into a purpose-built note taking device and provides a fast and user-friendly interface for collecting noteworthy moments in the classroom.
- Learning to notice and developing professional vision usually consist in a collaborative rather than in an individual effort. A note taking app can be useful for facilitating joint note taking, reflection and discussion because it contributes to establishing a "hybrid space" of discourse that includes pre-service teachers and experienced teachers as well as university mentors (Zeichner 2010).
- While written reflective journaling has a long tradition in teacher education, mobile apps are particularly suitable for multimedia-based note taking in the form of pictures or audio and video recordings. Notably classroom videos have proved to be very promising in terms of enhancing professional noticing (Gaudin and Chaliès 2015). These types of recordings document practical situations in a richer and at the same time more direct and authentic way than traditional written notes. Whereas research on text-based note taking—especially in lectures—has shown positive effects on the encoding and retention of information but may make heavy demands in terms of cognitive load (Jansen et al. 2017), mobile and multimedia-based note taking are considered to be a less obtrusive and less distracting alternative to traditional note taking in practice situations (Mueller and Oppenheimer 2016).
- The collected moments serve as starting points for fostering and extending professional "reflection on-action". These reflections can be either documented in writing or recorded as a multimedia file. Since the results of studies on reflective journaling indicate that scaffolding prompts are essential to reaching adequate levels of reflection (Hübner et al. 2010), the app includes a list of topics for reflection as well as specific prompts for guiding reflection.
- As the app provides functions for the exchange of comments between pre-service teachers, experienced teachers and university mentors, individual notes serve as a joint base for communication, the sharing of resources and engagement in co-constructive discussions. This opens up the full range of potentials and possibilities that are commonly associated with computer-supported collaborative learning (Jeong and Hmelo-Silver 2016).
- Recordings from classrooms consist of sensible data, especially when the faces of individual pupils are visible in videos and photographs or when written notes include names. This requires specific precautions for ensuring data and privacy protection in addition to the adherence to general data protection regulations. To this end, the data generated by the app are collected and securely stored on a local university server, which allows universities to treat the app in a way that is similar to the running and maintenance of a local learning management system
- Owing to the integration of e-portfolio functionalities, this tool can be valuable not only in the context of internships but also over the entire span of a teacher's professional development.

Although each of these individual functionalities can be found in other apps, it is the specific combination into a coherent software-supported framework for reflective activities that makes the approach of the Metapholio app unique and novel.

3 Emerging Technology in Practice

To sum up, the Metapholio app has been designed to support fast and easy note taking, both individually and collaboratively, to help pre-service teachers write scaffolded reflections based on these notes, and to facilitate discussions on notes and reflections with others. If they want to work with the app, users have to go through the following course of action:

1. *Installing the app and creating an account* After installing the app, users create an account that is linked to a valid e-mail address. During the registration process, they are asked to select their university from a list of participating institutions. This selection determines what kind of reflection framework and what prompts they see while they are writing a reflection. The app can be installed on several devices and run under the same username and password. In order to lower the barriers to making use of the software, users are not assigned specific roles, and school or university administration is not involved in the registration process. Every individual user has the same rights, retains control and is responsible for providing other users with access to his or her own Metapholio.

2. *Inviting fellow pre-service teachers, experienced teachers and university mentors* (Fig. 1) Users can open a dialog for inviting fellow pre-service teachers, experienced teachers, university mentors or other persons to get insight into their notes or reflections. The persons who are invited to a user's "moments" gain the right to view all notes, to add notes and to comment on notes. Almost the same applies to "reflections": users who have been invited to access another user's "reflections" can read all reflections and write comments themselves.

3. *Collecting noteworthy moments in the classroom by using the smartphone app for typing in short text notes, taking pictures, or recording audio and video files* (Figs. 2, 3) Note taking can be done both individually or collaboratively. After the selection of the "plus" button in the bottom right-hand corner of the screen, a short menu is displayed for selecting the kind of recording that is to be created. As simultaneous noticing and note taking in the classroom can be difficult for pre-service teachers when they teach for the first time, moments can also be collected by other invited pre-service teachers who are present as well or by the experienced regular teachers of the classes in which the internship takes place (see Step 2). All moments can be reviewed and supplemented with comments later on.

4. *Selecting several moments and writing or speaking a comprehensive generalized reflection on these records* (Figs. 4, 5) For creating a reflection, student teachers switch to the reflections tab where previous reflections are displayed. Upon tapping on the plus-button at the bottom right-hand corner of the screen, a dialogue appears in which pre-service teachers choose a topic to reflect on. Afterwards, they record their reflection either in written or in spoken form. This task is facilitated by pertinent prompts. These topic-specific frameworks and reflective prompts can be customized to the purposes of each teacher preparation program that decided to work with this app.

5. *All notes and reflections can act as a starting point for comments and discussions* (Fig. 6) Invited users can comment on and discuss all moments and reflections.

6. *Exporting moments, reflections and interactions for creating an individual e-portfolio*
    As in an institutional e-portfolio, users have full administrator rights to their own record-
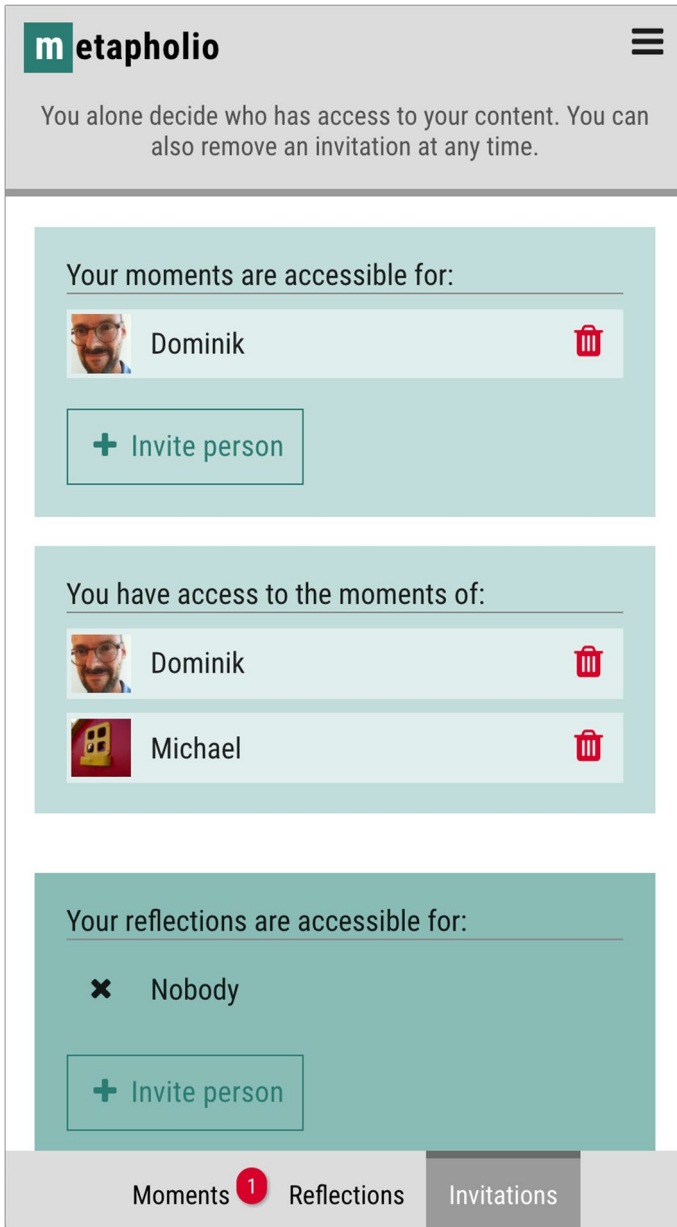   ings, which can also be exported and deleted.

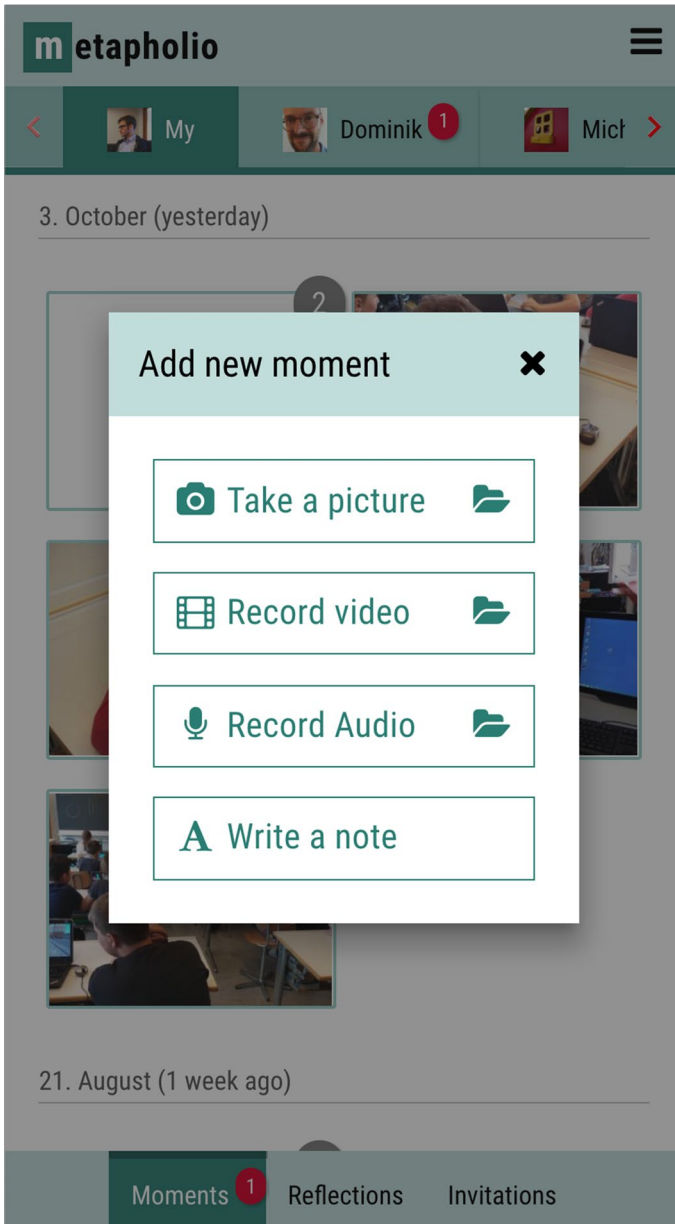**Fig. 1** Menu for inviting others to access one's own moments and reflections

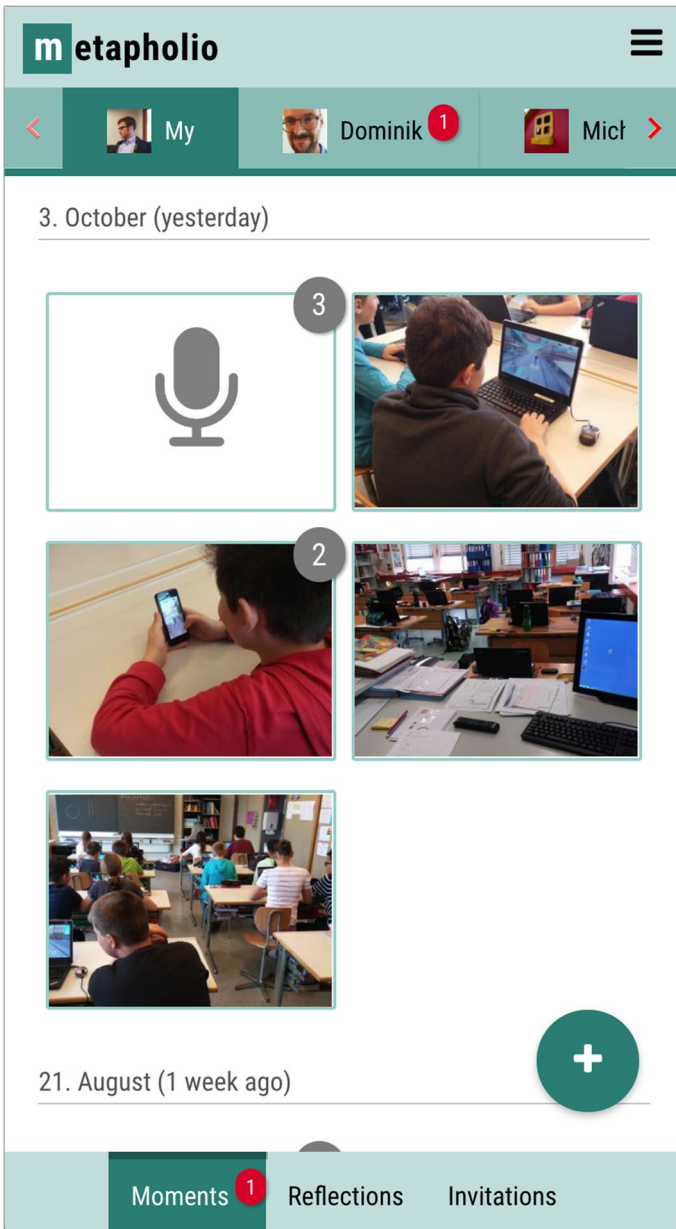**Fig. 2** Menu for documenting a new noteworthy moment

Fig. 3 Overview of collected noteworthy moments

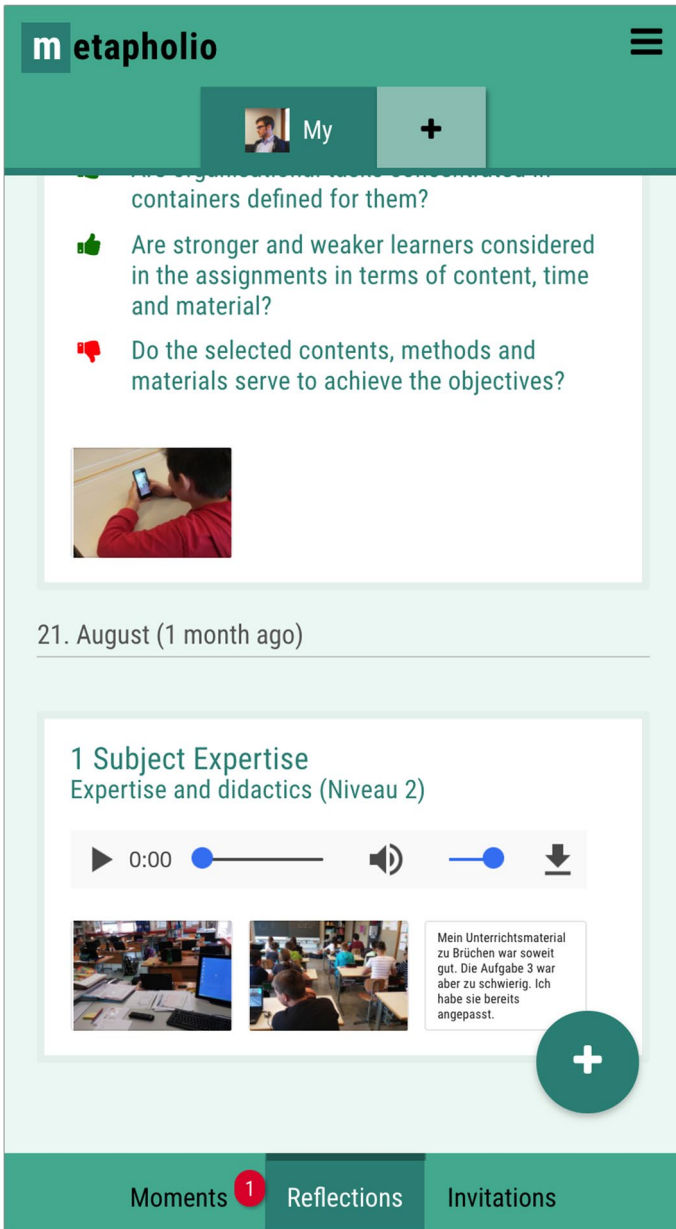**Fig. 4** Menu for writing or speaking a reflection

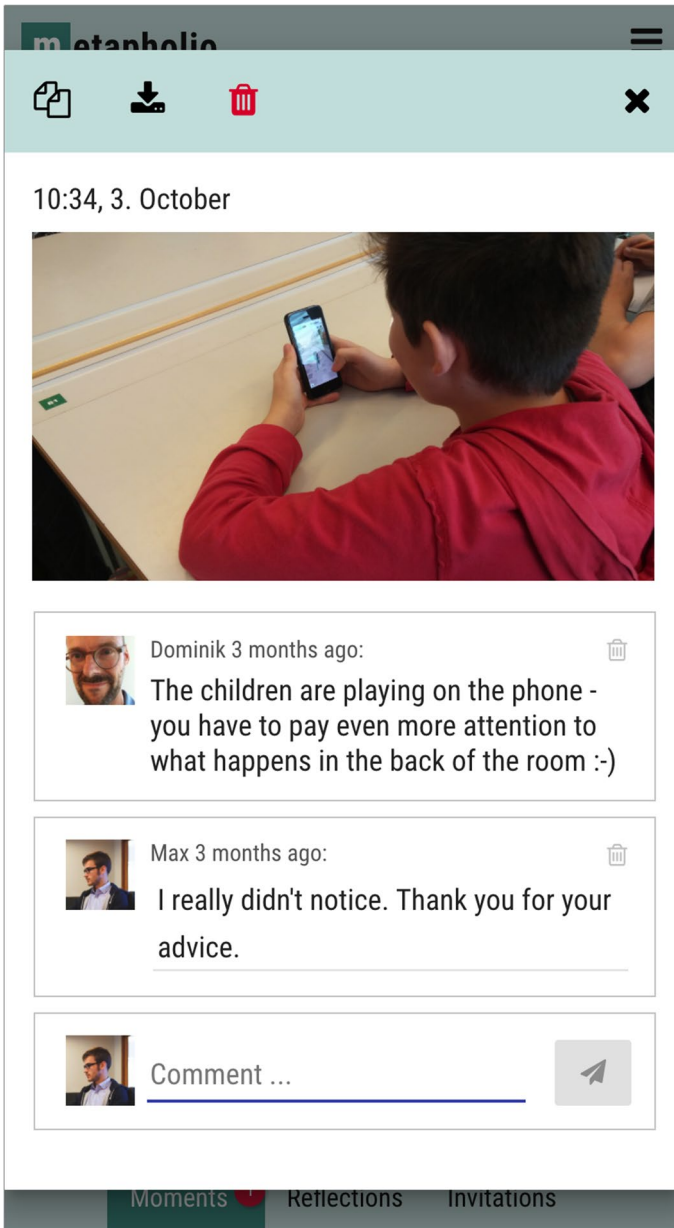**Fig. 5** Overview of written or spoken reflections

Fig. 6 Menu for commenting on a moment/a reflection

4 Significant Challenges and Conclusions

The Metapholio app combines different functions of several common note taking apps into one coherent software package that is tailor-made for professional reflection in teacher education. It provides pre-service teachers with a step-by-step procedure that is intended to

support professional noticing, reflection and exchange with peers, experienced teachers and university mentors. The design of the app is grounded in research findings that emphasize the importance of professional noticing as a prerequisite for reflection, the need for prompts as scaffolds for reflection, and the vital role social exchange among pre-service teachers and between pre-service teachers, experienced teachers and university mentors.

A first set of case-studies was carried out with nine pre-service teachers who used the app over the course of a 4-week teaching internship. All participants were asked to record at least 30 moments and 8 reflections. The results indicate that most of the pre-service teachers succeeded in relating practice to theory and that they often used the appropriate terminology and included suggestions for future actions in their reflections. Not all of them related the collected moments to their reflections, however. Furthermore, the level of reflection proved to be particularly elaborate when the experienced teacher had recorded moments for the pre-service teacher. While the pre-service teachers mainly collected picture-based notes, experienced teachers decided to record videos of classroom situations more often. Thus, the study highlights the importance of the involvement of experienced teachers when the Metapholio app is to be used productively. Controlled studies will need to show how these processes ought to be orchestrated so that the app can effectively contribute to achieving measurable progress in reflective skills, teaching quality and, ultimately, pupil learning. In particular, we will have to address questions concerning the frequency with which moments should be collected (incident-based vs. at regular intervals), the mode of the collection of the moments (text-based vs. multimedia), and the focus of the note taking activities (open vs. focused on predefined aspects). With respect to reflections, it remains to be analyzed whether their quality varies according to their mode (written vs. spoken) and depending on the support by different types of scaffolds (specific vs. generic prompts). As the app facilitates social interaction and enables collaborative noticing and reflection, we also need to clarify who should participate in the creation of a hybrid space of discourse (e.g. university mentors, experienced teachers, pre-service teachers, and possibly also pupils and parents). Although the app has been specifically developed for the purposes of teacher education, it can easily be adapted to the needs and requirements of other fields of practice-based education and training and thus serve as a versatile tool for fostering professional noticing and reflection in various professional contexts.

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