Chapter 7
Bringing Learning to the Workplace: A Smartphone App for Reflection and Increased Authenticity of Learning

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Recent publications on professional education acknowledge the importance of academic knowledge when preparing students for professional practice. But they also seem to agree on the necessity of changing the pedagogy of professional education, suggesting an alternative to the traditional, content-based approach for learning and learning design. For example, Dall'Alba and Sandberg (2006 p. 404) argue that

> Pedagogy that focuses on promoting acquisition of decontextualized knowledge and skills fails to address issues concerning when it is appropriate to use such knowledge and skills, how to use them, and to what purpose. Furthermore, given the breadth and complexity of professional practice, no single pedagogical method can be a panacea.

In their view, it is no longer content which should serve as the guiding principle of program design, but understanding the nature of professional practice and its consequences for how to teach.

In general, many pleas have been made to include the learner experience as part of the learning process (Eraut 1994; Ericsson et al. 2006; Ericsson 2009). A particularly strong message was conveyed in a recent position paper in *the Lancet*, which voiced the importance of connecting learning experiences with formalized training and learning in health professions education (Frenk et al. 2010). The authors claim that learning systems should be developed to improve the professional skills of students, allowing students to acquire leadership capabilities to become change agents in their profession: people who are capable of shaping their own profession

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and professional practice. It is important to note that the acquisition of those new capabilities should not replace the acquisition of current core competences in health professions education, but rather should be developed in conjunction with them.

Our knowledge about designing curricula that facilitates student learning has increased substantially over the past few decades (e.g. Hattie and Timperley 2007). Next, our understanding of how we can transfer professional values and knowledge about professional practice has drastically improved due to the successful development of innovative educational practices such as problem-based learning (Van Berkel et al. 2010; Wilkerson and Gijselaers 1996). Authenticity is stressed as an important characteristic of effective tasks or problems (Azer 2007; Van Merriënboer and Kirschner 2013). However, what is missing is how the learning experiences of students can be integrated into formal education. Reflective practices are common in workplace learning, but integration of formal and informal learning is crucial for students to develop expertise to be prepared in a rapidly changing professional world (Tynjälä 2008). For example in teacher education, ample attention is given to reflection on own work, aiming to improve own teaching and support professional development (Avalos 2011; Marcos et al. 2011; Oner and Adadan 2011). However, reflection is disconnected from formal learning and too often it is limited to defining problems and does not support learning how to deal with them (Marcos et al. 2011). Surprisingly few practices seem to be capable of connecting students' learning experiences at the workplace with formal training and education (Hafler 2011). This is especially important in medical education, which requires students to spend a substantial amount of their time at the workplace to acquire professional competencies.

Medical schools have put a lot of efforts into developing programs which mirror professional practice, and pedagogies which facilitate student learning to acquire necessary skills and knowledge. In general, Problem-Based Learning (PBL) has been recognized as a valid approach, which relies strongly on the input of professional practice in its pedagogy and curriculum design (Schmidt et al. 2011). In PBL, small groups of students collaborate on analyzing and solving problems, which have been constructed and described by their teachers. Problem descriptions are intended to trigger intrinsic interest in the topic, activate prior knowledge and guide self-study in a process of constructive, self-directed, collaborative and contextual learning (Van Berkel et al. 2010). As depicted in Fig. 7.1a, typically all students are focused on a paper-based case or problem description. However, problems are often too well-structured, too closed-ended and not realistic enough (Dolmans et al. 2005). Initiatives have been taken to make the problems more realistic by using video cases (De Leng et al. 2007) or introducing real patients into the curriculum (Diemers et al. 2010). To optimize the perceived relevance and value of a problem and support the learner's ownership of the problem, however, it would be beneficial to "solicit problems from the learners and use those as the stimulus for learning activities" (Savery and Duffy 1995 p. 4). This is depicted in Fig. 7.1b.

The current chapter describes how mobile devices (smartphones) were used while students were attending clinical clerkships. We aimed to develop learning practices – through the use of mobile devices – which solicit problems or issues encountered in practice from students who were distributed at several teaching hospitals. Next, we
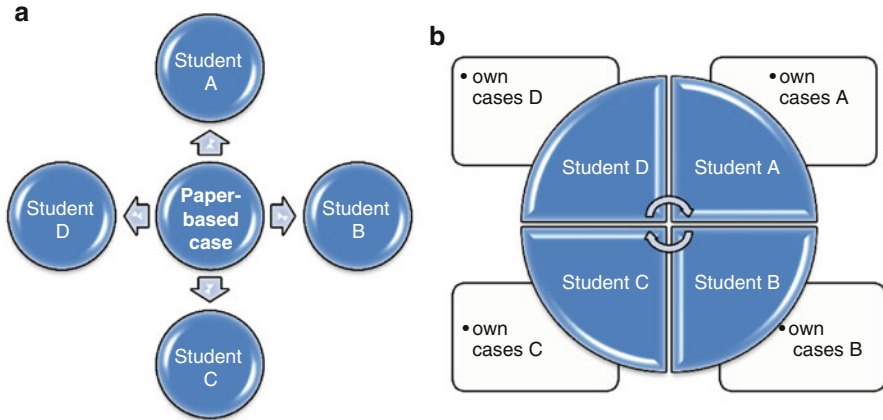
Fig. 7.1 (**a**) Situation in traditional Problem-Based Learning (**b**) Situation in a group meeting about cases from students

tried to collect their learning experiences, making them explicit and sharing them with students and medical teachers. It was our purpose that these learning experiences serve as the basis for formal education meetings, allowing medical staff and teachers to exchange authentic experiences acquired at the workplace.

7.1 Integrating a Mobile Device to Capture Learning Moments in the Workplace

7.1.1 Project Goals and Aims

Medical education supposedly should help students – in this particular case, residents in training – to make accurate diagnostic decisions, develop treatment plans, and monitor the progress of the patient's well-being. To that end, students undergo a vast amount of training, preparing them for various situations that may occur in practice. Despite all training situations, they may encounter situations which are perceived as completely new. For example, it is one thing to teach about non-compliance behavior of patients, it is quite another to encounter such a situation in practice. The following situation happened during our project, and demonstrates how a student struggles with non-compliance behavior:

> I have met a patient who requested an emergency consult. However, the records show that this patient hasn't been loyal to any therapy or proposed action. Patient only showed up whenever it seems to be convenient for him. I honored the current emergency request. But I have serious doubts whether I should do so again in the near future.

Was it really the best decision which was made? What is common practice in the medical profession or within this hospital? Suppose the student did not meet the

patient request; what are potential risks for the patient, resident and hospital in terms of patient well-being and liability issues?

These simple questions were raised by one of our students while our project was in progress. It shows that this student wanted to know if other students and staff had encountered similar cases and how they would have responded to the situation. Our project aimed to help residents, who are working as doctors in hospitals but are still in training, to learn more from their experiences at work. Their training is no longer structured in formal learning activities and they are expected to learn from work. But it may be questioned whether students learn from work situations as part of their natural learning process; reflection on practice and development of abstract knowledge based on practical experiences. Moreover, their formal learning activities consist of few mandatory courses, which are mostly decontextualized in the same way as described above with respect to regular PBL-courses. Often fictitious cases are used and residents are expected to transfer what they have learned from the cases to their own practice, which is not an easy job. Taken together, two challenges emerge from this learning context: (1) how can residents be better supported to learn more from work and (2) how can formal training be contextualized to make learning tasks more authentic.

The "Learn more from work" project aims to meet both challenges. To support learning from practice, residents need to be aware of moments at which they get in trouble, feel insecure, or experience lack of knowledge or skills. We recognize these "learning moments" as situations that could trigger learning. However, they occur through practice in hospital – a hectic environment. So, the first step is that residents must be alert to such learning moments (Boyd and Fales 1983; Schön 1984). By reflecting in action, these moments are recognized. Then, they must be set aside for a later, quiet moment suitable for reflecting on the situation and learning from it. In the meantime such learning moments must not become lost, which is a big challenge. To make learning more authentic, it is necessary to help residents to efficiently and effectively capture and store their learning moments for later study. Our solution was to develop a smartphone app with which moments can be easily registered at the workplace by making a short note, taking a picture, making a voice recording or video.

After the residents registered the learning moments, we wanted them to be used as cases for discussion in tutorial group meetings. Benefiting from learning moments is likely to increase through group discussions, as is the case in PBL. Reflection-on-action (Schön 1984) can be supported by tutorial group meetings, guided by a tutor. Tutorial group meetings are expected to improve learning from work, which occurs at the implicit level in the work setting. Moreover, by using the learner's own cases, the authenticity of learning during these meetings is likely to be higher than in typical formal training activities. Therefore, we studied the effects of both the implementation of the app and the tutorial group meetings on level and frequency of reflection within a 2×2 research design with 64 residents. In another empirical evaluation study we found – amongst others – that app users reflected more frequently and that tutorial group meetings contributed to more learning activities because of learning moments (Könings et al. 2013, 2014b). These results demonstrated that our app does indeed support development of reflection after experiences in clinical practice. The present chapter focuses on the experiences of those residents who used the app and

attended the tutorial group meetings. The next sections will describe how we developed the app and the steps taken in that process. The set-up and content of the tutorial group meetings are described in more detail. Furthermore, the residents' experiences with the app and the group meetings are presented.

7.1.2   Project Setup

7.1.2.1   Smartphone App Development

The development process started with defining the requirements of the app. We wanted to enable the use of different modes for registering: making short text notes, taking pictures, making audio memos in the form of voice recordings, and making short videos. Users can choose the most appropriate mode for a particular learning moment. Furthermore, we wanted the files to be synchronized with the university server, as this is a safe storage place and enables sharing of files in the electronic learning environment for educational purposes. Synchronizing must proceed in a safe manner (e.g., Webdav protocol) to ensure privacy for personal reflections and possibly personal information about patients and personnel at the workplace.

Having set these requirements, we searched for existing apps and found an app that appeared to contain most functionalities. We tested it and contacted the developer to request small adaptations to improve its usability. Although we were not able to meet the programmer, who resides in Australia, he was willing to contribute to our project from a distance and to improve his application. We took this as proof of the value of exploring technologies from around the world.

A pilot study was conducted with this app. Three residents used the app over a period of 2 months. They took a smartphone with them during work and registered moments that they considered important for their learning process as a medical specialist. As it was not routine to use an app at such moments, they were sent reminders by SMS once a week, asking, "Are you still using your smartphone app for registering your learning moments?" The residents tested technical aspects and usability of the app and evaluated the added value of its use for learning. We were interested in the spontaneous use of the app and did not give instruction about how to use it. After 1 month and at the end of the pilot their experiences were evaluated in interviews. They were enthusiastic about the ideas behind the app.

The following observations were based on the results from the pilot: first, the app was a "rendezvous" of experiences or topics to be addressed later. These can be skills that need to be developed more, difficult conversations with patients or the supervisor, situations that provoke emotions, missing knowledge that needs to be retrieved, and issues to be discussed with the supervisor or included in the personal portfolio. The app prevented learning moments to get lost because of forgetting them. With the app in place, a quick note captured learning moments.

> The app makes easier what you already did or should have been doing [monitoring your learning moments]. The app feels like a mini-portfolio with things you have to do for your learning on the job.

Second, residents perceived that the app increased their awareness of learning moments, because of the kickoff-meeting in which the app project was explained, the regular reminders by SMS, seeing the icon of the app on the home screen of the smartphone, and the commitment to the pilot.

Third, residents suggested the use of coaching or group meetings to discuss the challenges faced and to converse with experts on possible solutions. This need was especially experienced when solutions to problems cannot be found in books, for example in case of unpleasant experiences with a colleague or patient, or inadequate and frustrating conversations.

Technically, the residents had offered minor suggestions for improving ease of use. A major concern, however, involved the uploading of files to the server, particularly when Internet access was reduced or absent. Files were lost because they were not saved on the smartphone. Unfortunately, the app developer did not wish to modify the app, leaving us with no choice but to discontinue its use for our project. Our results prompted us to suggest these additional requirements: use as few steps as possible to save and upload; ensure local file storage; and include an automatic reminder to use the app. Additionally, the importance of an informative kick-off meeting was stressed and the need to schedule occasions for discussing the learning moments.

In the next step, a completely new app was developed which includes all requirements and is suitable for IOS and Android. During the development process at Maastricht University the app was tested extensively on various devices and by different users, and improved until it met our needs. The new version includes four large buttons for taking notes, making pictures, videos, and voice recordings. Files are automatically and safely uploaded via username and password and are stored in the personal electronic learning environment at the university server, and are also saved on the phone. A notification is sent as a reminder after 3 days of inactivity with the app (interval adjustable). Files are listed under the button labeled 'view files' and can also be opened in the app (Fig. 7.2).
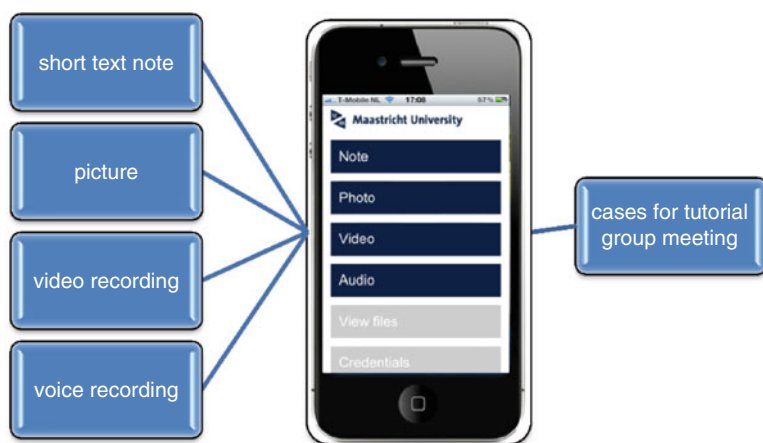

Fig. 7.2 Learning moments registered in the app are input for the tutorial group meeting

This final app was used in the current project, where it was offered to 14 who additionally attended tutorial group meetings. They were instructed to use the app for registering learning moments regarding general skills, such as communicating, collaborating, managing, and professionalism (CANMEDS; Frank 2005).

Additionally, residents must develop their medical skills, which are very specific for each specialty and less open for discussion. Learning moments on general skills, however, are most suitable for multidisciplinary group meetings, as reflection is conditional for learning.

7.1.2.2 Tutorial Group Meetings

Residents participated in tutorial group meetings to discuss their learning moments, as registered in the app. Every two weeks an obligatory tutorial group meeting was organized for about eight residents representing various disciplines and stages of their medical training. Discussions were guided by a tutor, a recently retired medical doctor who was very experienced in supervising and coaching students. A kickoff-meeting was organized to present the aims of the project. Participants were given instructions in the use of the app and the plans for tutorial group meetings were explained. The first group meeting was scheduled two weeks after the kickoff meeting. In total, three meetings were held over a period of six weeks. The topics discussed in each 2-h tutorial meeting addressed learning moments registered in the app since the former meeting (see timeline in Fig. 7.3).

As a preparation for the meeting every resident sent a description of one or several learning moments to the tutor beforehand. These learning moments formed the basic contents of the meeting, as these are the problem descriptions that guided the learning process in the group. The prompt registrations that residents made in the app could ideally be directly accessible for the tutor, but registrations often contained insufficient detail to be understood by anyone other than the resident himself. In the preparation assignment, residents described the learning moment(s) in a way that
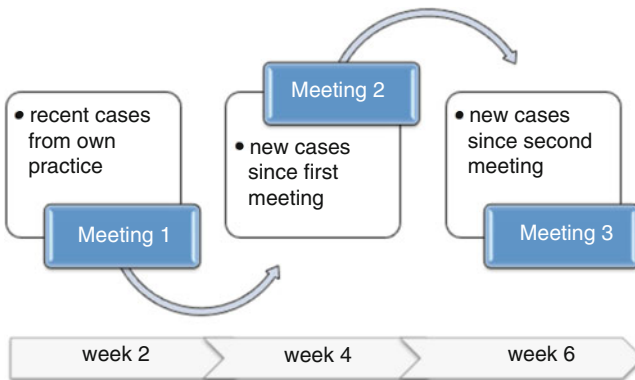

Fig. 7.3 Timeline of three tutorial group meetings over six weeks

enabled the tutor to imagine the situation, to prepare for the meeting and consider aspects of the case to discuss, to develop questions to ask the group and examples for adding a case, and to identify links between cases of different group members.

During the meetings, group members presented their case(s) to each other: they discussed their experiences, the circumstances, those involved, and how they (and others) reacted and behaved. The residents shared all information needed for others to have a clear idea of the problem. After that, the group members reflected on it, shared knowledge about the topic, asked one another questions, suggested alternative solutions, and shared earlier experiences with comparable problems and how these were solved. The tutor closely followed the discussion and intervened at moments when the discussion could be expanded. In the two hour meeting, the problems of all group members were discussed.

As residents were asked to select problems that did not focus on the medical or technical aspects of their work, the content of the problems discussed was rather broad, but recognizable for all group members. Problems they shared included themes such as communication, collaboration and ethics, which are considered general competences of medical doctors and highly relevant for their professional development. Textbox 7.1 includes examples of problem descriptions, which residents sent to the tutor for discussion in the tutorial group meetings.

As can be seen from the textbox, residents experienced difficult situations with respect to professional behavior and responsibility: where does the doctor's

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Textbox 7.1: Case Descriptions Sent to the Tutor as Preparation for the Tutorial Group Meetings

- Trauma Care with abdominal pain. Is there evidence (or not) for skipping the thorax and pelvis X-ray before you directly proceed with a CT scan in case of evident abdominal pain? Resident of radiology was not amused that firstly x-rays were taken, while he was waiting. Bosses of trauma care generally first want X-rays. What is wisdom and what is defensible? How do you deal with "conservative" boss and "progressive" resident/radiologist? I don't want to get my head chopped off by any or both of them. But somehow it happens anyway.

- A 75-year-old patient was admitted due to pleural liquid without obvious cause. Extensive history. Already very comprehensive outpatient screening.... Patient lost patience and is admitted to do all investigations clinically.... At the first visit, the patient vents his frustration again about the duration of analysis, which he finds far too long and that nothing is happening … He makes himself more and more angry. No non-verbal aggression towards caregivers, but banging his fist on the table. After some time listening patiently to his account and try to break, this appears not to be working and my supervisor at one point expresses that he is getting angry (on a quiet tone) and that the patient should calm down or else better go home. But that it would also be finished then. After

(continued)

Textbox 7.1 (continued)

this, the patient eventually calms down and since then communication was a lot easier. *[Instructive observation of communication skills of supervisor]*

- Working at the clinic with a staff member who "immediately has to go away". He leaves you with his outpatients' clinical consultations. "You'll get there, don't you; you can always call me" *[Resident however does not at all feel comfortable with the situation]*

- Surgery in which the orthopedist and neurosurgeon have to collaborate. During timeout (i.e., procedure before starting the surgery) by the orthopedist there is said the neurosurgeon would be present. He finally appeared to be abroad and did not have settled replacement. In the meantime, the patient was asleep already. *[Question about own responsibility to participate in this surgery]*

- Eighty years old patient has a hip fracture and needs surgery. According to the family of patient, she is forgetful and would not be able to take the appropriate decisions. Patient refuses surgery, even after several doctors have discussed the possible consequences to her. The family requests surgery, since she would not be able to make a realistic decision because of her forgetfulness. What about this situation and how do you solve this in short order?

- Patients and family think they are our only patient and we have unlimited time available and want to hear their whole life story! I find it very difficult to deal with. I tried to make clear that it is about the problem of today and not the problems of years ago. So how could you subtly make clear to patients that you do not always have time to hear their whole life story? How do you decently cut short the story of your patients at a certain point?

responsibility stop when the patient is not constructively motivated? Also, dealing with conflicting opinions was a frequent topic. To what extent do you always have to follow your supervisor, particularly when you have a different opinion? And, dealing with ethically problematic situations: are you just following your colleagues? What about your own responsibility? Furthermore, communication issues were mentioned frequently, including experienced difficulties in conversations with patients and their families, or observations how the supervisor solves a conflict situation. Also, the communication with colleagues was a source of troubles. It is difficult to know how to handle such situations so that you are taken seriously by colleagues at all levels of the hierarchy. The different kinds of problems the residents encountered at their workplace are summarized in Fig. 7.4. What all these problems have in common is that there are no easy solutions to be found in the handbooks or scientific medical literature. This made the discussion during the tutorial group meetings very dynamic and practical. The next section will describe residents' experience with the app and participating in the meetings.
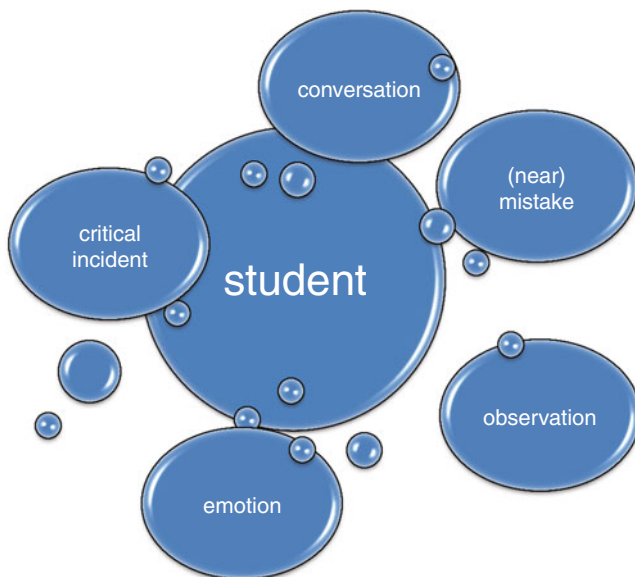
Fig. 7.4 Types of problems encountered at the workplace

7.2 Participant Perspectives and Experiences

7.2.1 Experiences with Smartphone App

The residents used the app in different situations: in the medical context when the resident encountered a case he did not understand or a disease about which he knew too little, or in a situation where the resident felt, "Gee, my own opinion is so different here. Is this because of me or why is this the case?" Medical-technical learning moments were more easily observable during work, as the resident was not able to proceed with work without looking up information. However, learning moments with respect to general skills were less easy to detect. "You can move on with your work, also when communication was perhaps not optimal…it doesn't cause that you cannot do your work." Often at the end of the day or in evening hours residents took time to think about what happened during the day and reflected on it. "Communication and that kind of issue are of course sometimes vague and difficult to catch in one sentence at that moment [when they happen]." "When you reflect, then at once you think: wait, that's not correct or should it really go like this?" It also required some distance taking: "You have to step back to see the problem." Such learning moments gave a dissatisfied feeling at the end of the day or caused one to wonder whether things should have gone the way they went. Already this first step of personal reflection was valuable for learning, as nicely summarized by a resident stressing the importance of reflection on his/her own behavior and thinking about alternatives or prevention of problematic situations, "as you know that you might not be able to change the others, but yourself."

The app appeared to be useful for quick registration of learning moments that needed an immediate solution. Learning moments that needed more reflection were vaguely noticed during work and were not registered at that moment, but rather at the end of the day after rethinking. This later reflection required a trigger. In this project there were two types of triggers: reminders sent by the app after 3 days of inactivity and the deadline to send in new cases for the tutorial group meetings.

The group meetings as such reminded for reflections. Residents knew that they had to send in cases for the next meeting, which increased alertness for learning moments. One resident mentioned that this was even enough for her to stay alert. The reminders sent by the app were valuable for most of the residents. "It does trigger you. It is an alert, yes, making you strongly aware. I think this is good." It raised alertness for learning moments. "I have to be attentive and think whether I encounter something. You're more alert with your work." Reminders were considered as beneficial, because otherwise they did not feel to be so attentive. "It's the ideal incentive, for sure, especially for things where you have to think about afterwards. A week passes so quickly; you have to do so many things… I think you register much less if you don't get reminders."

Some of the residents reported that reminders were not necessary for them, as they were already very alert. By consequence, they used the app regularly and did not receive many reminders. If they received one, their reaction to it was rather weak, like "Oh yes, I indeed just have to think about it again." Others felt slightly negative emotions after receiving a reminder: "stress, o gee, I have to write something down" and "I didn't like to receive a reminder, because you think, well, I have to take part [in the project] a bit serious". It also caused more intense reactions, like from the resident who said:

> How should I say this properly? Yes, then I think, shucks, why do I get this. As you did want to note something, but then you didn't do it that evening immediately… I thought, blast it [first name], be a bit more alert…. It's more slovenliness… I intended not to get reminders, but it still slips in.

7.2.2   Experiences with Tutorial Groups

Residents were very positive about the group meetings, which were especially valued because of their safe atmosphere for discussion, similarity of problems encountered, solutions from different perspectives, and the input by the tutor as an experienced practitioner. They will all be described in more detail below.

7.2.2.1   Safe Atmosphere

Residents valued the atmosphere in the meetings that enabled them to discuss cases, situations, or problems that they normally did not talk about. The setting was good and the atmosphere was relaxed and very open, with no pressure. "You didn't get the impression that there was anything you could not talk about." Residents pointed to the difference between tutorial group meetings and discussion with colleagues about difficult cases.

At the workplace "there is for sure a chance that you discuss it with your supervisor or colleagues, but still that's less intense than in such a meeting." Another resident said,

> I sometimes tell colleagues about things I encounter or don't know and then they tell what reaction they would have given. But that is different from when you are discussing it in a much more relaxed manner, thinking everyone has the same problem. So, why can't we talk about such problems as freely at the workplace, and also with your boss?

But residents even felt emotionally stressed by lacking the opportunity to share their troubles, as this resident indicated:

> I liked to just sit together, that you can spill out things that maybe bother you and that you just can spill out. I think this is good. If you make a note, it is bothering you, I think. Sometimes it is not that serious, but it can also be something serious that is really bothering you and you can spill out and everyone can react on it and perhaps that's nice and, yes that you then leave with a better feeling. Yes.

Taken together, the setting in which they were able to talk together about their learning moments was evaluated as very beneficial.

7.2.2.2   Similarity of Experienced Problems

Residents appreciated that the other group members experienced comparable problems during work. They found it interesting, but also mentioned, "It's nice to see that you are somehow struggling with the same problems." This caused feelings of relief:

> I found it indeed very strong to see that we all run into the same problems, only in different scenarios. Normally you don't talk very much about it and normally, formerly, well, things about which you feel uncertain, you don't want to always speak your mind. But then you realize that in fact almost everyone is the same in that sort of things and how they experience it… It is good to name them, also about work, in your team. I think this happens far too rarely.

Talking about troubles also might raise feelings of self-confidence, as it "has made you realize you're not the only one who is bothered by these kinds of things." And,

> It does make that you are a bit more sure of yourself, as, oh, I'm not the only one, everyone makes mistakes now and again and everyone runs into these things or is fed up with certain things or has heavy time at work sometimes. I'm not the only one.

7.2.2.3   Solutions from Different Perspectives

Discussing the cases in the tutorial group also helped the residents to find solutions for their problems and learn from the others' problems. By talking about your own problems,

> you realized, oh yes, indeed I didn't look at it this way or I could have done it that way. Therefore, you have to discuss with someone else, otherwise you keep reasoning in a circle for things that you cannot completely solve. I think it works better if you actively talk about it with others.

Group members represented different specialties and this multidisciplinarity was valuable, as new and differing views to the problem were appreciated:

> that people have a fresh view at it, because if you would do that with your own colleagues, they might easily say like 'never mind, it's just like that here'. You are looking more un-biased to situations than direct colleagues or if you know the whole situation.

New insights emerged by discussing the problems: "things were said where you make a connection in your thoughts that you didn't think about before… the penny has only dropped at the moment that you discuss it and that others contribute." This was also felt by another resident who experienced that it has finally clicked by telling about the case: "I have really learned it, as when I was telling it, the penny has dropped for myself, because I really was telling it once again." Preparing for the meeting had an effect, because presenting the case required more thorough analysis of it:

> You better think about what happened and what it did to you, what you could have changed and what you might do differently next time. If you have to tell some one else, you need a stronger story, a clearer clue than if you think for yourself.

If other group members agreed with the resident's opinion or action, it also increased self-confidence.

> It is also a confirmation. It's sometimes nice if they say, we agree with your thoughts on this case; that you feel strengthened in that. It does make you a bit stronger. You don't have the feeling that you're alone in that.

This was also mentioned by another resident who said, "it reassures a bit and you think, well, I'm not the sorehead of the group… it's not about me. So, that's nice."

Otherwise, residents learned much from listening to each other's problems. "How they solve it, you can try that strategy yourself. And you can share your own strategy or success stories to help the others." The tutorial group meetings offered the potential to learn about situations that residents might encounter in the future. "I hope that if I come in such a situation, I'll have tools, for sure from what the tutor sometimes said, to look at it from a different angle." Another resident even formulated it stronger:

> If you encounter a similar situation, you think back, what the problem situation was and how they thought to solve it…. I like that you can fall back on it at that moment. Because in fact it's an experience you had, that you in fact not yet had, as it was someone else's experience.

Thus, residents indicated that they learned from preparing for the meetings, presenting (and analyzing) their problems, discussing their own problems, and also imagining and discussing problems from other group members.

7.2.2.4   Role of the Tutor

Residents were very satisfied with their tutor and indicated several characteristics that made the tutor effective. His patience and openness were valued: "Very calm, but also his own contribution and his own experiences. He left people free in their

cases and sometimes he asked a challenging question about how you're dealing with it." It was also mentioned that he was a very good listener and was well able to empathize with the situation of the residents. His experience in the clinic was appreciated: "He is someone with a very good overview of everything…. He knows the tricks of the trade…. that he of course can think along on all fields and also experienced problems." "He is just an old hand in the profession, who valuably adds to it or that he just says things of which you think, 'Oh yes, you can look at it that way as well'" or as formulated by another resident "he took you along to that different viewpoint, by which you can better understand the situation too."

Next to the large value of his experience and expertise, safety was crucial for being a good tutor:

> He should not radiate too much authority. You shouldn't look up too much to him, as you then again become careful in how you tell your story. If the tutor is more down to earth and more open, you tell your story much more open and direct. If my professor would have sat there, I would have talked differently about some cases, than I did now.

Finally, general tutoring skills (such as leading the group, being able to tell stories, having a guiding role if necessary, being enthusiastic) were valued. It was good to realize that the role of the tutor was to stop the discussion at the right moment, as a resident mentioned,

> it was sometimes a bit long-winded, as everyone of course has once experienced something about the same topic and then everyone tells that. Then at a certain point I thought pff, now I do know, it's fine, it is discussed enough.

7.3   Utility of Mobile Devices in Educational Settings

From this project we have learned that it is very valuable to organize tutorial group meetings around cases as experienced by the residents or students. Several characteristics of the setting contribute to its success. First, the atmosphere during the meetings should be safe. Creating a positive climate is the responsibility of all group members, but the tutor plays a large role in this. Second, discussions should focus on problems that are recognizable for all group members, which make the presenting student feel understood by the others, and related to cases to which all members can connect. Next to the emotionally added value of being able to share troubles with peers, it enables effective discussion of the cases, solutions and alternative approaches. And third, the tutor should be an expert in the field, with an open attitude for all problems students want to discuss. His/her contributions should stimulate new ways of thinking and new insights, within a supportive and safe climate.

The smartphone app is an appropriate tool to bring the problems from the workplace to the tutorial group. "I think it can increase the efficiency of learning, it continuously reminds you that I indeed have to keep thinking about what I already know and what I don't know." The app and the tutorial group meetings complement

one another, as meetings stimulate awareness of learning moments at the work-place: "Meetings are an incentive to better use the app or use it more consciously." On the other hand the learning moments in the app improve quality of the meetings, "by the examples that you saved in the app, you can get more out of the coaching" and "If you don't actively discuss it, you do less with it and you learn less from it." If you consider organizing tutorial group meetings without the app, a resident remarked that, "you shouldn't go and sit there and just tell something, because then you perhaps cannot hit upon something."

The added value of the app and the tutorial group meeting is nicely summarized by one of the residents:

> The biggest added value of the app is that you always have it with you and you have these reminders, so you in fact are almost forced to register your learning moments when you encounter them. The added value of the meetings was for me especially the depth you went into the learning moments. Because by thinking about what am I registering as learning moments for the group meeting, by thinking that way, you automatically think much deeper about the things you have registered. And then you have the meetings where the learning moments of everyone are discussed.

7.4   Opportunities for Future Implementation

The aim of the current project was twofold: (1) to promote reflection during work by offering an app and (2) to scaffold their learning from these encountered learning moments by organizing tutorial group meetings. The content of reflecting and learn-ing was focused specifically on general skills of medical doctors in training, but the idea of promoting reflection at the workplace – and learning more from work in general – is applicable to many domains. In our project, participants spontaneously used the app for medical-technical learning moments, although this was beyond our instruction, which shows that the app was useful for reflection on all medical com-petencies. But also in other contexts, learning at the workplace can be stimulated and supported by the app and the linked group meetings. It could for example be used in vocational training, to stimulate learning from practical experiences (see for example Mauroux et al. 2014). At the postgraduate level, the app could be used in other professional training programs, such as business education and training for working professionals. It is known from research in business education that acquisition of business expertise is highly dependent on workplace learning (Arts et al. 2006). However, the domain of business education lacks the instruc-tional tools to connect informal learning experiences acquired at the workplace with formal education. The present app provides course developers in business education a strong tool to relate different learning experiences within the managerial work-place with formal theories about management and business. In professionalization programs, it can help to continue working on the topic of the training in between training days, to promote alertness of transfer of newly acquired skills to practice, and to organize the training around participant cases. Recent research in Professional

Training for Certified Public Accountants has demonstrated the importance of sharing knowledge and experiences acquired in different work situations which reflects common theoretical foundations in the field of Accounting and Auditing (Grohnert et al. 2014). In higher education, placement programs in any discipline could profit from improved learning during workplace experiences.

In addition to implementing the described approach at other levels of education and in other domains, it could also be extended by adding extra functionalities, such as sharing the learning moments in the app with the supervisor or tutor. It could also be valuable to directly share learning moments with peers (within the tutorial group or a selection of peers). This can intensify collaborative learning, as a continuous process. Group discussion could also take place online with videoconferencing or on a discussion board or blog. This is especially valuable when group members are working at different places or different institutions, which may hamper face-to-face contact. Skillful moderation of such an online discussion is of utmost importance as tutor input and a safe atmosphere are highly appreciated by participants. Moderated online discussion can also be an important element with regular face-to-face tutorial group meetings.

Another direction for further development relates to the integration of the app with the digital learning portfolio. By this linkage, the learning process becomes more visible both for the learner and the supervisor who must support and assess learning. One of the participants suggested using the app for 360-degree feedback:

> These are all assessment moments and if you register your learning moments, you can better show in which direction you have been studying and working, where you have run across. You can talk about that during your appraisal, but yes then three fourth of things are lost. Then you think afterwards, 'Oh yeah, I actually should have told this also.' But of course you then forgot it…

Therefore, coupling the app with a portfolio system could improve learning by saving more information *for* and *about* the learning process, which can be used for extended learning afterwards by the learner himself and for extra support by supervisors/tutors. Additionally, it could make learning more transparent and appraisals more informative.

7.5   Considerations and Challenges

When promoting the use of an app for registering learning moments at the workplace, confidentiality is a major topic at four different levels: the user, the app, the tutorial group, and the organization. First, the app should be a personal tool for the user to register his troubles, worries, weaknesses, disappointments, etc. The app should contain the option to keep learning moments private. The need for this might depend on the working context, but the app should enable learning from *all* experiences, and not be limited to those one is willing to share.

The app itself should be technically safe by using encrypted data communication with a secure server. However, 100 % safety is difficult to reach and users might lose

their smartphone. In our project, confidentiality of patient information had to be warranted and participants were instructed not to register any recognizable patient details in the app. The work context should determine the use of the app and whether it is necessary to make clear agreements with the users about confidentiality of information.

Additionally, a safe atmosphere during group meetings is of major importance. It should be stressed that the group members are expected to keep everything discussed confidential. A tutor who is not too closely linked to the daily workplace of the participants is likely to improve the safe atmosphere. This, however, also depends on the kind of learning moments that are discussed; in some contexts the group meetings could be tutored by a direct supervisor.

Another level on which psychological safety aspects should be considered is the organizational level. If it is known by all employees in a department that (confidential) group meetings are organized about (for them unknown) experiences at the workplace, this might create a psychologically unsafe working environment (Carmeli 2007): quality of relations and interactions at the workplace influences perception of safety and by consequence the openness to discuss errors. So, the atmosphere at the workplace helps or hinders failure-based learning behaviors. In case of large-scale implementation of the app and group meetings, openness to all colleagues about its aims is important. Additionally, ideally the initiative will enhance the learning orientation of a department or organization. However, the organizational atmosphere should be carefully considered when planning the implementation.

Next to accounting for these (psychological) safety issues, successfully scaling up this project or implementing it in a different context can be empowered by several factors (Dede et al. 2005; Dede and Rockman 2007): flexible, pro-active, and enthusiastic leaders working with intrinsically motivated participants in an environment in which a need for change is clear to all, will help to cope with the changes required for an innovation. Additionally, the innovation must be adapted and fine-tuned to the learning environment in which it is implemented. Innovation requires trying to understand the different perspectives of those involved, asking for feedback and using it in decision-making (Dede et al. 2005; Dede and Rockman 2007; Könings et al. 2014a). This also promotes feeling of ownership by all, which facilitates the change process. Collaboration among stakeholders improves mutual understanding and optimal use of expertise of all stakeholders, which is likely to result in optimally effective instructional designs and sustainable implementation plans.

7.6 Conclusion

This project shows that technology can be effectively used for scaffolding learning at the workplace. The development process itself can be characterized as a participatory process in which educational researchers, residents, and technical

staff collaborated and piloted the products and the implementation. The developed app connects learning experiences and formal education meetings. Easily saving important learning experiences at the busy workplace (instead of losing/forgetting them) and elaborating on these experiences in formal meetings (instead of being taught on decontextualized cases) made this project a valuable initiative for improving learning from work. Nothing more authentic than one's own learning experience!

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