Work-based mobile learning in the health sector

Concept of a mobile learning system exemplified by educational scenarios of junior doctors [1]

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Abstract

The following article describes conceptual scenarios where learners are supported virtually in critical situations by mentors with smartphones using image and video technologies. The multimedia materials generated in this way can later be used in follow-up meetings and training sessions. The concept is exemplified by educational scenarios of junior doctors and analysed against the background of situated learning and cognitive apprenticeship methods.

1. Requirements and concept

The postgraduate medical education of junior doctors is different from teacher and classroom-centred learning approaches: The theoretical part is relatively small and has little direct impact on improving professional practice (compare e.g. Davis et al., 1995, Marinopoulos et al., 2007). Competences and skills are mostly acquired through systematic practising at the clinical workplace (Berendonk et al., 2008, 1337). This work-based education is complex, stressful and error-prone (compare e.g. Chow et al., 2005, Lesar et al., 1990, Weingart et al., 2000, Williams et al., 2005). Junior doctors are in need of expert support when dealing with difficult problems. These experts are – due to high local mobility and limited human resources – often not available. If the problem cannot be solved via phone, patient and junior doctor have to wait for the on-site support of the medical specialist. This tends to result in a loss of efficiency, the dissatisfaction of junior doctor and a loss of confidence at the patient's side. Junior doctors who make decisions without consulting experts are likely to commit errors. Thereby, learning is not encouraged.

Existing technological solutions only partly meet educational and work-related needs in clinical contexts: Multimedia learning programmes, for example, can illustrate authentic problems. However, they do not close the gap between theory and clinical practice (Mandl et al., 2002, 148). Just-in-time learning programmes focus on the timely integration of short learning sequences into work practices (compare e.g. Harun, 2001, Kahn et al., 2006). However, when physicians have to deal with immediate, complex, patient-related problems they mostly rely on consultation with colleagues (Bennett et al., 2006). In addition, current learning programmes are predominantly

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available for stationary PCs, and therefore have limited impact at the point of care: Clinical staff may cover distances up to 15 km during their shift between patients, offices and work stations (Bardram and Bossen, 2005, 132). Mobile learning addresses these needs with portable computational devices. At the same time current mobile learning software focuses rather on the provision of content than on social interactions. Telementoring, in contrast, is based on social interactions to provide real-time guidance and instruction to a learner in a remote location, based – for example – on audio and video technologies (Rosser et al., 2007). Unfortunately, the focus of existing telementoring systems is on diagnostic quality and technical requirements. Didactic aspects of telementoring have rarely been considered.

A mobile system that combines aspects of telementoring and learning should be valuable in this context. It has to support just-in-time problem solving and, subsequently, encourages discussion and reflection through the generated materials. The following description illustrates a possible case of use in practice: In problematic situations junior doctors convey the symptoms and proposed treatment procedures to distant senior doctors with the help of their mobile devices (e.g. smartphone) based on imaging and video streaming. Through simultaneous discussion the junior doctors are supported in the problem solving process. The multimedia materials generated in this way are later used in follow-up meetings and training sessions.

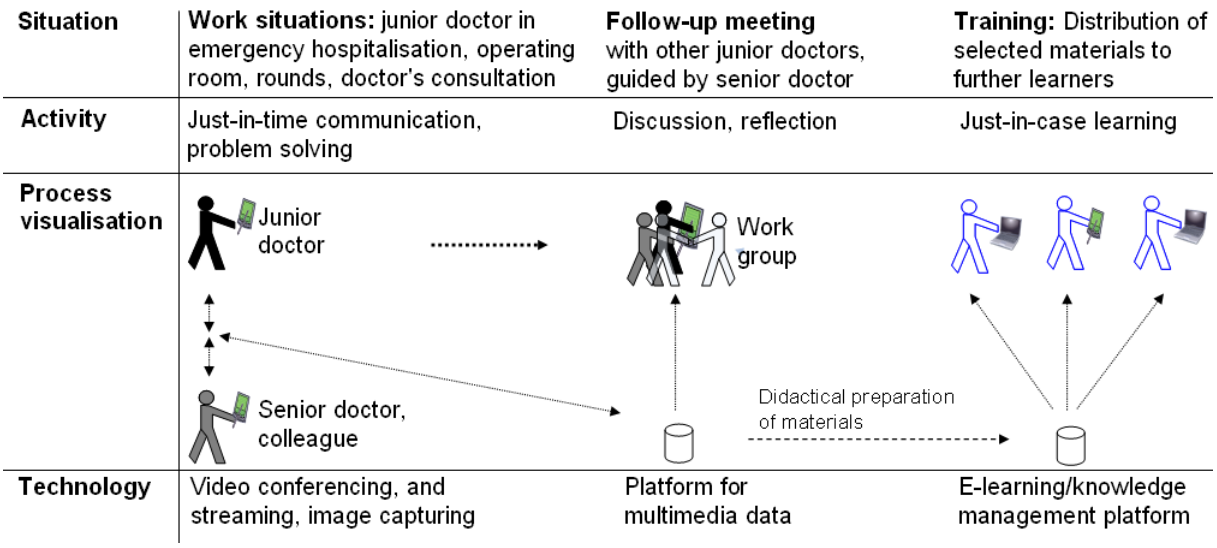

Figure 1 Learning scenario

The proposed concept is seen as an *'add-on'* to existing technological solutions. Learning does not take place in teaching scenarios distant from the workplace. It is encouraged through multimedia enhanced problem-solving and reflection processes.

2. Theoretical and empirical background

It is assumed that certain on-site interactions can be replaced by virtual support using the multimedia-enhanced communication features described above. A number of studies show that diagnosis and consulting can be realised on mobile devices through image and video technologies (compare Ebner et al., 2008, Eze et al., 2005, Hsieh et al., 2004, Hsieh et al., 2005, Piek et al., 2006, Tsai et al., 2004, Yamada et al., 2003). Telementoring can increase efficiency (compare e.g. Rosser et al., 2007, 1458). However, its impact on learning and teaching should be critically analysed:

Clinical and medical learning in general and the effect of this concept in particular might be explained by theories of situated learning and the cognitive apprenticeship model. Situated learning stresses the importance of authentic activities and social interactions. Learning occurs among peers (compare e.g. Lave and Wenger, 1991, 93) and in mentor-learner relationships as described by cognitive apprenticeship. This model combines elements of traditional apprenticeship learning with cognitive elements of schooling. The model is illustrated by activities such as reading, writing and mathematics (Brown et al., 1989, Collins et al., 1991). It is also used to explain the development of clinical or medical competences (compare e.g. Balmer et al., 2008, Cope et al., 2000, Stalmeijer et al., 2008, Woolley and Jarvis, 2007, Alan, 2006, Mandl et al., 2002).

Cognitive apprenticeship is an approach that describes how to design situated learning scenarios by the following didactic methods: *modeling*, *coaching*, *scaffolding*, *articulation*, *reflection* and *exploration* (Collins et al., 1991). These methods are typically applied in clinical teaching and learning scenarios (compare Stalmeijer et al., 2008, Cope et al., 2000, Woolley and Jarvis, 2007). The proposed concept supports and/or encourages *coaching*, *articulation*, *reflection* and *exploration*. In particular, reflection techniques might be enhanced by the use of the generated multimedia materials. However, *Modeling* and *Scaffolding* are difficult to virtualize with the described functionalities in the clinical context. These methods need to be particularly encouraged and practised in order to enable a well-balanced curriculum in the spirit of cognitive apprenticeship.

The system's impact depends on a number of individual, sociocultural, organisational, legal, technological and ethical questions. A key factor is the acceptance and satisfaction of patients (compare e.g. Ebner et al., 2008, 6).

So far, the impact of the proposed concept can only be anticipated by the analysis of similar projects and be discussed against the background of learning theories. Next, it will be necessary to implement and examine the concept in order to show detailed effects. Thereby, two main research questions should be addressed: How will the multimedia-enhanced collaboration and learning system affect the cognitive and sociocultural practices of junior doctors and will these new processes improve the quality of their learning compared to that of junior doctors taught by existing methods and technologies? (compare Sharples et al., 2002, 13).

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