Linking Mobile Learning and Offline Interaction - A Case Study

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Abstract
The use of computer mediated learning has changed the way of learning. To support the collaboration within small ad hoc learning communities, a mobile learning application was enhanced to provide possibilities to share user-generated content. To link the mobile application with the social offline interaction between the learners, the pedagogical scenario of a mobile application was enhanced to offer more possibilities for verbal communication between the learners. Results of a pilot study indicate interferences between computer mediated and face-to-face communication, which leads to a preference of one of the communication channels by the users.

Author Keywords
Mobile learning; collaborative learning; e-flashcards; offline interaction; learning communities.

ACM Classification Keywords
K.3.1 Collaborative learning; H.5.3. Synchronous interaction; H.5.2. [User Interfaces]: User-centered design;

Introduction
In recent years, the use of computer mediated learning has changed the way of learning. The use of mobile devices offers new possibilities for learning anytime and

anywhere in spare times, for example while waiting at a bus stop. Studies indicate a positive effect on the learning outcome where mobile devices are used within the learning process in large university courses (see for example [5]). However, designs of mobile learning applications often focus on single users and offline interaction between the learners is not taken into account. For example, opportunities for offline interaction occur if two or more learners take the same bus on their way to the university. But instead of learning together, the learners may sit together and interact with their own mobile device separately.

This leads to the main research question, how to enhance a mobile learning application to support collaboration within ad hoc learning communities. Related studies, for example [1, 3, 6, 7], show the implementation of ad hoc mobile collaborative learning scenarios within formal educational settings, but mainly did not consider its effect onto the offline interaction of the learners. To gain additional benefits, a mobile learning application should support:

- offline interaction between learners,
- mobile collaborative learning,
- ad hoc exchange of learning content.

To meet these requirements, a mobile e-flashcard application was enhanced to facilitate ad hoc collaboration and foster offline communication within small learning communities.

Linking Mobile and Offline Learning

The flashcard learning approach for ad hoc collaborative learning picks up the pedagogical scenario of questioning each other using paper-based flashcards. One learner takes the role of a questioner and requests the answer to the question on his flashcard from the other learners. The answers of the other learners are compared with the flashcard content and discussed between the learners. Afterwards the flashcard is sorted into the flashcard decks and the questioner may change.

Recent studies carried out within university courses (see [2, 4]) indicate an acceptance of the computer mediated use of electronic e-flashcards by the learners, but the proposed mobile application does not support collaborative learning. To take offline interaction within small learning communities into account, the mobile e-flashcard application, described in [4], was enhanced to support ad hoc collaborative learning. Furthermore, the collaborative paper-based flashcard scenario was converted into a mobile learning scenario. This mobile scenario contains the following steps:

1. Establishing a Bluetooth-Connection between the mobile devices of the learners.
2. Start of the collaborative learning session.
3. Learner 1 chooses the course lection and the question types to be used and starts the learning session.
4. Learner 1 takes the role of the questioner. Therefore, Learner 1 sees the answer side of the e-flashcard on the mobile device. The other learners only see the corresponding question side of the e-flashcard on their mobile devices. The order of the answers is mixed to enhance verbal discussions (see figure 1).
5. The learners communicate verbally according to the question of the e-flashcard. The questioner can send the solution or parts of it,

for example a correct match in a fill-in-the-gap question, to the mobile devices of the other learners.

6. The next first learner, who touches the display after the answer is displayed on all mobile devices, takes the questioners' role from learner 1 for the following e-flashcard.

7. Next to step 4.

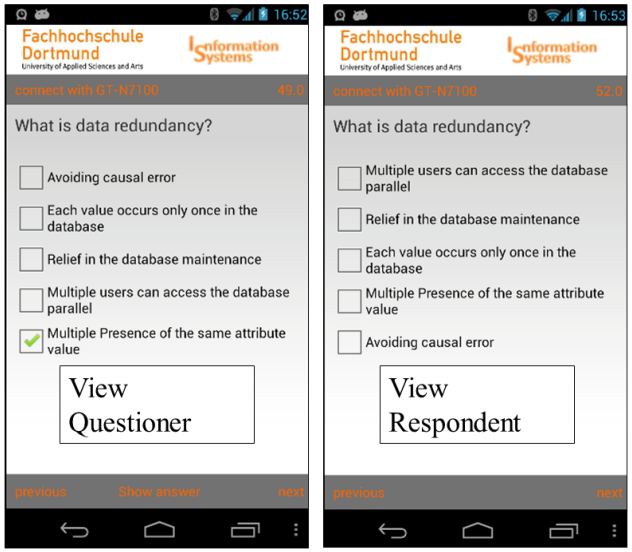

Figure 1. Screenshot of the mobile Application

First Experiences

To prove the concept of linking mobile learning with e-flashcards with offline interaction of learners, a study was conducted at a vocational school for commerce in February 2013. The test group consisted of 16 students (14 male, 2 female), who were preparing for the A-level examination in the subject business economics.

The students had worked with an e-learning management system beforehand, but they had no pre-experiences with mobile learning applications. The peer groups worked on their own, questioning each other by means of the mobile application. But the students sat side by side and worked together with their mobile devices just as if they were working on their own. Although verbal communication was encouraged, offline interaction between the learners remains constant at a low level.

Discussion

Future work will investigate the technical potentials of mobile devices to support ad hoc learning communities. Beyond that, the impact of the use of mobile learning application on the offline communication between the learners has to be measured empirically. As the first experiences indicate, it is not sufficient only to convert an offline pedagogical scenario into a mobile collaborative application to foster offline interaction between the learners within learning communities. To motivate offline interaction between the learners, the mobile application can be enhanced to offer further stimuli for offline communication. This might be achieved by enhancement of additional playful or social elements to the mobile application. For example, a playful element is the task of guessing definitions and terms based on explanation of one of the learners. An example for a social element is a quest task based on the user generated content, which is fulfilled by the whole group. More research should clarify, which additional elements are appropriate to foster offline interaction between the learners. Furthermore, combinations of those elements, for example a mobile quiz combined with an offline social reputation-based system, have to be evaluated regarding their effect on

the learners' offline interaction. Additionally, further studies should investigate the reasons for the observed interference between the face-to-face and computer mediated communication channels. One reason might be the shift of the sensory channel used for communication. Whereas the offline interactions take place mainly verbal and non-verbal, users got used to communicate with each other in daily life with their visual and haptic senses by utilizing mobile devices. Therefore, users adapt their communication behavior to the technical capabilities of mobile devices, which limits offline communication.

CONCLUSION

This study presented a mobile learning application, which pedagogical scenario offers more possibilities for verbal communication. First experiences indicate difficulties of the user to communicate face-to-face while interacting with the mobile application simultaneously. Further studies have to be carried out to overcome this negative side-effect of decreasing offline interaction and to strengthen the ubiquitous potential of utilizing mobile devices in ad hoc learning communities. These studies have to clarify, how the use of both communication channels between the learners can be combined and balanced out.

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