Schmitz, B., Borner, D., Kalz, M. Klemke, R. and Specht, M. (2014). Paper presented at the Bristol Ideas in Mobile Learning 2014 Symposium, Bristol.

Creating and understanding mobile game simulations for school children

Out of the project EmURgency a mobile game simulation evolved, which trains laymen in providing Basic Life Support (BLS) and Cardiopulmonary resuscitation (CPR). The application gets players to act as if they were in a real case of emergency. We conducted two studies to assess usability issues and perceived effectiveness of the mobile game simulation for different groups of learners. Our research highlights a number of issues relevant when working with school children and learners with special needs. The presentation of results comprises a full description of the research design and summarizes the main data collecting methods adopted for the two experiments. This is followed by a description of the game-concept. We conclude by discussing and highlighting design implications, which we derived from the research data, i.e. assessing data from the usability study and comparing students' perception of the game simulation and contribution to their learning.

Mobile phones are considered a new cultural resource that will bring sustained change to the landscape of learning (Cook, Pachler, & Bachmair, 2011). Their interactive nature enhances the learning experience by augmenting objects, places and activities thus adding context to learning objects and inherently supporting the concept of student centred, *active learning approaches* (Sokoloff and Thornton, 1997) such as inquiry-based learning or discovery learning. Recent research investigates the potential of mobile devices to facilitate sense-making activities, i.e. connecting, hypothesizing and reasoning based on what is being observed (Rogers, Connelly & Hazlewood, 2010) and looks upon them as a mode of meaning-making for they enable users to generate their own content and contexts for learning (Cook, Pachler, & Bachmair, 2011).

Still, educational practitioners seem to be reluctant in using them. It is arguable that beyond learning theory und motivational aspects, e.g. school children's attraction for the device, its perceived potential to deliver relevant knowledge is not consistently clear. While more mobile applications are being developed for educational settings, little is known about how the learning process can be transformed when using them (Rogers et al., 2010). A particular challenge is to find adequate curricular functions in school where the inclusion of these new cultural resources can and should be introduced (Cook, Pachler, & Bachmair, 2011). Also, most of the devices used for learning were not designed with educational applications in mind and usability issues are often the case. In order to support the use of mobile devices for educational purposes, usability issues should be tracked over a longer period, from initial use through to a state of relative experience with the technology (Kukulska-Hulme, 2007).

In the course of our research we conducted a series of formative studies between May and December 2013. The studies accompanied the development of a mobile game simulation for health called *HeartRun*. Its aim is to give school children an understanding of Cardiopulmonary Resuscitation (CPR) and to get them into action. Comparable studies indicate that children aged 13-14 perform

compressions as well as adults (Jones et al. 2007). Addressing school children is regarded one toehold to enlarge the target group for CPR training activities. Organizations such as the American Heart Association expect that in the long run, mandatory training of schoolchildren at regular intervals will increase the number of trained adults (Cave et al. 2011) and will raise awareness, interest and sense of importance of actions in out of hospital cardiac arrest for example (Plant and Taylor, 2013).

Plant and Taylor (2013) in their review point out diverse methods of first aid training that have been successful with children. They state that especially the use of "virtual worlds and multiplayer online simulation could be an attractive training and/or retention tool to use in this age group" [p. 3]. Building on this evidence, we set up the mobile game simulation *HeartRun*. It uses smartphones as a location-based gaming platform to enable an authentic, simulation like environment. Based on different roles it prompts learners to help the victim or to get an AED device in order to help. Using mobile phones allows us to augment the situation with location dependent information as well as instructive, situation-dependent educational materials, to structure the process by sending out notifications and to record user behaviour, which can be reused for later reflection and feedback sessions.

With this paper we present the findings from two studies on the use of *HeartRun*. The purpose of our studies was to gather both numerical and qualitative data on the perception of the mobile game simulation and usability issues. Of particular interest was the issue of matching the intellectual level of tasks with the cognitive capacities of the learners. A total of 70 children played the game simulation. The group comprised regular learners and learners with special educational needs (SEN). For the data collection we used videos and field notes of researchers' observations and conversations with participants during the activities, focus groups to obtain information on how learners think or feel about the game simulation after the activity as well as a standardized questionnaire based on the System Usability Scale (SUS) to evaluate usability and learnability issues. The activity involved (a) an introduction phase where players were presented a short introduction to the game, e.g. how to read QR codes with a telephone and (b) the game phase with pupils playing *HeartRun* in teams of two.

From the gaming sessions it showed that mobile devices can effectively support real-life activities and facilitate the switching between such activities and tasks on the mobile, which is substantiated by connatural research (Rogers et al., 2010). Learners with special needs highly valued the application, even though the handling was hampered and more difficult for them. What proved to be essential for them were the activity elements, the content and its relevance to real-life situations.

Acknowledgement. This research was financed by the European Regional Development Fund (ERDF), regions of the Euregio Meuse-Rhine and the participating institutions under the INTERREG IVa program (EMR.INT4-1.2.-2011-04/070, http://www.emurgency.eu).

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