Designing for Collaborative Learning Expeditions by Using Wearable Technology and Smart Glasses

Eva Mårell-Olsson, Applied Educational Sciences, Umeå University, Sweden, eva.marell-olsson@umu.se
Thomas Mejtoft, Applied Physics and Electronics, Umeå University, Sweden, thomas.mejtoft@umu.se
Isa Jahnke, Applied Educational Sciences, Umeå University, Sweden, isa.jahnke@umu.se

Abstract: Wearable web-enabled technology is the newest social fad, but in what ways is it useful in education? In this paper, we illustrate an explorative study of wearable technology for supporting collaborative learning. More specifically, university students from three different study programs collaboratively developed a gamification activity for pupils in secondary schools. The study illustrates a new way of collaborative learning towards “learning expeditions” where the students become designers for a collaborative learning situation.

Keywords: collaboration, gamification, wearable technology, Google Glass

Introduction
Wearable technology experienced a major breakthrough in 2013, but this was not a totally new concept. Steve Mann, the father of wearable technology, has been developing and researching computer-based glasses for many years (Mann, 2012). However, it was with Google Glass and the Glass Explorer Program that this type of technology caught the interest of the general public. Wearable technology is not only based on the fact that we carry around ubiquitous technology, but the technology is context aware and provides users with augmented experiences of reality (Greenfield, 2006). Hence, augmented reality is one of the most prominent features of such smart glasses. This involves the opportunity to create context-aware applications that analyze situations in real-time and present information to the user. However, although smart glasses have a potential for daily life outside education, there is still a knowledge gap as to whether wearable technology could be useful in education and in what ways. We conducted an exploratory study and focused on wearable technology by asking in what ways smart glasses (e.g., Google Glass) can facilitate and support collaborative learning in an educational context and what the benefits, potentials, and challenges of this technology are.

Study context
The study included a two-level collaboration between university students and secondary-school students. The university students consisted of two student groups across three study programs who created an application for Google Glass. The assignment was to create a gamification activity (with the characteristics of a treasure hunt) for children in grade 7. The university students developed a technical application for Google Glass and a pedagogical design that focused on the children’s interaction with the technology. The children’s assignment was to use Google Glass as a tool for solving a learning expedition (Jahnke et al., 2014). The university instructors did not design the learning expeditions for the university students; rather, they created conditions and provided an open environment where the university students were able to design the learning expeditions for the children.

The project was conducted during the spring 2014 with 11 participants organized in three groups. The first group from the study program Interaction Technology and Design (3 students) developed the technical application for delivering location-based information to Google Glass. The second group (6 students) from the study programs of Engineering Physics and Engineering and Management developed a pedagogical and social design based on the idea of a gamification activity. The pedagogical “design for learning” included challenges, problems, and clues (Figure 1). The third group consisted of two children in grade 7 (both about 14 years old), and they conducted the learning expedition in May 2014 by using Google Glass and the new app to solve the challenges put forward by the pedagogical design. The learning expedition focused on ‘Cultures of Co-creation’ that was the theme when Umeå was the European Capital of Culture in 2014. For example, one of the tasks for the children was to find words in poems painted on a big wall. The pupils had to combine the words to figure out what the next piece of the bigger puzzle was and to go to the next location in the assignment.

When the university students developed the Google Glass application for pupils in the form of a treasure hunt, they used the developed application to set information to specific real-world coordinates and within a specific radius. Location-based information supported the pupils’ learning expedition and helped them to find the information they needed piece by piece. At each location they had to solve a riddle that provided clues as to how to proceed to the next location and level of the assignment.
**Methods**

Data were collected through observations and group discussions with both the university students and the school children. In addition, the university student groups wrote evaluation reports at the end of the semester. The reports described the work process, collaborations, and reflections on the potentials and challenges of the technology throughout the semester. The empirical material was analyzed through an inductive thematic analysis (Ely, 1991) with the aim of identifying key concepts and patterns. The following four views of collaborative learning were used in the analysis: a) the design of a situation, b) the interactions, c) the learning mechanisms, and d) the effects of collaborative learning (Dillenbourg, 1999).

**Findings**

This study provides insights into wearable technology for collaborative learning. The first step was to design a learning situation and an open environment for university students that provided the necessary resources for developing skills to become *designers for learning expeditions*. The study has increased the knowledge of the opportunities and pitfalls when using wearable technologies. The collective knowledge of the two student groups was necessary to successfully deliver and test the final application during the field study. The results clearly show that this project is pushing the limits of computer-supported collaborative learning situations and contributes to the debate over the digitalization of schools. A take-away message is that wearable technology provides the opportunity to reflect on and design teaching and learning in different ways where the teacher is the facilitator of an open environment that supports students in becoming collaborative designers across existing study programs and where the learning assignment develops “design-in-use experiences” for secondary-school students (Fischer & Herrmann, 2011). Such designs for learning have common features in that they take place:

- across existing departments and across established boundaries (e.g., different study programs),
- across different places and spaces (e.g., they connect higher education and secondary-school education),
- and through the connection to a real-world audience (i.e. the process and product designed by the university students are connected to a real audience, in this case primary-school pupils).

This can be called a two-level collaborative learning expedition. Such collaborative learning expeditions can be characterized as rather open-ended and problem-based learning paths. They include goal-oriented learning to master X, or to explore and understand the implications of N, but learning methods and instruments are open and unstructured. Such expeditions take place in sociotechnical communication spaces with reflecting peers (Jahnke et al., 2014). Nevertheless, there are limitations. Google Glass is still a prototype, and it is not customized to the Swedish language. These are attributes of an early-stage emerging technology that is difficult to use. For example, software updates sometimes crashed the new app that was developed during the project. However, in such situations the students learned to change their strategy.

**References**


