Using Interaction Design Methods for Learning Design

Johan Eliasson
Department of Computer and Systems Sciences
Stockholm University, Sweden
je@dsv.su.se

INTRODUCTION

Interaction design is guided by a collection of methods proven useful for inquiry, exploration, composition and assessment in designing interactive systems (Löwgren and Stolterman 2005). In this position paper we discuss how interaction design methods can be used for guiding the learning design process, illustrated by an ongoing research project.

From a research perspective one project aim is to improve the interaction design process by developing design guidelines and models for designing contextual mobile learning activities. The project goal is to make abstract relations in mathematics and natural sciences visible by using mobile devices.

In the project we use interaction design methods and representations to design learning activities together with teachers and students. The learning goals are from geometry and biology. The learning activities are across indoor and outdoor contexts, with mobile devices used as support for the outdoor activities. Until now we have completed four iterations (*Figure 1*). The project, now on it's third year, is at Stockholm University, Sweden, in collaboration with a local school. It is intended for fifth grade students working in groups of two or three.

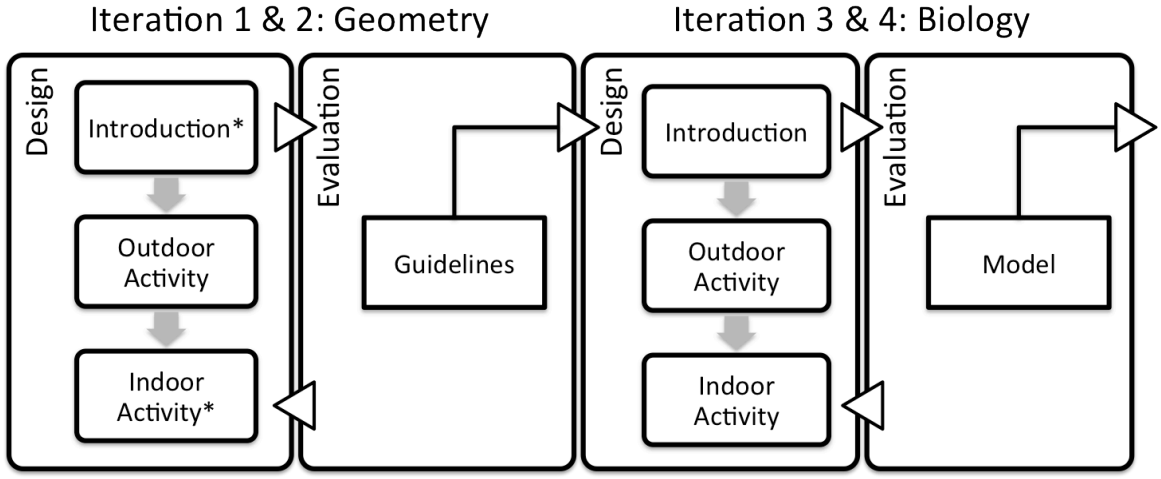

Figure 1: Research process (: Introduction added and indoor activity removed for iteration 2)*

We design and evaluate contextual learning activities, by adopting design practices from interaction design (Löwgren and Stolterman 2005) for the design iterations. By design practices we refer to working in iterative cycles together with teachers in creating a sketch and later a prototype that can be tested and eventually deployed in schools. The Design-Based Research Collective (2003) discusses design research in education and states that "[t]he challenge for design-based research is in flexibly developing research trajectories that meet our dual goals of refining locally valuable innovations and developing more globally usable knowledge for the field." (p. 7). The Design-Based Research Collective (2003) argues that design-based research blends empirical education research with the theory-driven design of learning contexts. Design-based research has proven a suitable methodological approach for the field of technology-enhanced learning, since design-based research attempts to combine the intentional design of interactive learning contexts with the empirical exploration of our understanding of these contexts and how they interact with the individuals (Hoadley 2004). Design-based research follows an iterative cycle of identifying, developing, building and evaluating similar to that of interaction design processes.

The design process has been informed by three areas of research: 1. design guidelines from previous mobile learning research 2. learning theory (e.g. inquiry-based learning), and 3. participatory design with the school children (future workshop and prototype testing). In other words, every step of the human-technology interaction design loop has been considered from what we know are problematic in mobile learning design, together with the project's perspectives on pedagogy and didactics.

INTERACTION DESIGN METHODS

The interaction design process may be described as linear or iterative (as in *Figure 1*), but in practice it is a fully dynamic dialectical process (Löwgren and Stolterman 2005), which means that the design work is guided by a collection of design methods rather than having a framework structuring the entire design process,. Learning to choose between these methods in any given design situation is about developing into a reflective practitioner (Schön 1983). In designing contextual learning activities we have chosen to use the following methods: future workshop, scenarios, paper prototyping and testing, thinking aloud and hi-fi prototyping and testing.

STUDY SETUP

In the two iterations on geometry learning activities about geometry were designed. The students worked with the concept *volume*, using GPS for measuring distances and heights, in the first design of the geometry-learning activity and in the second design iteration the students worked with the *area* concept. In the iterations on biology plants and trees were tagged with QR-codes, and when scanned with a mobile phone the code gave additional information on the characteristics of each species. A pie chart on a larger device could then be used to see how different species were distributed.

ANALYSIS METHODS AND PRELIMINARY RESULTS

We have mainly used video from handheld cameras for analysis. Initially we used interaction analysis (Jordan and Henderson 1995) where three researchers that had been part of the data collection in the field worked together on recorded video and audio material. In the first iteration (Eliasson et al. 2010) we used the analysis foci suggested by Jordan and Henderson (1995) and in the second study we used analysis foci related to mobile devices in the foreground of interaction. In the second iteration we added a more detailed analysis of the video episodes where the students' visual focus on devices was especially strong and episodes where it was notable that focus on devices was absent (Eliasson et al. 2011). In the third analysis we transcribed interaction with devices from video data and mapped the transcription to a model of six categories of interaction we suggested (Eliasson and Knutsson 2012). The result was a concrete measurement of to what degree the students interacted with the devices and the physical environment in the ways intended in the design of the activity (Eliasson et al. 2012). In the fourth iteration we will analyse transitions between interaction with devices and interaction with the physical environment by comparing two conditions: students identifying species of trees by using QR codes and by not using QR codes. The QR condition was designed using our model of human-device interaction. Thus we hope to see more than just marginal improvements in the QR condition over the non-QR condition.

CONCLUSION

Throughout an interaction design process special representations are used both in designing and evaluating design suggestions. We believe that many methods and representations from the practice of designing interactive systems are equally applicable to learning design practice, as illustrated by the example project. We also believe that interaction design methods beneficially can be used to guide the learning design process. A number of methods and representations originating from the cooperative design or participatory design traditions should be of special interest for teacher-led inquiry.

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