A Learning Design Studio in Mobile Learning

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ABSTRACT
Mobile learning is a young and vibrant field of research and practice. Teaching a university course on mobile learning is a challenge: how do you connect the theories and case studies to students' experience, and make them relevant for their educational practice? This paper reports on one such course which was conducted using a Learning Design Studio format: working in groups, students identified an educational challenge, conducted independent search and analysis of the relevant literature, devised an innovative solution and evaluated it. The studio approach has been used successfully by several researchers in the past. The course described here was conducted at the University of Haifa in spring 2012. During the course, students engaged with core literature, reviewed case studies, and designed, implemented and evaluated six mobile learning projects. We argue that the Learning Design Studio format is particularly suitable for teaching about mobile learning, as it situates students learning in a genuine context and allows them to learn through conducting meaningful research.

Author Keywords
Teacher training; Higher education; Learning Design Studio; Context; Practice; design-based research; learning design

INTRODUCTION
Designing a university course on mobile learning raises interesting questions: how should the course balance theoretical discussions with empirical results and case studies? How does it refer to, and challenge, media debates and common misconceptions about the use of mobile technology in schools? How does it bridge between the students' experience as naïve users of mobile technology and a desired stance of informed and critical educational innovators? What are the guiding principles which determine the objectives for the course, and how is the actual sequence of activities derived from these?

In spring 2012, such a course was offered at the University of Haifa, as part of the Technologies in Education M.A. programme. It was an elective course. Most of the students were experienced teachers or educational professionals. The course aims were defined as enabling students to critically examine the promises and risks of, and barriers to, the use of mobile technologies in education, through a review of the key literature in the field, analysis of case studies, and practical experience in the design of mobile learning activities.

This paper reports on the design of this course and its effects, through a joint account of the course designer and teacher and one of its students.

BACKGROUND
Diana Laurillard (2012) argues that teaching should be repositioned as a design science. If we accept this position, then university courses in teaching should adopt a model of design inquiry. Recent years have seen a growing acknowledgment of the value of training educators as learning designers (Voogt et al, 2011; Ronen Fuhrmann, Kali and Hoadley, 2008; Laurillard, 2008; Cross et al 2008). One approach which appears to hold significant promise in training learning designers is the learning design studio (Kali & Ronen-Fuhrmann, 2011; Hoadley & Cox, 2009; Cox, Harrison, & Hoadley, 2008). This approach is modelled after the tradition of studio-instruction in arts and design disciplines (such as architecture). In this model, the main activity of a course is the students' continued work on design challenges in a defined domain of practice. Students typically work in groups. They identify an educational challenge, research it, and devise innovative means of addressing it. The course instructor guides the students through the process, and classroom sessions are mostly dedicated to group work and public review of design artefacts.

THE COURSE STRUCTURE
The course was designed to bring students to adopt a design-inquiry approach to mobile learning. Design, in this context, is the informed creative practice of devising "*courses of action aimed at changing existing situations into desired ones*" (Simon, 1969, p 129). Inquiry-based learning attempts to shape educational experiences in the model of scientific investigation. Similarly, an inquiry approach to the training of educational practitioners should mimic the form of design research in education. Thus, the design of the course mimicked the structure of a design experiment (Mor & Winters, 2007), with the exception that students did not have the resources or the time to conduct several iterations, scaling up from a conceptual prototype to an extensive deployment. In a learning design studio, students work in groups on projects of their own choice. Each group identifies a concrete educational context and a specific educational challenge within this context, locates and reviews relevant literature, devise a techno-pedagogical innovation to address the chosen challenge in its context, and evaluate their innovation – if possible, by observing its implementation in the real-world context. The

course ran for 13 weeks, and included 17 students in 6 project groups. Each group maintained a website for their project, instantiated from a template designed to scaffold their design process. The website template contained sections corresponding to the phases of a single iteration of a design experiment. Students replaced the instructions in the template with the content and artefacts they generated in the course of their work, so that when they completed the project, the website presented both its products and the process by which they were created. The course website (in Hebrew) is available as an open educational resource at http://courses.edtech.haifa.ac.il/mlearning and the student project sites are listed at http://courses.edtech.haifa.ac.il/mlearning/projects.

The first phase of the course focused on defining the context in which projects will be situated and the pedagogical challenge they attempt to address within this context. In the first week of the course, students were asked to propose an idea for a project they would like to develop. They then formed groups based on common interests, and spent the majority of the course time working on their joint project. Students documented and described the material, social and intentional factors which define the environment in which they will work, and expressed these in the form of a force map (Mor, 2011). Based on the tensions identified in the analysis of the context, students were asked to specify well-defined and measurable educational objectives. Next, they conducted preliminary research, reviewing appropriate learning theories and relevant case studies, and choosing the theories which they identify with and the cases which inspire them, as a basis for their design work.

Based on their articulation of the context and challenge, and the outcomes of their preliminary research, students developed an initial scenario, which included an outline of the proposed solution, and a storyboard depicting the learner's envisioned activities and expected learning trajectory. Students were instructed to consult the design principles database (Kali, 2006) or appropriate collections of design patterns (Mor and Winters, 2007). Students developed prototypes (or paper prototypes) of their solution and acted out the activities. After incorporating the lessons learnt from this experience, they proceeded to conduct a pilot study in the actual project settings, and evaluate the effectiveness of their design. In cases where conducting a pilot study was not possible, students conducted a heuristic evaluation of their design instead.

Finally, students edited their website to present their work - the design process, it's outputs, and their reflections. At this phase, students reviewed the record of their work and constructed a design narrative, recounting their experience and the lessons they learned. Students were also required to maintain a learning journal throughout the course, and comment on their peers work.

RESULTS

All 17 students completed the course successfully, and their feedback suggests they valued its contribution to their understanding of the core issues in mobile learning, as well as the pragmatic considerations of implementing mobile learning in realistic educational contexts.

Students expressed notable criticism about the course's administrative aspects, as well as the workload which exceeded their expectations. Students also noted that the course would have benefited from an extended presentation, which would have allowed them more time to develop their projects and evaluate their implementation. Despite these shortcomings, students all acknowledged the effectiveness of the design studio approach, some noting that it has changed their attitude to the subject of mobile learning, and to technology enhanced education in general.

Six projects were completed, and are now available as open resources (in Hebrew) at: http://courses.edtech.haifa.ac.il/mlearning/projects

- UnVeil: a social game aimed at encouraging deeper social relationships and mutual familiarity.
- QRG: a location-based game using QR codes and virtual reality, aimed at enhancing social cohesion and connecting families to local history and geography.
- PQPA: A video Q&A platform, aimed at facilitating informal peer learning within a scholarly community.
- Biophone: a web and mobile platform to support inquiry learning in higher secondary school biology field projects (see details below).
- Museum Mobile learning: a mobile learning environment and activities designed to meet the educational agenda of the Hecht museum in Haifa.
- Math in the pocket: teacher training in using math4mobile to support maths education.

One student chose to continue his project as a final project for his degree. At least one team is still developing their project and collecting data. One student reported that the core features of his project were incorporated into a large scale initiative run by a national school network. These examples suggest that the course had impact which extended far beyond its presentation cycle – and affected participants' long-term professional practices.

EXEMPLAR PROJECT: BIOPHONE

A group of three students decided to design a mobile learning environment for biology at upper secondary school. As part of their matriculation exams, pupils[1] are required to conduct a biotope study. The project group included two experienced teachers, one of which was working at a secondary school and had access to biology teachers there.

As the first step of the design process, students were requested to define the learning context. To do this, they interviewed a biology teacher at one of the group member's school and constructed a model of the learning and teaching practices related to biotope studies; how do the pupils conduct their inquiries, in the field, at home and class? How much the teacher is involved her pupils' learning process and their field work?

The group analysed these practices to identify gaps and tensions which might impede the pupils' learning. Some of these concerned access to information during field work and a common environment for sharing the collected data. These issues were defined as the design challenge which the project will address. To inform their design, the group reviewed several case studies and possible technologies. For example: the 'Portable Information Technologies for Supporting Graphical Investigations' Project (Hennessy, 2000) in which secondary school students were given handheld computers to use in a collaborative project involving mathematics, science and geography skills; 'Epicollect' (Aanensen et all, 2009), which incorporated linking smartphones to web applications for epidemiology, ecology and community data collection and the 'ButterflyNet' project (Yeh et all, 2006) which included the development and evaluation of mobile capture and access system for field biology research.

Drawing on the analysis of the context and challenge, and the review of case studies and technologies, the group outlined a solution, which was designed to reinforce the connectivity between the classroom space, the pupils' field work and the teacher. The group proposed a combination of web and mobile technologies to address these needs.

The next phase was an intensive and iterative process of prototyping, role playing, experimenting, reviewing and refining the proposed solution. This resulted in a guiding website that combines mobile technologies. This website also provides a portable reference tool, with content, work instructions and tools for collecting data and field notes.

This site was presented to the teacher and her pupils for evaluation. The evaluation group consisted of nine biology pupils, aged 17, divided into three groups. The pupils were highly proficient mobile users, owning a variety of devices (iPad, Android phones and iPhones). They were enthusiastic about participating in the study, and particularly motivated to use their mobile phones in the course of their field studies.

Pupils use the website frequently in the course of their work. They report that the interface is user friendly and contains necessary details and can be used independently. In addition, using the links from the website for obtaining information was crucial for them in the field/in real time. The pupils enter observations data via on line forms and receive the data in an organized and clear fashion, for analysis and processing as part of their follow-up desk research.

The biology teacher is very satisfied with the use of the Biophone website to support the Biotope study. She acknowledges the contribution of the organized data and the collected information to the learning process. In addition she sees an advantage to the feedback she can offer as a result of the visibility of the data regularly processed.

Reflecting on the process as a whole, one student noted: "It took a long way to accomplish the goal. It wasn't easy to design such a learning space. It was big effort for us to transfer the general ideas we had in mind into real ones. We feel that we got useful and practical tools during the 'mobile learning' course for doing the design process. Our experience with collaborative project such as 'Biophone' helped us understand what mobile learning is."

CONCLUSIONS

Looking back at over a decade of research, mobile learning has established itself as a significant field of scientific inquiry. Yet projecting the outputs of research into practice is a challenge. Teacher training needs to address this gap, and there are several reasons for adopting a design-inquiry approach, where students learn through developing techno-pedagogical innovations in their domain of practice.

Specifically, the Learning Design Studio model appears to have the potential of achieving several aims, which are critical to the understanding and application of mobile learning:

- Acknowledging the importance of context, and developing tools for documenting and articulating context.
- Working out from a pedagogical challenge grounded in a concrete educational context, rather than in from a technological innovation in search of an application.
- Adapting rigorous habits of design inquiry modelled after the design experiment ideal – but adapted to the needs and constraints of educational practitioners.

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[1] We use "students" to refer to the mobile learning course participants, and "pupils" to refer to the secondary school students.

- Combining personal construction and reflection with collaboration and communication as drivers of effective learning.

Educational practitioners often operate on the basis of their intuitions, and find it difficult to bind these to pedagogical theory. To counter this tendency, and allow them to retain their tacit pragmatic knowledge while adopting an attitude of scientific rigor, they need to acknowledge their role as techno – pedagogical designers. The suggested model may serve as a framework for those who aim to train educators as clear and conscious decision-makers. Carefully, with well-defined guidelines and supportive environment, teachers may become better learning designers.

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