

# Mobility and multi-modality – An exploratory study of tablet use in interaction design learning

**Jinyi Wang**

Dept. of Computer and Systems Sciences  
Stockholm University, Forum 100, 16440 Kista,  
Sweden  
jinyi@dsv.su.se

**Petter Karlström**

Dept. of Computer and Systems Sciences  
Stockholm University, Forum 100, 16440 Kista,  
Sweden  
petter@dsv.su.se

## ABSTRACT

Tablet computers contain affordances that could make them particularly useful for students in interaction design. However, there is a lack of research and guidelines on how to integrate mobile tablets in learning. In this paper, we aim to gain understanding on the use of tablets in interaction design education by conducting a case study in an undergraduate class in interaction design. We frame our results in five features of mobile devices. Mobility and multi-modality stood out as the most distinct features of tablets in interaction design education.

## Author Keywords

Affordances, Interaction Design, Mobile Learning, iPad

## INTRODUCTION

Mobile devices support students in formal as well as informal learning activities (see e.g. Klopfer, Squire, & Jenkins, 2002), but may also disrupt learning (see e.g. Taylor, Sharples, O'Malley, Vavoula, & Waycott, 2006). The question for educators is how to handle these formal, informal and disruptive aspects when designing for learning. Our main goal is to seize possible opportunities for tablets in learning activities in higher education, especially in interaction design education. We approach this goal in an iterative design manner. This paper reports the findings from the first iteration of a learning design.

We studied the use of tablets in a class of interaction design students by means of direct observation, interviews and diaries, and elaborate on Klopfer et al.'s (2002) five features of mobile learning. These features can be used as lenses for us to understand how students use mobile tablets in their daily learning activities.

Klopfer et al. (2002) suggest five features of mobile devices, in the context of learning and augmented reality: Portability, Social interactivity, Context sensitivity, Connectivity and Individuality. These affordances make the mobile devices especially valuable in many different educational contexts (Naismith, Lonsdale, Vavoula, & Sharples, 2004), but learning interaction design is a context that is different from e.g. inquiry-based learning. It is also about learning facts about the world, but less formal and with the added factor of changing that world in some constructive manner.

Design aspects are not the focus in this paper. Instead, we are more interested in finding out affordances of tablets in a learning context, in order to provide a platform from which to discuss how to design learning activities. For interaction design students, learning activities with tablets may potentially involve collaboration, visual presentation, multimodal interaction, etc., as well as the ability to capture the design inspirations anytime, anywhere.

## CASE STUDY

### Overview

We introduced iPads to the undergraduate students enrolled in an interaction design program and provided each student with an iPad, a stylus pen and a set of apps installed on the iPad. The apps were roughly categorized into two groups; 6 productivity apps, (e.g. Pages<sup>1</sup> and Keynote<sup>2</sup>), and 6 design apps, (e.g. Sketchbook Pro<sup>3</sup> and OmniGraffle<sup>4</sup>). Together these were intended to be useful in their learning activities: taking notes during lecture, brainstorming in group meetings,

---

<sup>1</sup> <http://www.apple.com/apps/pages/>

<sup>2</sup> <http://www.apple.com/apps/keynote/>

<sup>3</sup> <http://usa.autodesk.com/adsk/servlet/pc/index?id=6848332&siteID=123112>

<sup>4</sup> <http://www.omnigroup.com/products/omnigraffle-ipad/>

sketching ideas, creating graphic design, writing reports and giving presentations. 9 students (3 female and 6 male students with age between 21 to 34) participated in our study on voluntary basis during a course in “Graphic Communication” starting in January 2012 and running for 4 weeks.

The students were given a lecture and a graphic design assignment every Monday. They were required to present their initial design concept on Wednesday during a supervision lecture, and then submit their final weekly task by Friday. The assignments were all done in groups and each group has 4 students. The students were not required to use iPad in their course assignments. By allowing them to use iPads freely, we hoped to understand which possibilities students would see and what problems they would encounter.

## Method

We conducted the study during two weekly tasks, in week 1 and week 3 respectively.

During week 1, we concentrated on iPad usage during students’ group work session, while the study in week 3 concerned individual iPad use. The data from week 1 included notes obtained from a 1.5-hour participatory observation of one student group meeting, snap shots of their work in process and notes from semi-structured interviews with the 4 students in the group.

During week 3, all 17 participants were required to keep a diary for 5 weekdays recording their daily usage of iPad and its relation with their learning process. We wanted to investigate how the students used iPad on a daily basis, without disturbing them, and also allow them to work in various places and times. A diary method (see Bolger, Davis, & Rafaeli, 2003) was deemed appropriate for this kind of study. The diary was created as a fillable PDF file and returned to us via email every evening. The diary contained questions such as *how long*, *where* and *for what* the iPad had been used, and *which applications* were used. There were also text fields for positive and negative experiences.

## FINDINGS

### Learning anytime anywhere

The participants used the iPad in school, on public transportation, cafés and restaurants. Several participants reported the informal aspect learning outside of class.

*“It is easier to pick up an iPad and start working than a computer. And more comfortable to read on.”*

*“(iPad is) more relaxing, less ‘tool-like’ than a computer.”*

*“(iPad is) quick to prepare and use, smooth and easy.”*

Figures 1 and 2 show how a group of students used iPad in their weekly project. The assignment was to find something in the city that was not well designed, and then propose a new design concept to make a change. One student felt a subway station was dark, cold and emotionless. So she took a picture of the hallway in the subway station in order to suggest a redesign.

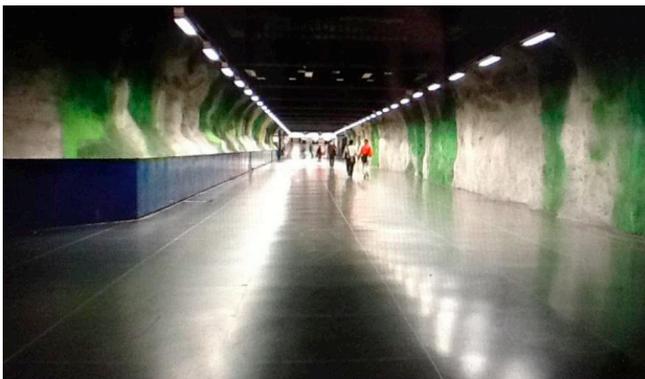


Figure 1: Photograph taken by a student in the subway station

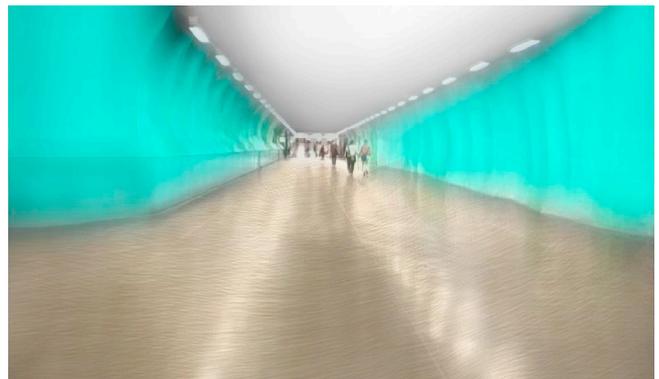


Figure 2: The sketch students created based on the photo

The student group decided to work further on the idea of changing the interaction between the passengers and the physical environment in the subway station. Figure 2 is the concept sketch the group created during their group meeting.

Two students were concerned about theft and were unwilling to bring iPads to public places and longer trips. This suggests a gap between the administration guidelines (students responsible for hardware) and the course design (hardware to be used everywhere): *Mobility* can be either supported or limited by the design of the learning activities, the requirements of the courses and the regulations of the educational institute.

### **Staying connected**

Daily activities included reading news, sending emails, communicating with friends via instant messages and checking updates in social networks. Students shared learning materials via emails and apps like Dropbox<sup>5</sup>, and Evernote<sup>6</sup>. They also shared the information among the different devices they had, such as computer, mobile phone and online storage.

*"I like Evernote. Awesome app that I can run on the computer, phone and iPad."*

The participants also accessed course materials, posted questions to the teachers and discussed assignments with other students anytime, anywhere.

None of the students used a SIM card for their iPads and some tried workarounds such as connecting iPads through their mobile phones:

*"I use my iPhone as Internet hotspot and it annoys me that when you put iPad to sleep and then start it again, the Internet get lost and you must restart Internet sharing on your phone Internet connection"*

Their *connectivity* was otherwise limited to certain physical locations, where wireless networks were available, such as university buildings and students' homes.

### **Customized Learning**

Mobile tablets are designed for individual use. Different students had very different interests and ways of learning. The followings are quotes from some of the participants describing how they used iPads.

*"I have mainly used the iPad to read textbooks...I have also tried to use it as a tool for writing CSS / JavaScript, but find it quite difficult. I have made a few mockups of websites, but not quite got into a good workflow."*

*"I have used iPad to make music instrument. And for musicians, it is fantastic."*

*"I have used iPad for doing graphic design, reading news and taking notes."*

Some of the participants' comments also indicated the students carried iPad with them and supported their learning in different ways.

*"iPad is like a scrapbook, in which you can collect inspirational materials that you can take with you everywhere."*

*"(iPad) is great for taking notes. Forgot my pen and paper today."*

However, as Sharples (2002), Sharples et al. (2005), and Taylor et al. (2006) have previously discussed, iPads were also used disruptively, e.g. for playing games during lectures. Still, doing the course assignments was the most frequent activity the students use iPad for, and graphic design apps had the highest frequency of usage. Courses and learning activities design of mobile learning need to find a balance between the *individual's* level of customization and organizational control of usage.

### **Collaborative learning**

*Collaborating* was the second most frequent activity the participants use iPad for. Normally, students had to book a group meeting room with limited hours. When such meetings rooms were not available, they had to carry their laptops around and find a common space. But the laptops were bulky, and had limited battery capacity. The tablets supported more flexible student collaboration during their group design assignments, especially in the early design stage.

However, mobile devices are mostly designed for personal use. This posed a limit collaborative learning activities. For example, we found that the collaboration among the students was often controlled and directed by the student who was using the iPad. This was very different from how they would interact with each other on a shared computer or in front a whiteboard. If the workload is not equally distributed among the students, some students may learn less than they would otherwise.

### **Multimodal Interaction**

With the help of various apps that support sketching, brainstorming and prototyping, iPads helped the students work on their assignments during the ideation stage of the visual design and enhanced the students' learning experiences.

*"I like it as a portable sketchpad, great to have to write down or draw your ideas."*

---

<sup>5</sup> <https://www.dropbox.com/>

<sup>6</sup> <http://evernote.com/>

*I did use it for showing some ideas that we had drawn out on Monday for a poster idea to the class when the computer failed to render proper colors.*

Unlike pen and paper, tablets enabled the students to try out different colors, go back and forth to check ideas, restore all the sketches and share them with group members.

The tablets allowed *multimodal interaction* for input and output, including visual, auidial and kinetic interactions.

### **FEATURES OF MOBILE TABLETS IN EDUCATION**

Based on the findings, we appropriated five features (Klopfer et al., 2002) of mobile devices. These features suggest what affordances were at play, and may act as a frame for educators to examine and/or design interaction design learning activities.

- Portability/Mobility – Learning activities took place semi-informally, and out of the school context. This is one of the two aspects we found the most interesting, because students worked with their projects in novel ways that were not possible with traditional devices. Proper task design was a key aspect here – a balance between an interesting task and freedom to interpret that task and make use of technology (See figures 1 and 2).
- Connectivity – Students managed to fulfill tasks without being connected at all times. Being disconnected was perceived as an annoyance for them, albeit a surprisingly small one. Nevertheless, educational institutes may wish to consider how to handle the economical aspects of student connectivity.
- Individuality – Because of the informality of the learning tasks, students used their tablets in diverse ways. More structured tasks would steer students towards less individual ways of conduct. Again, there is a balance between structure and freedom.
- Collaboration – Tablets worked well for co-located activities, probably because of the possibility to lay the tablets flat down before everybody to see. However, there were also problems with one person controlling the tablet and the others watching.
- Multimodal Interaction –While tablets are context sensitive (e.g. location services), we found that the ways of interacting with the environment was more important than automatically gathering context data. In figures 1 and 2, data was collected by the student’s initiative rather than automatically by the device. We propose that the term “multimodal interaction” captures both these ways of interacting with the surroundings better than “context sensitivity”.

### **CONCLUSION AND FUTURE RESEARCH**

This project is an on-going study. One contribution of our work at the current stage is advancing Klopfer et al’s (2002) five educational features of mobile devices in the interaction design-learning context. These features can act as lenses for educators to understand the use of the mobile tablets in the students’ learning activities. Mobility and multi-modality stands out in particular. Mobility allowed novel kinds of semi-formal tasks, and our students made use of multi-modality rather than context sensitivity.

The next steps of the project is 1) to develop these features more into the concept of educational affordances and 2) to evaluate students’ learning activities in other kinds of courses.

### **REFERENCES**

- Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: capturing life as it is lived. *Annual Review of Psychology*, 54(1), 579-616.
- Klopfer, E., Squire, K., & Jenkins, H. (2002). Environmental Detectives : PDAs as a Window into a Virtual Simulated World. *Proceedings of the IEEE*, 2-5.
- Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2004). *Literature Review in Mobile Technologies and Learning: Report 11*. Futurelab.
- Sharples, M. (2002). Disruptive devices: mobile technology for conversational learning. *International Journal of Continuing Engineering Education and Lifelong Learning*, 12(5/6), 504.
- Sharples, M., Taylor, J., & Vavoula, G. (2005). Towards a Theory of Mobile Learning. *Proceedings of mLearn 2005*. Cape Town, South Africa.
- Taylor, J., Sharples, M., O’Malley, C., Vavoula, G., & Waycott, J. (2006). Towards a task model for mobile learning: a dialectical approach. *International Journal of Learning Technology*, 2(2/3), 138–158.