

Blending mobile and ambient technologies to support mobility in practice based education: the case of teacher education

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ABSTRACT

Practice based education is gaining a growing popularity in fields as diverse as, e.g. software engineering, pedagogy, and medical studies. Practice based education involves mobility of students since the learning takes place in different arenas. In this paper we focus on a practice-based pedagogy course we are cooperating with. In this case, students are moving around the university, where theoretical lectures take place, and the schools where they do their practice. In this context we introduced a mobile blog to support informal cooperation among students and teachers. Mobile devices were expected to support the students in collecting and publishing fragments of their experiences to be used for reflection and shared with other students. However, our experience with the initial introduction of the mobile blog shows that students' mobility dramatically limits the visibility of the system. In this paper we propose the usage of shared ambient displays to enrich the spaces that are inhabited by the students to assure a better visibility of the system. Access to the system when students are mobile could be achieved by mobile technologies, e.g. via mobile phones. However, shared displays can promote a higher degree of visibility because they support "chance encounters" with the system. In addition, the system is in this way contextualized in the community life and the information is made visible in a context where it can be used to foster informal cooperation among students.

The work reported is part of the MOTUS2 project (<http://www.idi.ntnu.no/~divitini/motus2>).

KEYWORDS

Practice based education, shared ambient displays, blog

1. Introduction

Practice based education is gaining a growing popularity in fields as diverse as, e.g. software engineering, pedagogy, and medical studies. Practice based education involves mobility of students since the learning takes place in different arenas. Support for mobile students has mainly focused on providing access to remote resources while on the move. The space of possibilities opened by advanced mobile technologies, allowing to be connected all the time, independently by time and space, is considerable and can overcome many of the difficulties that students are facing in getting access, for example, to lecture notes, syllabus, and the like. At the same time, different attempts of introducing mobile technologies have resulted in failures and problems, see e.g. (Smørdal et al. 2002). We can expect that some of the reported problems will be overcome with the evolution of the available devices and a better connectivity. Other problems, however, require a more thorough understanding of the needs of students out in the field and to overcome the oversimplifying assumption that mobility of students requires mobility of the supporting technology.

Research in the field of ubiquitous computing and ambient intelligence has put the focus on the spaces that are inhabited by users and the support that can be provided by enriching these spaces (Streitz et al. 2005; Tscheligi 2005). This line of research can be useful also in learning environment and, we claim, in particular, to support practice based education.

In the paper we focus in particular on ambient displays, i.e. displays hanging in community spaces and visible to everybody in the area. Ambient displays have been recently advocated as a novel technology for supporting collaboration (O'Hara et al. 2003). The growing interest in these devices comes from the popularity of conventional bulletin boards and similar paper-based artifacts. Bulletin boards play a variety of roles in any space inhabited by a group, a family, or a community. Electronic counterparts of these artifacts are developed with the hope to overcome their limitations, such as limited interactivity and no support for remote access. As pointed out in (Luff et al. 1998), a combination of shared displays and mobile devices can be used to support different degrees of mobility and a smooth switch from individual to collaborative activities, from public to shared information. Shared displays can also facilitate socialization, as suggested in (Agostini et al. 2002). In this paper we propose an ambient display to promote practice-based teacher education. Our proposal is based on our collaboration with the teacher education programme at our university. The programme encompasses

traditional classroom activities as well as practice periods. During practice periods students get the opportunity to work in a school and get first hand experience of teaching.

The paper is organized as follows. In section 2 we briefly describe our case and some results from our observations and questionnaires. For a more complete description of the case, the reader can look at (Divitini et al. 2005; Morken et al. 2005). Based on our experience, in Section 3 we identify some requirements for an ambient display system to be used in practice based education. In Section 4 a demonstrator of the proposed system is introduced. Section 5 concludes the paper.

2. Practice based pedagogical education

In this section we briefly describe the course Practical Pedagogical Education (PPE) and reflect on students' usage of common spaces and bulletin boards of different types. We also briefly reflect on the usage of different technologies during the course.

2.1 Description of the course

PPE is organized as a one-year course, with normal classes as well as teaching practice. In this course our university cooperates with 30 schools that are grouped to create partnerships. A partnership includes 5 schools that offer teaching practice to circa 30 students. Normally the students of a partnership are spread on the five schools of their partnership, but sometimes they all go to the same school. This happens, for example, during a takeover, i.e. when students have the responsibility for all the teaching in the school while regular teachers are away. A number of mechanisms and strategies are adopted to ensure that students are constantly helped in their learning process and to promote reflection. Examples include regular meetings with supervisors, support groups, plenary meetings during practice periods.

The PPE staff is aware of the need to develop an adequate technological infrastructure to keep students informed about important issues, but also to promote cooperation between students and teachers as well as among students. Different ICT solutions are adopted. Mailing lists are used to distribute information. The university Learning Management System (LMS) is used to support course activities, e.g. delivering of exercises, and to keep an overview of students' progress. In addition, during the week of takeover, when we have observed students out in practice, we have introduced a blog to promote informal interaction and the sharing of experiences

among students. Blogs allow easy publishing on the Web, generally supporting the chronologically presentation of entries (Nardi et al. 2004). Blogs have become very popular in the last years, and they have been used in educational settings, see e.g. (Dron 2003; Higgins et al. 2004). In the blog we adopted, a third party solution was used for entering SMS to the blog and we informed students about the possibility to upload pictures.

The reflections reported in this paper are based on an extensive analysis of material describing the course, observations of the students, the results from a questionnaire distributed after the observation period, the logs and the contents of the blog.

2.2 Reflections on the usage of message boards and spaces

The school where the takeover took place has separated areas for teachers and for pupils where activities outside teaching take place. The teachers' area, used during the week of takeover by the PPE students, is divided into dedicated workspaces and common areas. Dedicated workspaces are cubicles with desks and some computers that groups of 3-4 teachers can use to prepare lectures. Common areas include a copying room, a small kitchen, and an area with tables and chairs where teachers can relax, read, and meet with others. The teachers' area is relatively open, allowing getting an overview of who is present and what is going on. Sharing the same area gives students continuous occasions for short unplanned meetings. The conversations during these encounters are sometimes about topics not related to the teaching practice. Often, however, these encounters are not only promoting socialization, but become an important occasion for sharing experiences. The openness of the space also makes it easy to "look over people's shoulders", often triggering informal collaboration.

The space around the entrance to the teachers' area is the central space for providing information. There are several boards placed in this area and mailboxes for the teachers. In particular, a central role is played by a board at the entrance of the teachers' area. This board contains different types of information, such as time plans, announcements, and pictures (Figure 1). Another important source of information at the entrance of the area is a whiteboard used to write messages of a more volatile nature. When there is no space enough for hanging important information in a highly visible place, the information might be put elsewhere but with a note on highly visible boards to increase the chances that students see it. For example, on the whiteboard we have observed the

message: "Students: inspection plan is hanging on the board in the library."



Figure 1: Message board at the entrance of the teachers' area.

Information is also hanged around depending on the needs. For example, during the takeover teachers left a poster in the kitchen specifying students what they could use and what not. This message was at the same time granting students the right to use the space, and limiting what they could do. A glass wall inside the teachers' area was also extensively used during the takeover to communicate information to the PPE students (Figure 2). Printouts with information relevant to the students were hanging on both sides of the wall.



Figure 2: Information hanging on the glass wall in the teachers' area.

It is interesting to note that the PPE students used the space in a slightly different way that the regular

teachers: some boards used by the teachers were taken in use also by the students, others were not, some spaces not regularly used by the teachers were appropriated by the PPE students.

The observations that we have briefly summarized in this section point out the critical role of community spaces in practice based learning. In line with what reported in previous literature related to different working settings, the existence of a common space is critical to promote chance encounters and awareness of other people's activities. This can result in improved cooperation (Olson et al. 2002) and knowledge sharing (Davenport et al. 1998).

Common spaces are also critical to give visibility to information, thanks to the usage of different displaying areas. Displaying areas might be different in nature, from permanent to very volatile, as in the case of printouts hanged on a wall or post-its on a folder. Each area has associated implicit rules that govern the type of information that it visualizes and its usage. Displaying areas do not live in a vacuum, as discussed also in (Crabtree et al. 2003) in relation to the home environment. They rather form an ecology of interconnected displays that together satisfy the information needs of the community inhabiting the space. This is evident, for example, in the case of the message displayed on one board to link to the inspection plan available in another area. This way of using one board to refer to another relates to a problem often encountered with boards - they can only take on a given amount of content. The solution to this is often to place different content on different boards. But having only limited central spaces, this may cause problems with people not seeing or being aware of information provided.

Displaying areas are generally rather flexible, with the possibility to change the type of information and its organization depending on varying needs, as in the case of the glass wall used during the week of takeover. Displaying areas serve different purposes: (1) they give visibility to the information, (2) they can indirectly support coordination through the information provided, e.g. inspection plan or through messages with specific instruction to be followed by the reader, and (3) they support socialization by making visible, for example, pictures and announcements interesting for the community. In addition, the information displayed, being made available where people meet, can trigger conversations and promote socialization.

Displays support people mobility because they allow people to keep informed about different aspects of community life without requiring that all the members of the community are physically collocated all the time.

2.3 Reflections on the usage of IT

During the course, students had access to a number of technologies that they can use. Here we can distinguish between personal or public resources. In our case, students have access to a number of computers at the university and, when they are out in practice, they can, with some restrictions, access the computers of the school. In the staff area they have access to some computers, while in the classrooms the access is more limited. In addition, during teaching the students need to be highly focused on their work and on supporting the pupils. There is little spare time during a lesson, and thus little time to use technology for purposes other than teaching.

Students are expected to use the university Learning Management System. The system is used for collaboration among teachers and students. The system provides some basic support for sharing documents and the possibility to create discussion forums. Despite the strong commitment of the course organizers, the system is poorly used. Most of the students access it only if it is strictly necessary.

In addition to public technologies, either hardware or software, students have access to private equipment. Most of the students in our case have Internet access at home. Mobile phones are also widely used and most of the students use SMS to contact other students. In general, the technology available to the students seem inadequate to support their mobility. The public technology mainly focuses on providing access to official information resources, with little support for interaction of students and teachers. The technology also does not support in any way a contextualized and flexible sharing of information.

With the introduction of the blog, students' mobility was partly supported by of the possibility to upload pictures and sending in SMS messages. This allows, while mobile, to collect fragments of information that can later on be used for reflection. There is however no support for students to view the content of the system, or know about changes, while mobile. In this way students are not aware of what is happening, e.g. if new information has been added. They need to connect to the system from a stationary PC, with no possibilities for "chance encounters" with the system. This limited visibility of the system might negatively impact on its usage when, like in the case of learning in the field, students are often on the move and without access to workstations.

In the case we have focused on submitting information via mobile devices, though in a very primitive way. However, contributing to the system while mobile does not seem to be the major problem.

Mobility, and a tight schedule, reduces the willingness and the chances to use the provided ICT support. This was observed for the blog as well as the university LMS. For a system to be used we have to increase its visibility. Given the observed usage of community space, the adoption of shared ambient displays seems a possibility.

3. Implication for design

The complexity of practice based education requires the combined adoption of different solutions. In addition, the needs of students might vary quickly and be different depending on the particular context where they are acting. In general, in our case we have observed students having problems in getting an overview of the information they need and a limited visibility of what is going on. Collaboration is important but it is often jeopardized by students' mobility, limited time to dedicate to activities that are not strictly connected to teaching, and the lack of adequate support for cooperation in the existing ICT support.

Given our observations on the usage of common spaces and the artifacts enriching these spaces, we suggest the adoption of an ambient display resembling the displays available in the school. Ambient displays can provide various benefits. The objective is to create a system that provides the same benefits than traditional bulletin and message boards, at the same time overcoming their limitations (Divitini et al. 2003). To meet the needs of students out in practice, ambient displays should be designed so to provide a *single access point to different information sources* that are relevant for the students. The usage of an ambient display hanging in a common area can assure that the content of the system is highly visible to the students. In addition, the visualization is contextualized in the spaces of the community. This means that students can discuss with other people the content of the system, for example to get immediate clarifications. The same way a common space triggers chance encounters with other people, the usage of ambient displays assures chance encounters with the system, increasing the possibility of students' participation.

In order to be useful for the community the display must provide students with the possibility to access a set of services that are needed by the students in different conditions. The needs of the students might vary during practice and the type of services that might be relevant, for example, during a takeover are not the same then when regular teachers and PPE students are collocated. It is therefore important that the ambient display is not seen as a monolithic entity

but rather as a complex system that is build as a flexible constellation of services. The importance of changing the content of the system depending on the varying practices that take place in the common space was also evident is a previous experience we had with the adoption of ambient displays in an office environment (Divitini et al. 2004).

In the following we provide a list of students' needs, as emerging from our observations, and examples of services that might be provided in the display in order to meet those needs.

Support for awareness of other students and activities: presence services and activities indicators

Support for remote communication: access to chat and e-mail tools

Support for sharing of experiences: access to individual and shared blogs

Support for socialization: visualization of information related to the social life of the community, for example pictures of events people have participated to and birthday lists

Support for access to external information sources: access to a web browser for access to Internet, visualization of relevant databases

Support for coordination: visualization of and access to shared calendar, scheduler, project plans

Support for chance encounters with members of the community that are geographically distributed: buddy list with presence information, audio/video connection among different practice schools

Support for switching from chance encounters to focused cooperation: access to a set of tools that may be used for supporting focused collocated cooperation, e.g. drawing and writing in a common document.

Given the mobility of the students and the problem they have to access desktop computers, it is important that the ambient display system supports different forms of interaction.

Interactive touch-screen displays can be useful when there is a need to navigate the information in the system or to insert some quick information. This can happen, for example, when a student want to activate a browser to check some information on the Internet or when he wants to leave a short message for students coming later. The usage of PDA or mobile phones can provide a richer interaction with the system for students that are in the physical space

where the display is available. This can be necessary for example when a student want to activate and control an application or when he wants to personalize the services that are visualized on the display.

The display system should not only support collocated interaction, but also remote students. This might include both receiving information from the system while mobile as well as posting information while mobile. For example, when travelling, a student might be interested in receiving on her mobile phone a notification of certain types of changes in the content of the display, e.g. when the running text changes. This will increase her awareness of what is happening even if she is not present in the community spaces. At the same time, it can be useful for a student to have the possibility to send in via SMS a message to be visualized on the display to inform the students in the school that she is late for a meeting.

4. Demonstrator

To illustrate the system that we envision we have developed a demonstrator with Flash called PPE-board (Figure 3). On the bottom of the display is a line with running text visualizing messages from the PPE teachers to the students, for example regarding important meetings or last minute changes in the daily plan. On the right it is visualized the blog of the students. In this way students can see new entries, getting aware of changes, and possibly be motivated to contribute. We also expect that this can trigger discussions around the content of the blog with other people that are in the room. On the left, from the top, it is possible to see:

- A list of the contact information for the students doing their practice in the school
- A calendar with the possibility to insert new events and appointments
- A message board, with the possibility to insert new messages that will be added to the list following a chronological order
- A button to access the student intranet (Innsida)
- A button labeled “tools” that allows selecting commonly used tools, such as a drawing tool, a text editor, or a web browser
- Images from a remote location. In the display there is space for showing the video captured in two different locations, though only one video streaming is activated in the figure. The objective is to create an audio-video connection between the school where the display is located and other schools where other members of the community are located. This is expected to improve awareness by creating a media space (Mackay 1999).



Figure 3: The PPE-board

As discussed in Section 3, different forms of interaction should be supported to meet the needs of different users. In Figure 4 we see the PPE-board projected on an interactive board. In this case input can be inserted directly by using the touch-screen. Other forms of interaction should be made available, for example by using mobile devices, e.g. mobile phones or PDAs.

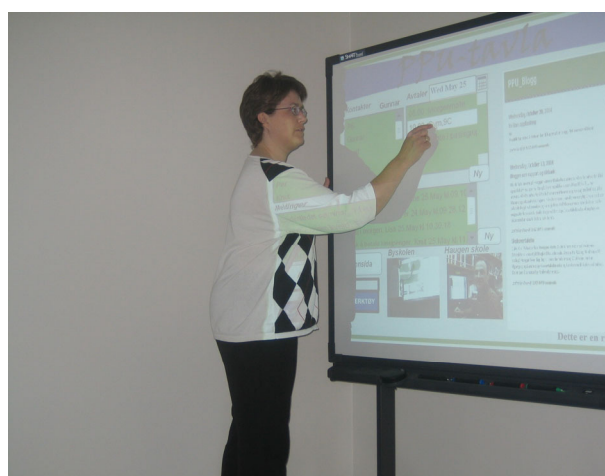


Figure 4: The PPE-board on an interactive board

5. Conclusions and future work

In this paper we have discussed the importance of common spaces in practice based education and the important of bulletin boards of different types to support students. Based on our experience we have identified some main requirements for the design of an ambient display system to support practice based education. To illustrate the system, we have briefly described a demonstrator that we have developed. The demonstrator is intended to provide an overall

idea of the possibilities offered by the usage of shared displays. In a previous work we have developed a fully functional prototype of a display for a working setting (Divitini et al. 2003). As part of our future work we intend to extend this system to develop a fully functional demonstrator of the PPE-board.

The focus of our future research will be on the integration of ambient displays and mobile technologies to provide a better support to mobile students. Though our case is related to teacher education, we believe that our proposal can be generalized to other situations of practice based education where students share a common space. To verify this hypothesis will be part of our future work.

Acknowledgements

The authors thank Ove Haugaløkken for his help with the case and all the students of the pedagogy course for their patience and feedback. The work reported is part of the MOTUS2 project (<http://www.idi.ntnu.no/~divitini/motus2>).

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