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18. Newbies and Design Research: Approaches to Designing a Learning Environment using Mobile and Social Technologies

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Overview

The highly motivated engagement of young people to participate in, contribute to, and collaborate on social networks in web-based communities "anywhere, anytime" is an emerging phenomenon being explored in learning and design research. The *Gidder* (Groups in Digital Dialogues) research project similarly explores the potential of mobile and social technologies to support learning. This chapter presents methods and approaches used in the design of a wiki-based learning environment for upper secondary students interpreting art in classroom and museum contexts. Based on an understanding of new technologies as always already forming and intervening in the lives of young people, a combination of ethnographic methods and an agile programming approach is used in the design of tasks and a wiki prototype that incorporates a mobile blogging feature. Participating in the design research and the three-week pilot study described in this chapter are a curator from the Astrup Fearnley Museum of Modern Art in Oslo, upper secondary school teachers and students specializing in art, myself as learning researcher, and interaction designers, programmers, and developers at InterMedia, an interdisciplinary research center at the University of Oslo, Norway.

Pierroux. P. (2009) Newbies and Design Research: Approaches to Designing a Learning Environment Using Mobile and Social Technologies. In Vavoula, G., Kukulska-Hulme, A. and Pachler, N. (Eds.) Researching Mobile Learning: Frameworks, Methods and Research Designs, Chapter 18, pp. 291-36. Bern: Peter Lang.

1. Introduction

The significance of technological developments in mobile communication devices for how, when, and where people learn has been explored during the past decade or so in the field of "mobile learning" (see Naismith et al., 2005). This research has highlighted a number of issues, including the need for improved methods and longitudinal studies to better conceptualize – and design for – learning in today's networked knowledge society in which mobile, social, and ubiquitous technologies figure most central.

Accordingly, the contours of current mobile learning research may be traced in interests in *tracking patterns of use* of laptops, "smart" phones, and handheld computers in different settings (McGreen and Arnedillo Sánchez, 2005; Wali et al., this volume), *theoretical model building* of mobile learning (Sharples et al., 2007), *design approaches* that address both the emergent character of mobile technologies and envisioned user settings (Vavoula and Sharples, 2007), and *methods* of collecting and analyzing empirical data related to learning when mobile devices are used (Taylor et al., 2006). In this chapter I focus on the latter, specifically, methods and approaches for designing tasks and a web-based learning environment that can support youths' meaning making encounters with art in museums using, among other means, personal mobile phones.

The research project and learning environment are called *Gidder* (Groups in Digital Dialogues), a Norwegian slang word that translates as "engagement" – a central aim when designing technology for museum experiences. *Gidder* may be related to initiatives in museum education departments that specifically seek ways of integrating technologies into learning activities for teens, based on knowledge that identity, social activities, and personal technologies are uniquely coupled in the "multiliteracies" of youth culture (Paris and Mercer, 2002; Pierroux, in press; Schwartz and Burnette, 2004). Among these learning technologies are mobile devices such as mp3 players, handheld computers, and mobile phones, which in one respect may be seen as a continuation of more than forty years of experience with audio and multimodal "content delivery" devices in museums (Nickerson, 2005; Proctor and Tellis, 2003).

Yet it is the "content production" potential of mobile phones that is particularly interesting for the *Gidder* project, as a personal technology with specific features that "match" young people's motivations to document, manage, and share individual and collective interests and experiences on a museum's website or social networking sites like *YouTube*, *Flickr*, *Facebook* and *MySpace*.[1] As discussed in greater detail below, this kind of highly motivated engagement on the part of young people to participate in, contribute to, and collaborate on web-based communities "anywhere, anytime" is an emerging theme in contemporary research on technology enhanced learning in formal as well as informal settings.

2. Framing the research questions

At the time of writing this chapter, *Gidder* has gone through two design iterations in a time span of about six months, involving the corresponding prototypes in pilot and case studies. Participating in the design research are a curator from the privately owned Astrup Fearnley Museum of Modern Art in Oslo, upper secondary school teachers and students specializing in art, myself as learning researcher with a background in art history and in design (architecture), and interaction designers, programmers, and developers at InterMedia, an interdisciplinary research center at the University of Oslo, Norway.

Research in the overall project has followed two distinct yet intertwined themes. The first is concerned with the design process, framed by the purposely open-ended question: how can tasks and specific features of social software and mobile phones be designed to support meaning making across school and art museum settings? The second theme is concerned with analysis of meaning making processes and asks: how are specific aspects of technologies and tasks – but also artworks, subject knowledge, exhibition

1 See for example <http://newmedia.walkerart.org/aoc/index.wac>, <http://modblog.tate.org.uk/>, <http://www.ookl.org.uk/web/whatisthis.php>.

design, and interactions with teachers, museum hosts, and other students – made relevant in students' meaning making activity? The perspective on meaning making is grounded in the work of Vygotsky (1978, 1986) and a sociocultural approach to understanding the collective aspect of human and cognitive development, mediated by cultural-historical semiotic artifacts and "tools" (Wertsch, 2002). The two themes are related in the sense that (mainly) interactional data is collected and analyzed through shifts in focus to inform an iterative design process and to understand how meaning in art is mediated and constructed.

This chapter will investigate the first of these two themes, that is, the task and technology design process for the first version of a wiki-based learning environment that incorporates a mobile blogging feature. This focus means that the discourse and multimodal texts produced by students during their participation in the pilot – the "empirical results of meaning making" – are kept to the background and serve mainly to illustrate how such findings are taken up in the design process.

The chapter is organized as follows. I briefly present the theoretical framing of the design research, which draws on sociocultural perspectives on meaning making and design interventions. The methods of collecting and analyzing data through different phases of the project are described, which include ethnographic observations, a participatory design workshop, interaction analysis, and interviews. I discuss the agile programming approach that was used to address the complexity of design issues associated with the development and implementation of the mobile blogging and wiki prototypes, and I summarize the activities in the pilot. I conclude with a discussion of the appropriateness of the methods and approaches for this project and mobile learning research, and I consider designing with social technologies in light of what Engeström (2008) calls "formative interventions."

3. Newbies and designing with social technologies

In the learning sciences, "design research" and "design experiment" are among the many terms in interaction design, HCI, CSCW, and CSCL emerging from the work of Brown (1992) and Collins (1992) that reflect awareness of the need for designs to take into account the naturalistic and meaningful contexts in which information technologies are used. However, as Engeström (2008) points out, some of the positivist assumptions that design research initially aimed to critique remain in place, including interests in generalization, evaluating and assessing results in relation to some optimal result, and identifying gaps between a current design and ideal design goals. Despite a broad range of participatory design methods developed in recent decades, such research-driven agendas may account in part for conflicts between researchers' design aims for learning technologies and the authentic concerns of teachers, school leaders, and policymakers, making it difficult to gauge actual benefits of new technologies in formal learning settings (Jewitt, 2006).

Situating the design of learning technologies as a research practice is further compounded by recent developments in web-based software for collective knowledge building and social networking. These developments have been described by Lankshear and Knobel (2006) as bringing about a *mindset* that is fundamentally different from the individual assessment focus in schools and researcher interests in designing technologies "to do familiar things in a more technologized way" (p. 34). Instead, today's networked society embodies an *enabler* mindset (Lankshear and Knobel, 2006) of knowledge and social production, with expertise and authority that is open, collective, and distributed rather than housed in closed systems, individuals, and institutions. Therefore, as researcher *newbies* – newcomers to social networking technologies – purposely bring these two different mindsets together in designs for formal learning settings, "questions about whether and how aspects of practices like blogging, instant messaging, text messaging, and generally being in "i-mode" can, with integrity, be taken into account in school-based learning becomes a subset of a much larger and more fundamental question" (Lankshear and Knobel, 2006, p. 194).

This larger question centers on change, and the ways in which schools – but also, I argue, museums – will in their respective practices take up not only enabling technologies but the mindset as well.

Engeström (2007b, 2008) similarly notes that social networking technologies have created a new landscape for learning and present uniquely different challenges for researchers and designers. People's motivations to participate in *Facebook* and other forms of social production extend beyond self-expression and the more bounded notion of "communities of practice" proposed by Lave and Wenger (1991). Instead, Engeström argues, such extremely highly motivated activities may be likened to a "runaway object," which is "very poorly controlled and has the capability of expanding beyond any anticipated limits or boundaries, often to global scale" (Engeström, 2007b, p. 6). These uncertainties and complexities require a different involvement from researchers, where outcomes are not predictable and it may be neither possible nor desirable to know what the changes are (Engeström, 2008).

3.1 Formative technologies – formative interventions

The impact of these trends is manifest in a range of perspectives and approaches to learning technology design. At one end of the scale are participatory methods to envision future technologies and as yet unimagined use (Vavoula and Sharples, 2007). At the other end are concerns with sustainable processes of organizational change, and an approach to *design interventions* that builds on activity theory and a model of "expansive learning" (Engeström, 1987, 2007a). Design interventions are most effective when emerging from participants' articulations of actual problems in practice, Engeström (2008) proposes, as they constitute a kind of "first stimulus" in Vygotsky's (1986) theory of *double stimulation*. Thus the participants themselves, through a series of researcher-led meetings, generate the design intervention, which may take the form of new technologies, revised procedures, and organizational structures. This intervention then becomes a kind of "second stimulus" that mediates knowledge building and opens up the way for further new concepts and practices. Engeström

(2008) describes this method and design approach in terms of *formative interventions*.

Mobile learning and technology-led research often have aims and methodologies that fall somewhere in between future use scenarios and the kind of formative interventions that Engeström describes. Rather than being invited into a long-term collaborative process with "expansive learning" goals, where participants themselves give form to tools that can implement desired change, researchers generally initiate and lead short-term interventions in which schools, workplaces, and museums participate as "testbeds" for designs that explore the potential of emergent technological innovations to support learning. However, there are problems of added value for institutions participating in such projects in that, in contrast to Engeström's formative interventions, these technologies are seldom integrated into actual practice and "may soon become obsolete anyway" (Vavoula and Sharples 2007, p. 396). Furthermore, concepts used to frame findings are often drawn from various traditions in the computer sciences, which may be an obstacle for teachers and curators when they attempt to apply these to their own practice in meaningful ways (Pierroux et al., 2007). These are some of the larger challenges in design research, and also frame the methods and approaches used in *Gidder*.

4. Museum learning research

Problems in bridging art encounters on museum field trips with pre and post visit school tasks are familiar from a large body of existing research into museum learning, field trips and the teaching of art theory in upper secondary schools (Falk and Dierking, 1997; Hooper-Greenhill and Moussouri, 2002; Griffin, 2004; Pierroux, 2006). Time and physical constraints, and a lack of communication between curators, teachers, and students before, during, and after a museum visit, make it difficult for concepts in art to be introduced in ways that are relevant for students' meaning making across the distinct activity contexts in museums and schools. Resources such as

worksheets and guided tours, commonly used on museum field trips, may stifle interest and motivation by being too "school-like", and real meaning making often happens among students as they talk and move *between* works of art (Griffin, 2004; Pierroux, 2005). Such findings remind us that meaning making entails more than the mastery of disciplinary knowledge and is intertwined with the formation of personal identity, as an artwork's meaning is appropriated and made "one's own" (Wertsch, 2002).

This model of preparing for, engaging in, and following up on art encounters, moving from school to museum and back again, served as point of departure for the initial design idea for *Gidder.* This idea involved the design of a wiki-based learning environment to support students' pre and post visit work with classroom assignments in school, and the use of mobile phones during a museum visit to bridge this classroom work. However, before moving into a systems development phase, an ethnographic study of existing classroom and field trip activities was conducted, and a workshop was held with the participants, in order to first identify existing problems and then develop "solution ideas". Therefore, permission was obtained from a teacher and thirty students majoring in art at an upper secondary school in Oslo for the following sequence of research activities:

- *Ethnographic investigation:* observe and video record existing classroom practice and conduct semi-structured interviews;
- *Participatory design workshop:* participation in a workshop prior to the pilot with the teacher, curator and six students;
- *Pilot study of prototype:* observe and video record all classroom and museum activities during the three-week pilot and conduct semi-structured interviews after the pilot.

Table PL_Table_Ch18T1 presents an overview of the type(s) of data that was collected and the analysis methods used in each research activity.

RESEARCH ACTIVITY	DATA TYPES	PURPOSE OF DATA	ANALYTIC METHODS
Ethnographic study: classroom and field trip	– 6 hours video – 1 hour audio (interviews) – field notes	Identify material ecologies and problems in existing practice Develop "solution ideas"	Interaction analysis
Participatory workshop – Scenario enactment	– 4 hours video – wiki texts – phone logs	Formative evaluation by participants of tasks and technologies	Interaction & text analysis Usability testing
Systems development and interaction design	– project wiki – user stories – JIRA©	Agile programming, bug and issue tracking	Iterative testing and analysis of pedagogical and technical features
Three week pilot in classroom and museum	– 20 hours video – 2 hours audio (interview) – field notes	Analyze design/ redesign issues Analyze meaning making issues	Usability testing Interaction & text analysis

Table Ch18T1: Data collected and analytic methods used in Gidder research.

5. Ethnographic investigation

As part of the research into the "problems in practice" to be addressed in the design, an ethnographic study was conducted to better understand the activity contexts (Pierroux et al., 2007) and material ecologies of the school setting: the nature of tasks, the role of the teacher, semiotic resources, and how the students interact, collaborate, and make meaning. This empirical research, along with the subsequent workshop described below, may thus be likened to the first part of a two-phase process in what Vavoula and Sharples

(2007) call a "socio-cognitive engineering framework," which entails "a phase of activity analysis to interpret how people work and interact with their current tools and technologies, and a phase of systems development to design, build and implement new interactive technology" (p. 394).

5.1 Methods and data collection

The participating class was observed and video recorded by the learning researcher during four hours of classroom activity and two hours of field trip activities. One video camera and two sound feeds were used, with one microphone fastened to the camera and a remote microphone worn by or placed near the students or teachers. Two sound tracks are useful when editing noise to transcribe and analyze discourse and for capturing sound "off camera". Following video observations, the teacher was interviewed regarding lecture and studio practices, facilities, and the kinds of tasks, resources, and assessment criteria that are typically used. Students were also interviewed after observations regarding the use of worksheets and other resources, such as mobile phones, cameras, and laptops in their work in the classroom and on field trips. The interview data comprises notes, audio, and video recordings.

Excerpts from the video material were selected by the researcher for closer analysis in order to develop a rich description of the respective classroom and field trip activity contexts. These excerpts were presented at a "data workshop" at InterMedia, where researchers meet once a month to view and discuss empirical data using interaction analysis methods (Hall, 2000; Jordan and Henderson, 1995).

5.2 Findings from ethnographic study

In analyzing the ethnographic data, two main observations were useful for the pedagogical design. First, school laptops are integrated along with personal and social technologies into the students' creative work with messy art materials. It was not unusual to write assignments while searching the Internet, listening to music on iPods, trawling Facebook, uploading and formatting images from cameras, downloading assessment criteria from a

learning management system (LMS), chatting on MSN, and text messaging on mobile phones (see Figure PL_Figure_Ch18F1). The teacher is aware of the nearly overwhelming role that social and personal technologies play in the students' lives and work, but is primarily concerned with maintaining a focus on the curriculum.

Figure Ch18F1: Use of complex multimodal resources characterizes classroom activities.

Second, the video recordings show that students are practiced at discussing their respective art projects using subject knowledge and disciplinary concepts. Yet when one of the students in a group shifts into *writing* the "what I learned" summary required by the task, collective and productive discourse breaks down. Instead, still seated with other students at the table and a Word document open on her laptop, the student worked alone for over twenty minutes to finish the task, uploading the file to the LMS when done. She "thought aloud" while writing the text, both managing her ongoing social participation in the group and pointedly inviting the others to share ideas and comments. However, neither task nor technologies (Word and LMS) supported cognitive processes by the group (Stahl, 2007).

This may be explained by the strongly individual assessment culture in schools, which LMS features are generally designed to support (Kløvstad

and Kristiansen, 2004; Lund and Rasmussen, in press). Assessment issues are thus a challenge for learning technology designers, teachers, and students working with wiki software in school settings, and features are often developed to track and visualize individual contributions to collectively developed texts (Pierroux et al., 2008).

In sum, interaction analysis of classroom and field trip activities were useful in developing a holistic understanding of the activity contexts that *Gidder* aimed to bridge as a design intervention. Findings from the ethnographic study suggest that students

- master the integration of multiple personal, multimodal technologies and social network sites into classroom and field trip activities;
- master subject knowledge and appropriate disciplinary concepts through discourse with others about their respective art productions;
- use tasks on worksheets to organize their looking and discourse on field trips and to structure their work in the classroom;
- experience tensions between collective processes of meaning making and tasks and technologies that emphasize assessment texts written by individuals.

6. Participatory design workshop

Shortly following the ethnographic study, a half-day workshop was held at InterMedia in which the participants – curator, teacher, and six students from the class – were invited to act out and discuss the activities planned for the upcoming three-week pilot. In contrast to scenario building and more open-ended participatory techniques endorsed by Vavoula and Sharples (2007) to allow direct input into designing for future technology use, the purpose of the workshop was more pragmatic, namely to obtain input from the participants regarding the researchers' solution ideas for

activities, tasks, and technologies for the particular problems in practice. As mentioned above, initial ideas for the task and technology design were informed mainly by previous research. The ethnographic study corroborated these initial design ideas, provided insight into existing problems in practice, and gave form to the task activities acted out in the workshop – their sequencing, content, and collaborative aspects. I return to a discussion of this approach below.

As a participatory design technique, then, the workshop methods are more closely aligned with *formative evaluation* traditions in museum exhibition design (Borun and Korn, 1999; Taxén, 2004), in which visitors enact scenarios using mock-ups and prototypes with "best available" technologies in order to identify potential problems and inform the design process. Pedagogical interests also directed particular design attention to the description and presentation of the task and analytic attention to how it was understood and mastered by the students (Lund and Rasmussen, in press; Rasmussen et al., 2003).

6.1 Methods and data collection

A large meeting room at InterMedia served as the "classroom", with the teacher and each student bringing his or her own laptop, while the "museum", was constructed in InterMedia's studio with six artworks on loan from a local gallery. A basic wiki space was created in *Confluence*© and three different types of mobile phones were distributed among the students, each of which emphasized a different multimodal feature: 1) an extended keypad for typing text; 2) high quality video camera for moving images and sound; and 3) high quality image camera for still images.

All of the activities envisioned for the actual three-week pilot – the "solution ideas" – were acted out using best available technologies. First, working in groups of two and three in the "classroom", students researched and selected three works of contemporary Chinese art to interpret using resources in the wiki (pre-visit). They visited an exhibition of Chinese art at the "museum", which contained a minimal amount of text and label information, and they used their mobile phones to send text, images, audio, and videos that could be used in their interpretations to the wiki (visit). Back

in the classroom they continued to work in groups to develop their interpretations as presentations in their "group space" in the wiki (post-visit). Feedback about the tasks and technologies was elicited through discussions with the students, teacher, and curator, which were also videotaped.

6.2 Findings from workshop

The workshop was useful in moving the project from a phase of analyzing activity in naturalistic settings and general solution ideas to focusing on practical issues and the design of specific technological features. Many of the issues that emerged from the workshop supported findings from previous studies in mobile learning research: the *usability* issue of mastering unfamiliar mobile phones, which tends to create "heads-down" behavior and disrupts social interaction (vom Lehn and Heath, 2003); the *task* issue of creating a sense of purposeful activity to avoid excessive, unreflective "collecting" and picture-taking behavior (Walker, 2007); the *appropriation* issue of users' desires to personalize new technologies (Mifsud and Mørch, 2007); and the *subject knowledge* issue of the role of disciplinary concepts and the teacher in meaning making (Krange and Ludvigsen, 2008).

Another familiar issue in design research that became apparent during this session, and which was significant for the next iteration, was the displayed reluctance on the part of the teacher to take "ownership" in the design, despite her positive interest in the project and attempts to draw her into the design process in the workshop. As mentioned above, and confirmed by interview data, this *motivation issue* is linked to problems of time constraints and the question of added value for stakeholders participating in researcher-led projects. In contrast, the curator was engaged in contributing information about the upcoming exhibition of contemporary artworks by young Chinese artists to the Gidder website. She also emphasized the need for designing restricted access to content into the wiki, during and after the pilot, for copyright reasons. Perhaps the most relevant findings for the design process were the students' motivation and engagement in discussing, collecting, and sending information using the mobile phones, and their ease in mastering writing and editing texts in the wiki, which was a new platform for most of the students.

7. Systems development and pedagogical/interaction design

Data collected and analyzed from the ethnographic study and the workshop, along with findings from previous research, allowed the design team to formulate a set of broadly defined *success criteria*. Similar to the *mirror method* employed by Engeström (2007a), the success criteria articulate problems in practice and inform the technical and pedagogical design work of aligning task and technology features with specific situations and activity contexts. These success criteria are:

- students work collaboratively to solve tasks
- mobile phone use does not disrupt direct encounters with art
- technology supports social interaction and discourse
- integrated use of technology across settings
- teacher presence in the wiki
- minimal demands on museum personnel
- awareness of individual and group contributions
- students produce and share interpretations using disciplinary knowledge
- collection of interaction data to analyze meaning making

7.1 Pedagogical design for wiki

The design team included the learning researcher, two programmers specializing in system infrastructures and architectures, an interaction/pedagogical designer, and a user interface developer. InterMedia has several years experience designing wiki-based learning environments using *MediaWiki*,[2]

2 <http://www.mediawiki.org/wiki/MediaWiki>.

XWiki,[3] and *Confluence*© (Lund and Smørdal, 2006; Pierroux et al., 2008). A wiki is a collection of web pages that enables anyone with access to contribute or edit content using a simple-to-use markup language. *Confluence*© was chosen for this project because it was crucial that the technology functioned well during the short-term pilot and it is arguably the most stable of wiki applications, with good support and a large online community of developers working on new features.

Wiki technology is interesting from a learning perspective, among other reasons, for its potential to foster group cognition (Lund et al., 2007; Stahl, 2007) through collective practices of writing and editing multimodal texts in schools. Accordingly, one of the main wiki design challenges is to develop features and tasks that build students' awareness of contributions at group and class levels. The technical features designed in *Gidder* to address this challenge are a tag cloud and a blog with posts from the entire class, both of which appear on all pages in the website. Students can either use their own tags to describe the main idea of the content they produce, or they can use keywords provided by the teacher and the curator in the wiki. In this way, tag keywords – also referred to as "labels" – were designed as a means of more closely integrating the presence of the teacher and curator in the wiki, and of making links to the resources and assessment criteria that they had developed. By clicking on labels in the tag cloud, students can view, compare, and discuss how others relate metalevel concepts, ideas, and descriptions to specific content in their respective group spaces in the wiki and in their individual blog entries. As such, blogs and tag clouds are designed and explored in *Gidder* as collectively generated resources that can support metalevel reflection and learning. From a pedagogical design perspective it is important to note that writing labels, or "tagging" content also adds a level of complexity to a task.

Another challenge for the pedagogical design centered on striking a balance between the open, flat architecture of a wiki, in which texts tend to be "misplaced", and a navigable structure with group spaces that students can easily personalize and edit. In sum, the main design features developed

3 <http://www.xwiki.org/xwiki/bin/view/Main/WebHome>.

for the *Gidder* wiki are 1) a tag cloud, 2) a Flash object displaying images from the exhibition, 3) group work spaces, 4) a class "mobile blog" and 5) navigation links to teacher and curator resources, including an image database and assessment criteria (see figure PL_Figure_Ch18F2).

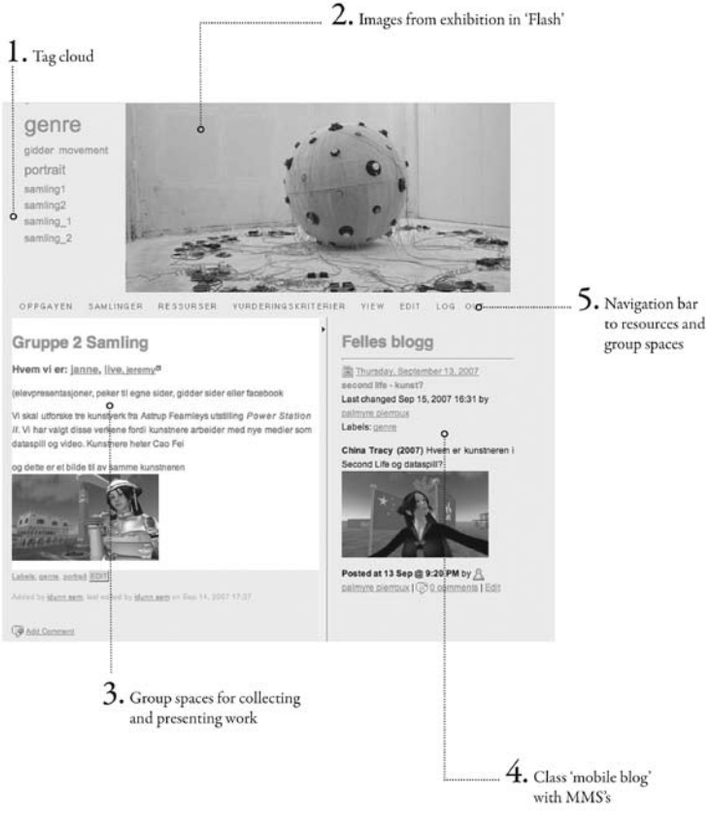

Figure Ch18F2: Main features in first Gidder prototype.

7.2 Pedagogical design for mobile phones

Mobile phone ownership among adolescents in Norway is close to one hundred percent (Ling, 2007), with good network coverage and costs that are generally considered affordable. Although some experiments have been conducted in Norwegian museums with mobile devices and phones (Olsson, 2006), the Astrup Fearnley Museum of Modern Art leads in this area through its integration of mobile phones in its educational program, where Norwegian visitors can for a small, flat fee use their own phones to call a number and listen to additional information about the museum's exhibitions (Ueland, 2006).

The design of the use of mobile phones in *Gidder* is framed by these considerations, and informed by the extensive research on mobile devices in museums (see Hawkey, 2004). In particular, the *MyArtSpace* (Vavoula et al., 2006) and *OOKL*[4] projects were important references. Similar to these projects, the main idea is to use mobile phones to capture impressions, information, and discussions with others during encounters with art in the museum. Images, texts, audio, and video are labeled and sent as MMSs to the *Gidder* wiki, where the content appears in the form of blog entries and tags. This multimodal content is used when the groups interpret their selected works.

Although more comprehensive design solutions were explored during the design process, a simple messaging service operation was eventually employed. This decision was made, among other reasons, in order to allow students to use their own mobile phones and thus promote usability and appropriation. As illustrated below (figure PL_Figure_Ch18F3), an application was written to unpack and format media and text as blog entries in the wiki when SMS and MMSs' arrived from the messaging service. Receipt SMSs are then sent from the InterMedia "tag guy" thanking the student for the blog entry, and referring her to similar tags or prompting her to tag if no label was included in the message.

4 <http://www.ookl.org.uk/web/index.php>.

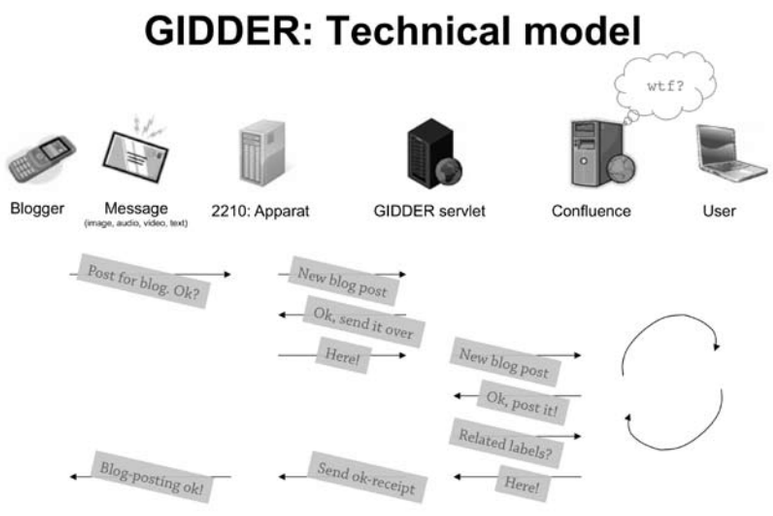

Figure Ch18F3: Gidder's technical model.

7.3 Methods and data collection

Design methods are grounded in an *agile programming*[5] approach, which is useful when working with existing technologies and open source software for aligning, tweaking, and developing components and features. The ethnographic investigation and the workshop provided the basis for developing *user stories*,[6] a method that serves as an alternative to detailed requirement specifications. In contrast to *epics*,[7] which are longer stories and describe an overall scenario, user stories are collaboratively written in frequent team meetings and become a "to do" list of items with prioritized deadlines.

5 <http://mauriziostorani.wordpress.com/2008/07/04/agile-method-and-extreme-programming-differences-and-similarities/>.

6 <http://www.extremeprogramming.org/rules/userstories.html>.

7 <http://www.agile-software-development.com/2008/01/thats-not-user-story-thats-epic.html>.

These are items that can be tested and are actively monitored using *JIRA*[8] to track development. In terms of data collection from the design process, a project wiki for *Gidder* contains meetings notes, media files, whiteboard diagrams, links, and management tools. The wiki is accessed and edited by all team members, and is important to the project both as empirical data and as a design/managerial tool.

8. Pilot methods and data collection

One month before the pilot, the learning researcher presented the project and its aims to the teachers and students in the class. Practical issues of filming and interviewing, consent forms, and mobile phone expenses were taken up. Students using their own phones to blog received one hundred Norwegian crowns (about fifteen US dollars) on the first day of the project to cover MMS expenses, and six students were selected to use mobile phones provided by InterMedia. These students agreed to familiarize themselves with the features of the new phones and to actively blog during the project. One day before the class was to begin working in *Gidder*, the learning researcher, interaction designer, and programmer from the design team met with the class for forty minutes to assist the students in registering as users of the wiki using their mobile phones and to familiarize them with the mobile blogging procedures.

Activities were observed and recorded using field notes and two video cameras on tripods. As mentioned above, the classroom is a large studio filled with art materials, laptops and personal technologies, ensuring that the physical presence of the two cameras was not intrusive (figure PL_Figure_Ch18F4a). Further, as the students had become accustomed to being filmed during the ethnographic study, it was possible by moving the camera to both follow certain groups over time, and to capture more general patterns of interaction, activity, and wiki use as they emerged at the classroom

8 <http://www.atlassian.com/software/jira/>.

level. The interaction designer and the programmer from the design team were also present during all sessions to assist with any technical questions, which were mainly about formatting wiki presentations and uploading large media files from mobile phones. In class the teacher introduced the tasks and answered students' questions regarding the assignment.

Figure Ch18F4a: Recording methods in the classroom.

Two cameras were also used at the museum (figure PL_Figure_Ch18F4b), as different groups of students alternated in wearing remote microphones and being followed by a member of the research team as they moved through the exhibition (for a discussion on similar methods see Leinhardt and Knutson, 2004). The museum visit lasted for approximately two hours, and students were able to leave when they felt they had finished. The post-visit group work, along with the groups' presentations of their interpretations to the class and curator, were similarly recorded.

Figure Ch18F4b: Recording methods at the museum.

9. Discussion

The design of tasks, activities, and technologies in this first *Gidder* pilot is based on analyses of data collected from existing classroom and museum field trip practices, a participatory design workshop, and on previous mobile and museum learning research. The ethnographic methods and analyses are crucial to the *learning research* track in the project. The interactional data are also central for the *design research track* in two ways.

First, analyses of ethnographic data are used to develop success criteria, which describe the "ideal" learning conditions that the technical and pedagogical designs aim to achieve. The success criteria thus frame the design work in a general way, as input to a design process focused on supporting meaning making and not as evaluation specifications for assessing results. As discussed above, this is an important distinction for learning researchers working within sociocultural perspectives.

Second, interactional data allow fine-grained descriptions that are used to develop *user stories*, an agile programming method that informs more specific decisions made by the design team about how to develop certain features and "tweak" available and existing technologies to produce, in this

case, a robust prototype. Agile programming is an iterative and participatory design method in that, ideally, users collaborate in continually developing new stories, and changes in the technologies are rapidly implemented based on this ongoing feedback and observations of actual use over time. This approach is useful when working iteratively to develop and tweak features of existing and emerging technologies for specific contexts of use. Based on an understanding of new technologies as always already forming and intervening in the lives of young people, this combination of ethnographic methods and an agile programming approach is suitable for researching the potential of mobile and social software to support meaning making.

At the same time, as pointed out at the beginning of the chapter, design interventions in which researchers take the lead in articulating and addressing participants' existing problems in practice risk projects with less potential for realizing truly innovative technologies and "formative" change. Within the context of the ongoing *Gidder* research project, a future technology workshop approach (Vavoula and Sharples, 2007) would be appropriate for allowing participants to explore ideas for new technologies more creatively. Activity theory methods (Engeström, 2007b) to involve participants in articulating their own problems in practice and proposing their own solutions could also be employed to promote greater ownership in sustainable, ongoing change in the respective institutional settings of school and museum. Methods that allow moving between these approaches to strike a balance between participation, innovation, and realizable change is particularly important for design research exploring the potential of this new landscape for learning in which mobile and social technologies figure most prominent.

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19. Are They Doing What They Think They're Doing? Tracking and Triangulating Students' Learning Activities and Self Reports

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Overview

Researching mobile learning requires studying learners' activities that take place across multiple contexts (formal and informal). However, collecting data on learners' activities in these contexts is difficult. In addition, learners' self reports may not be consistent with their mobile learning practices and so should not be the sole basis for claims about practice. This chapter discusses a study that investigates mobile learning using research methods that (a) enable the study of learners' activities that take place in and across multiple contexts, (b) provide information about the context of learning activities and (c) ensure the accuracy and validity of learners' self reports. The chapter sets a methodological benchmark for studying mobile learning and elaborates on the challenges and concerns that arise when applying this approach.

1. Background

Numerous studies have explored mobile learning through investigating learners' utilisation of portable devices to accomplish activities in multiple contexts (e.g. Hennessy, 2000; Waycott, 2002; Corlett et al., 2005). In these studies, students were supplied with portable devices to accomplish their (or researcher determined) learning tasks. Data was mainly collected through