‘That’s my PDA!’ The Role of Personalization for Handhelds in the Classroom

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Abstract

In this paper we describe primary school students’ use and personalization of handheld devices (PDAs). The paper reports on a case study in a 6th and 7th grade classroom in Norway. The findings revealed that personalization is an important component in many educational activities and that it can lead to more motivated use. This included customizing the user interface and the organization of folders. We draw on Vygotskian socio-cultural approach to analyze our findings.

1. Introduction

Digital educational technologies for classrooms can roughly be divided into (a) educational groupware that have developed over long time (from computer-based training to computer supported collaborative learning) and, (b) the relatively recent initiatives that focus upon handheld devices (PDAs). The former provides support for centralized document storage, information sharing and knowledge building (e.g. developing a shared artefact) [1], and the latter, support for communication and domain-specific learning tasks [2]. Although there is no clear separation between the two kinds of educational technologies, e.g. they can both access the web; the smaller screen size of handhelds limits complex interactions whilst poor mobility of stationary devices limits out-of-classroom activities.

This paper is about the role of personalization in handheld devices. By personalization we mean the action of making something personal, applied to the technology itself (hardware, software) or the artifacts created or supported by it. Here, we mean the students’ creation or adaptation of the artefacts according to their own requirements to suit the context that they operate in. We argue that personalization makes particular sense for this type of technology; it can even motivate individuals to participate in collaborative learning activities. Although there are flexible ways to personalize groupware systems, for example with bookmarks in browsers, user-generated content in web pages, and pedagogical interface agents [3], personalization is, in several ways, more flexible with handheld devices. First of all handheld devices afford personalization in ways like everyday artefacts [4], partly as a result of their mobility. Mobile telephony studies [5] have for example shown that personalizing a phone in order to make this appear as “your own” by changing features affecting outer appearance were common. An advantage of personalization of mobile technologies is that they have little effect on other users’ devices. On the other hand, personalization in shared systems such as groupware may unintentionally have effect on other users’ displays unless carefully designed [3].

The theoretical perspective we adopt in this paper comes from the socio-cultural approach, which originated with Vygotsky [6]. Vygotsky proposed among other things the “genetic law of cultural development.” This has been an important stimulus in educational research and technology development for many years and reads as follows:

"Every function in the child's development appears twice: first, on the social level, and later, on the individual level; first between people (interpsychological), and then inside the child (intrapsychological).” (p. 57).

This understanding has inspired research in ICT (Information and Communication Technology) and learning and in particular research and development in computer supported collaborative learning (CSCL) [7]. Many of the collaborative learning environments that have been deployed, however, have been criticized for ignoring the individual level and not motivating the students to become actively involved [8]. Instead these systems often require an external mandate in order to be used rather than individual discretion. Seldom will they engage the students in pleasure and fun [9] as a
motivation for learning. Tools that are intrinsically motivating should be an important goal to strive for when building computer supported learning environments. We believe this is possible to achieve with carefully designed pedagogical scenarios and techniques for pupil motivation at the technology level. We address the latter issue with personalization, drawing upon the “inverse genetic law of cultural development,” which we propose as a corollary to the above principle, namely to take part in collaborative learning activities (social level) the tools must be personally motivating for each participant (individual tools). We argue through a case study using empirical examples that personalization can stimulate participation in social interaction.

This paper is organised as follows: The background for the study is presented by surveying related work that focuses upon the introduction of mobile devices in the classroom. Next the methods employed are described. We present two examples of what we mean by personalization. At the end we discuss our findings and provide some suggestions for further work.

2. Background

Previous studies of mobile devices in education and classroom use can be divided into roughly two areas: challenges and possibilities of handheld devices in education, and studies of use in the classroom. Studies in the first area highlight various ways in which the technologies can be used in the classroom, such as exploring the potential of “one-to-one” device-to-student ratios. This includes how these devices can help children to construct knowledge in ways they could not do without the technologies [10, 11]. On the other hand, there are others who carry out in-depth analysis on the use of these technologies. For instance, some studies have questioned whether handhelos in the classroom will have any long term effects [12, 13].

Again others have pointed out the capability of mobile devices to disrupt the established conventions for communication in the classroom [14].

The Palm Education Pioneers (PEP) Program at SRI gave grants to teachers who wanted to explore the potential of Palm Pilot usage in their classrooms. The evaluation of this study concluded that 85% of the teachers involved believed that handhelds could improve the quality of learning activities and have a positive effect on their teaching practices [13]. Furthermore, 90% of the same teachers stated that the handhelds were an “…effective instructional tool and have the potential to have a positive impact on students’ learning and that the will continue to use handhelds in the future” (p. 7).

Teachers in the PEP report also claimed that handhelds were more easily integrated with the learning activities than desktop computers. However, the study did not delve into why and how handhelds improve the quality of these learning activities, and why and how the teachers believe it will have a positive impact on these students’ learning.

Brown [15] describes the use of handheld technology at a high school in the USA where students use handhelds to track their nutritional intake and physical activity. To accomplish this they use special probes connected to the handhelds to measure the amount of dissolved oxygen in a pond, and they recorded their findings as journal entries as part of the requirements for a language class. In a similar type of study, Hennessy [16] reports from 48 students using a palmtop computer in a school to record and graph weather data over a three-week period (a maths project). The teacher and the researcher worked together upon matters of classroom organisation and planning. Hennessy reports positive gains in motivation and that within the context of the activities undertaken the handhelds were “instrumental in contributing to some learning gains” (p. 255). The post-questionnaire asked the students which mathematical skills and concepts they felt that they had learned most about during the project. The test results indicated that students had made significant gains in the mathematical areas of reading graphs.

Curtis [2] describes a study from four school classes (3rd, 6th, 7th and 8th grades) addressing how their handhelds were used. These authors based their findings on observation, artefact analysis, and log files. They concluded that all the teachers had found numerous ways to adapt handheld computers to their classroom and the students’ needs. In the third grade school, for example, the pupils used handhelds to reinforce lessons from the district’s core curriculum. They also used the handhelds to “perform some tasks that would be difficult, if not impossible, to perform on paper” (p. 30). Examples of programs they used are Sketchy, an animation program, allowing the students to animate scientific concepts and Morse code. Curtis describes 6th graders use of the handhelds as follows:

“... powerful research tools and many of the students also find the handhel’s word-processing abilities very helpful...” while “the 7th graders have created a nearly paperless science class...” (p. 30).

Interestingly this shows that handhelds are used not only for communication and domain-specific task assignments, but also for more general activities that are typically associated with large-screen displays (e.g. word processing). In a related study that looks at the kinds of activities performed with handhelds, Sharples
and colleagues [17] explored 7-11 year olds' learning likes and dislikes of computers and learning technology. The methods employed were interviews and questionnaires with 291 children aged 7-11 in 2 schools. They found that although the children preferred to work in groups (67%), most preferred to keep the products of their work private (64%). These findings suggest that personal technologies should support students' group work and at the same time enable the children to keep personal material privately.

A study conducted by Rochelle and colleagues [18] on mediation suggest that handheld technology plays two mediating roles: (1) representing content to support student reasoning and (2) co-ordinating the flow of information in support of collaborative learning.

These studies provide the background from which the current study was designed. We focus on the strengths and weaknesses of using mobile technology in one Norwegian classroom, and use personalization and pupil motivation as a lens for selection and presentation of data.

3. Methodological Approach

In this paper we provide a descriptive account of how 6th-7th grade school students in Norway personalized their handheld devices before engaging in collaborative learning activities. It should be noted that primary schools in Norway have institutionalised a practice that gives teachers and students a certain amount of freedom with respect to variation in teaching style, and some flexibility in the rate at which the curriculum is covered. Furthermore, there are no public examinations at this level in Norway.

The data material was collected by observations and interviews in the classroom, screen snapshots of student concept-maps, and student logs. The raw data were recorded in Norwegian and translated into English by one of the authors (LM). The interview and observation material are referred to in the analysis in order to clarify the context of the observations and the discourse that followed. Interviews and observations were video-recorded and we made use of interaction analysis [19] to transcribe the interviews, capturing both conversations and gestures.

During the observation, the camera was first placed in the back of the classroom. Later, the camera was placed at more convenient locations, i.e. closer to the individual students or groups. The camera gave us access to students' physical gestures and the deictic references to the shared technological artefacts in addition to the spoken interaction. The spoken interaction is our primary source of data.

The data material was first logged in detail and then summarized [19]. Different types of activities could then be identified. Finally, representative extracts of activities that were repeated more than once were chosen to illustrate conceptual issues of personalization and pupil motivation.

3.1 Case Description: Headland Primary School

Headland Primary School (name of school and student names used are pseudonyms) is located outside a medium-sized city (approx. 70,000 inhabitants) in Norway. The school has two classes at each level (1-7), and the number of pupils in each class is relatively small. The study involved 41 children. The students and teachers were observed at two different periods during 2004, for three and four consecutive weeks. Both teachers and students were initially equipped with a Handspring Visor PDA, which was later replaced by a Palm IIIc with folding keyboard. The Palms had HiCE/GoKnow software installed [20] including, among others, FreeWrite (word processing software), PiCoMap (concept-mapping), Sketchy (an animation program), Locker (task-management), PicChat (simultaneous beaming); and Cells (spreadsheet). The programs were designed on an inquiry-based, student-centred platform [21]. Synchronization towards a centralized server enabled the teacher to log into the work of students when needed. Students could also log into the system and look at their work and the feedback given to them by the teacher.

Students used the PDAs for school and homework. They seemed to be used as an add-on to existing practices. It was observed that FreeWrite was used as self-study in English. The pupils wrote sentences in English and used SpellCheck at the end of a writing task for correction. SpellCheck highlights misspelt words without providing suggested alternatives. The students were asked to use the PDA for testing each other in vocabulary in PicChat. This program lets the student beam information to each other, which can later be wiped out.

The students received their homework on their PDAs and the teacher's feedback was either given directly in the classroom (i.e. verbally), by beaming or through the Palm Artefact and Archive Manager (PAAM) [22]. During their lunch break the pupils would listen to a story or use their handheld for games while eating at the same time.

The students were not taught how to download games or how to play them, but playing games downloaded from the Internet was a popular past time. While communicating and working on classroom
assignments, personalizing and customizing the devices appeared to be important for the students. Overall personalization seemed to be equally relevant for teacher-assigned tasks and pupil motivated discretionary use.

4. Personal Technologies

Gant and Kiesler [23] argue that the “personal aspect” is commonly observed in mobile telephony use. There are multiple reasons for this. For example, in a large-scale study mobile telephony Ling [24] shows that owners of mobile phones personalize their devices in order to “make a statement as to who we are and how we want to be seen.” Ling further argues that parts of what we perceive as the public sphere has become “colonized” as personal. This differs from country to country depending on cultural differences, and this ‘colonization’ is highly visible in Norway. Almost all (99%) of 16-24 year-olds in Norway have access to a mobile phone. At school 88% of secondary school students (13-16 year olds) and 96% of high school students have access to a mobile phone [25]. By comparison, digital technologies are distributed on an average ratio of 5 to 1 in schools in Norway, i.e. 5 students per PDA [26].

In a recent study of personalization behaviour with mobile phones Håkkilä and Chatfield [5] found that personalizing a phone in order to make this appear as “your own” by changing features affecting outer appearance were common.

The students at Headland Primary personalized their handhelds in different ways using different strategies. The different ways ranging from setting default fonts and colours in the word processor to downloading backgrounds to their PDA from the Internet. The two main strategies were surface customization and deeper-level (far reaching) functional customization. The former was manifest in the way they decorated the handhelds with stickers of their favourite cartoon characters and personalized handbags. However, personalization is not only driven by surface characteristics, it has also deeper-level functional implications when seen as part of activities. For example personalization can help to find one’s device among multiple similar ones [27]. Stickers and backgrounds are often unique to each student and help to distinguish the various PDAs. In fact it appeared to help the students to recognise their own PDA among the other PDAs in the classroom, as is illustrated by the following excerpt:

Amy I don’t have any [Closing her PDA] battery left so I have [Clicks the cover to recharge on]...

Ida This is yours

LM How do you know it’s yours?

Ida It says so there [Pointing to the top right corner of the screen]

It was also interesting to note that they carried their PDAs in small handbags they had made in their Arts and Crafts class in the beginning of the project (ss Figure 1). This is a form of personalization, resulting from the activity of establishing ownership of their PDAs.

Another aspect of personalization is that the students created rules for themselves for how to use the PDAs in their activities. One such rule was not lending their PDAs to other students. It was evident that they regarded their PDAs as a personal possession. The students said they used their PDAs to keep “secrets”. Keeping secrets was seen both during the video sessions and with the concept maps. The students did not want others to see what they had on their screens until they were ready to show it. This finding supports those reported by Sharples and colleagues [17].

From the PAAM website one can see that the personal, almost diary-like, nature of some of the content of the students’ PDAs was important to them. The students would write about almost anything, ranging from social relations in the classroom to what they looked forward to during the upcoming Easter holiday. Homework was also personalized. This was accomplished either by changing fonts or by creating “smilies”. One can see that the students perceived the handhelds as a personal artefact [4]: the content they put in the PDA was of a personal nature and “secrets” were often kept alongside the “required” information. Personalization was an activity that was fun to the students and it engaged them in their activities.
Students said that they perceived the use of PDAs as ‘fun’ even though the task was writing sentences in English. Several of them told us that writing on the PDA was more fun than writing on a copybook. This cannot be attributed to a novelty effect as at this time the students had used the PDAs for over a year [28]. When the students were using the PDAs in some of the situations, the atmosphere could be characterised by pleasure and fun.

Collaboration was often observed initiated by the students themselves and not only as part of mandated (teacher defined) tasks. The students would initiate use of the PDAs by exploring features such as beaming for specific tasks. Beaming provided affordances [4] for the pupils to engage in collaborative learning activities, e.g. using the beaming feature for information sharing. The students beamed games and beamed to play games during breaks and subject-specific activities during class. In the following excerpt a group of students are working on irregular English verbs using their PDAs with the IR-ports facing each other. After several turns of on-task actions (not shown) the interaction takes a social turn:

\[
\text{LM: What are you working on?} \\
\text{Maia: Nothing really. (Laughter)} \\
\text{Thea: Oh yes} \\
\text{Maia: We're just sending...} \\
\text{Andy: Eh...} \\
\text{Thea: We are just testing..} \\
\text{Maia: We are testing.} \\
\text{[Laughter]} \\
\text{Maia: We're just going on a little bit more. (Laughter) it's fun}. \\
\]

The students continued social interaction by making drawing and sending the drawings to each other. The excerpt shows that this activity was motivated by the pupils’ own interest in using the PDAs.

5. Discussion and Summary

The interaction between learning and social interaction is complex. Taking the Vygotsky socio-cultural approach as premise we study the relation of social interaction to cognition and learning. When technology mediates the interaction it is even more challenging. We have addressed a small part of this by the following working hypothesis. “To take part in collaborative learning activities (social level) the tools must be personally motivating for each participant (individual tools).” Wertsch [29] points out that many of the studies reported in the literature on mediated learning have assumed a ‘clean shift’ from social to individual operations, i.e. that a child first works with someone more capable (e.g., teachers, parent, more capable peers) on a task and then begins to carry it out independently. When viewing the social-individual transition in this way, Wertsch claims important aspects of the dynamics of the relation will be lost. Instead a series of changes occur on the intersubjective plane before it can pass to the other. In order to motivate two people to interact in the first place certain conditions must be met. In this paper we have identified personalization and fun (motivation) as two such conditions. Personalization and motivation supports identity formation and differentiation and we have identified several techniques of accomplishing this with handheld technology in the classroom. Handhelds have a lower threshold to personalization than the other educational technologies we have studied in the classroom (e.g. groupware).

What are the implications of handheld technology that is personalized by school children in the classroom? The students in our study personalized their PDAs in different ways: stickers on the outside and a handbag to carry the PDA in, content and files were customized on the screen and homework was also given a personal touch by choosing different fonts and colours. The students’ perception of their PDA usage was that it was engaging and the PDAs were fun to use. It is important to keep in mind that “Enjoyment and fun as part of the learning process are important when learning new tools since the learner is relaxed and motivated and therefore more willing to learn.” [30]. In this study, students’ comments that even sentence writing on the PDA were perceived of as fun and we believe this is an advantage that needs to be more fully explored in further work. We recommend further studies take personalization and motivation of educational technologies as key factors for stimulating individual participation in social interaction for learning and cognition.

6. References


