

Undergraduate student experiences in context-aware educational uses of handheld devices

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Overview

- Introduction
- Literature review
- Methodology

Introduction

- Increasing use of mobile technologies in education
- 1:1 educational computing (e.g., Liang, et al., 2005)
- 4th wave of computer development

Introduction

- Over optimistic or technologically deterministic (Patten et al., 2006)
- Successful implementation of technology applications depends largely on how the technology is used (Jonassen et al., 2003; Lankshear et al., 2000; Laurillard, 2002).

Key terms defined

- Handheld/handheld devices
- Context-aware educational uses of handheld devices

“handhelds/handheld devices”

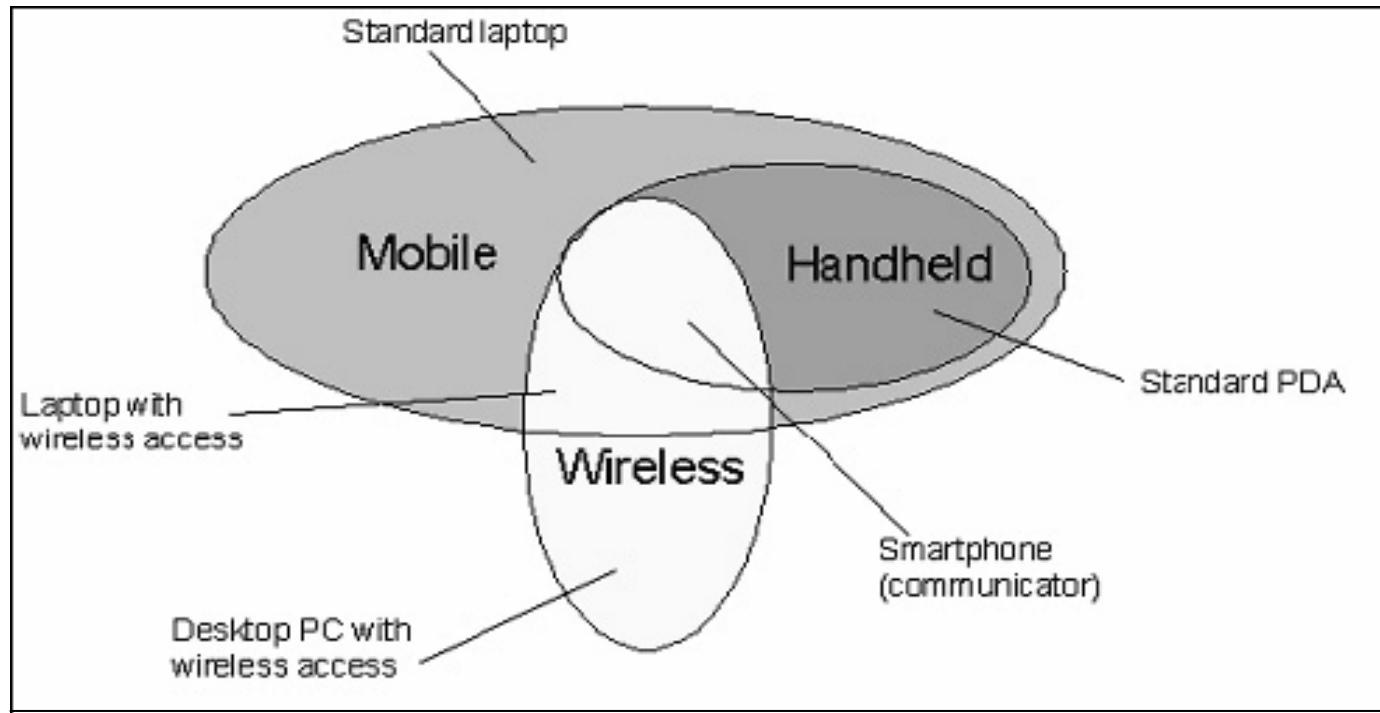


Figure 1. Defining the mobile device (Seppala & Alamaki, 2003, p. 331)

“handhelds/handheld devices”

PDAs are referred to as

- Palms (e.g. Klopfer, Yoon, & Rivas, 2004)
- handheld computers (e.g., Robinson & Dodd, 2006)
- handheld devices (e.g., Patten et al., 2006) (e.g., Horton & Wiegert, 2002;
- handhelds (Lai & Wu, 2006), etc.
- PPC phones – new hybrid form of mobile phones and PDAs

“handhelds/handheld devices”

Mobile phones, PDAs, and PPC phones

- They generally include some or all features of mobility, wireless access, mobile phone functionality, and/or standard PDA functionality.
- They have been really designed to be held and used easily with one or two hands.

“Context-aware educational uses of handheld devices”

- Context
- Context in “context-aware computing”
- Context in “context-ware educational uses of handheld devices”
- Second-level effects of ICT use
(Lankshear et al., 2000; Sproull & Kiesler, 1991)

Context

involves not only the dimensions of time and location, but also “includes the learner’s trajectory, goals and motivation, the surrounding resources, co-learners, and other available conversants”
(Sharples et al., 2002, p. 233)

Context in “context-aware computing”

“The physical and social situation in which computational devices are embedded”
(Moran & Dourish, 2001, p. 3).

Context-aware computing

One goal of context-aware computing is to “acquire and utilise information about the context of a device to provide services that are appropriate to the particular people, place, time, events, etc” (Moran & Dourish, 2001, p. 3)

Context in context-aware handheld educational uses

“The physical and social situation in which the learners make use of the handhelds for educational practices”.

Context-aware educational uses of handheld devices

The goal of context-aware handheld educational uses is to make use of the handheld for educational practices appropriate to the particular learner, place, time, events, etc.

Context-aware educational uses of handheld devices

- In second-level' effects in new ICT use
- “The effects include changes in environments of social practice and in practices themselves which result from participants actually using the technologies” (Lankshear et al, 2000, p. 36; Sproull & Kiesler, 1991).

First level effect of new ICT use

- First-level effect: “planned or anticipated benefits when new technologies are implemented”.

(Lankshear et al, 2000, p. 36; Sproull & Kiesler, 1991).

Examples of context-aware handheld educational uses



Figure 2 Photo taken in model making experiment using the handheld

Examples of context-aware handheld educational uses

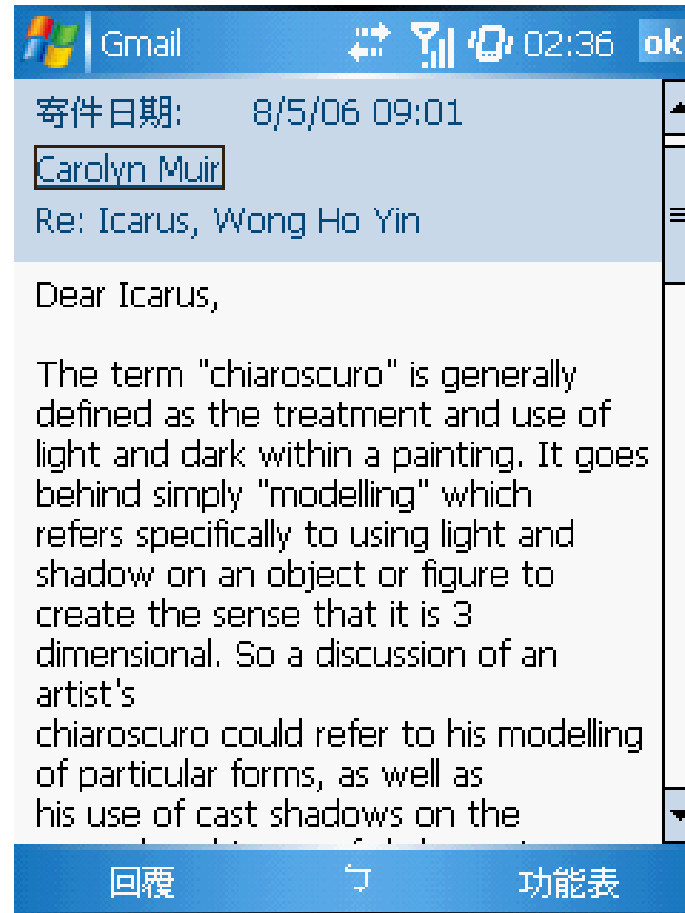


Figure 3 Screenshot of email checking

Characteristics of handhelds for educational uses

- Mobility: convenience, expediency, immediacy (Kynäslahti, 2003), and accessibility (e.g. Crowe & van't Hooft, 2006)
- Connectivity: wireless and mobile network (e.g., Cui & Bull, 2005; Waycott, 2005)
- Key for context-aware educational uses

Literature review

- Overview
- Functional categorisation of handheld educational uses
- Opportunities and challenges
- Rationale of this study
- Implications of this study

Overview: Classifications of handheld educational uses

Classroom communication issues:

- classroom response systems,
- participatory simulations
- collaborative data gathering

(Roschelle, 2003)

Overview: Classifications of handheld educational uses

Functional applications

- Administration
- Referential
- Interactive
- Microworld
- Data collection
- Location aware
- Collaborative (Patten et al., 2006)

Functional categorisation of handheld educational uses

- Educational communication
- Managing
- Information seeking and handling
- Context-aware educational uses
- Other applications

Educational communication

- Pushing
- Posting
- Messaging
- File-exchanging
- Response and feedback

(Liang et al., 2005)

Pushing

Within this category, course related material, resources, and assessment are delivered to the student handhelds to support their learning. This is one way communication.

Posting

Within this application, information presentation, dissemination, and annotation are achieved.

e.g. An application provided the possibility for the learners to make private annotations to public slides developed by the teacher, and allowed the presentation of some students' annotations on the whiteboard (Pinkwart et al., 2003)

Messaging

allows sending and receiving short messages among student devices, or between the handhelds of students and the teacher. Usually, messages are sent or received instantly.

File-exchanging

refers to the files that are exchanged between a student's handheld and a teacher's one, or among the handhelds of students.

Response and feedback

focuses on student doing quizzes and assessments received from educational institutions on their handhelds, and responding to the institutions. Feedback can be triggered after the submission. Therefore two-way communication can be achieved instantly.

Educational communication

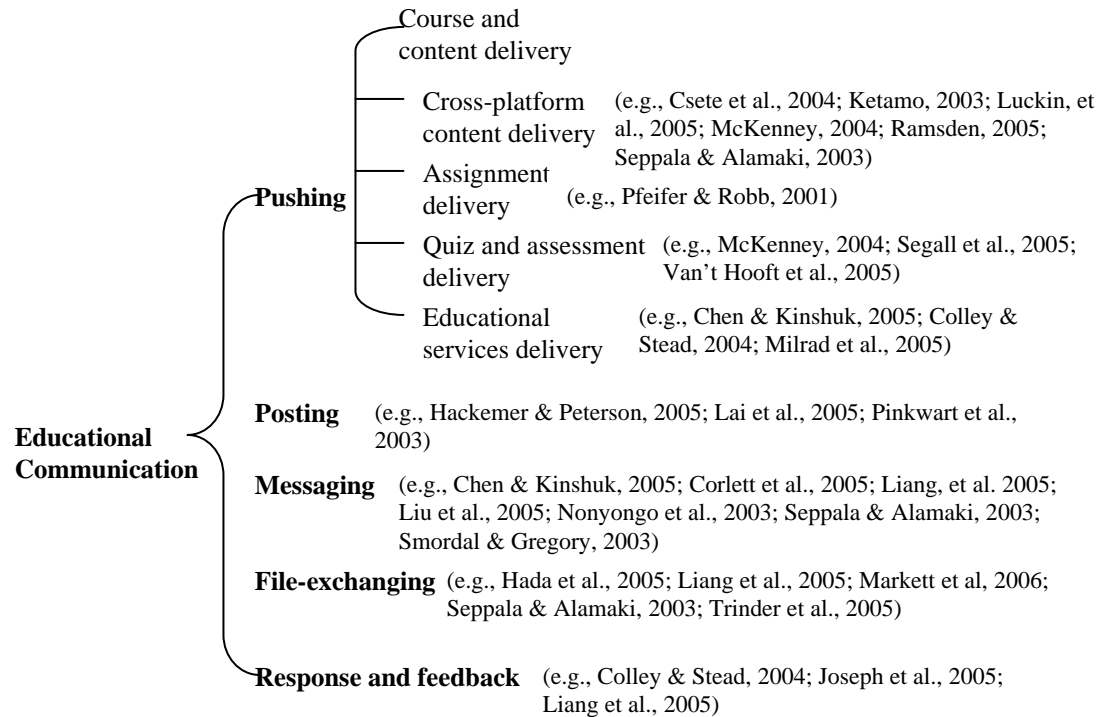


Figure 4 Categories of educational communication

Managing

Handhelds are used to make personal arrangements for various learning and social activities. They are also adopted in helping administrative work.

- Personal managing
- Administrative assistance

Managing

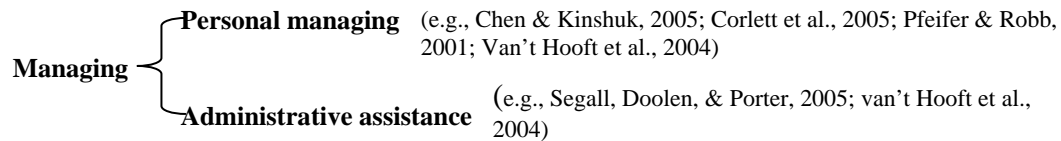


Figure 5 Categories of managing

Information seeking and handling

The most obvious characteristics within this application lie in the fact that more often than not, information is downloaded and stored in handhelds, or information can be accessed via internet using handhelds for the learners to seek useful information, and utilise it.

- References
- Revision

Information seeking and handling

Reference (e.g., Chen, et al, 2003; Colevins, et al., 2006; Corlett, et al., 2005; Lai, et al., 2005; Smordal & Gregory, 2003)

Revision (e.g., Bull & Reid, 2004; Hackemer & Peterson, 2005; Hsi, 2003; Luckin, et al., 2005; Pinkwart, et al., 2003)

Figure 6 Information seeking and handling

Context-aware educational uses

- Location-aware applications
- Needs and location-aware applications
- Anytime, anywhere educational uses

Location-aware applications

- aim to contextualise learning activities by enabling the learners to interact appropriately with their [physical] environment; they make use of the unique attributes of handhelds and are, occasionally, collaborative in nature” (Patten et al., 2006, p. 299).

Location-aware applications

e.g., The use of visual codes attached to locations and objects was used in a museum and park. This enabled the retrieval of web-based information to be triggered by capturing images using the integrated camera. This digitally tagged real world objects augmented the reality (O'Malley et al., 2003).

Needs and location-aware applications

Needs and location-aware applications were considered a step further to many location-aware environments that “adapt to the learner’s interaction according to features of the location” (Cui & Bull, 2005, p. 356).

Needs and location-aware applications

e.g., TenseITS, was designed to use individualised learning materials, and appropriate interactions for varying periods of time to adapt to the learner's grammar needs in that location (Cui & Bull, 2005)

Anytime, anywhere educational uses

Different from location-aware educational application, or needs and location-aware application, application in this category stresses the “portability” of learning, and aims at making learning “seamless” (Liu et al., 2003; Sharples et al., 2002).

Context-aware educational uses

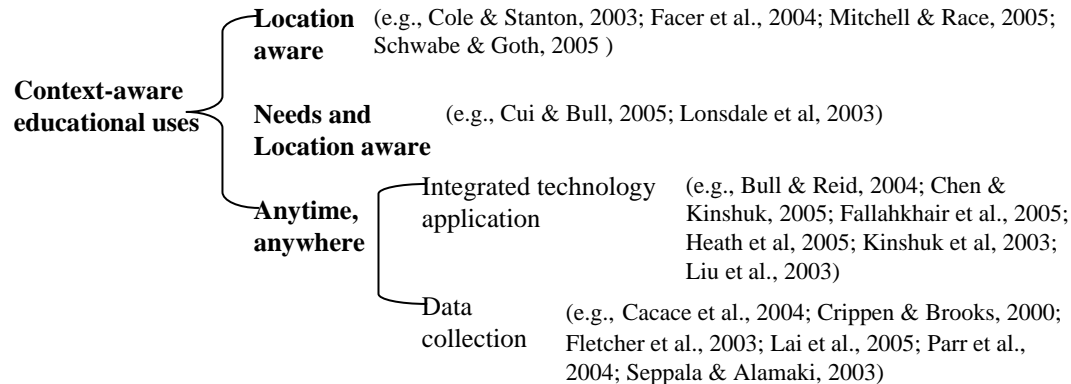


Figure 7 Context-aware educational uses

Other educational uses

Games and simulations “allow learners to construct their own knowledge through experimentation in constrained models of real world domains.

- Games & Simulations
- Entertainment

Other applications

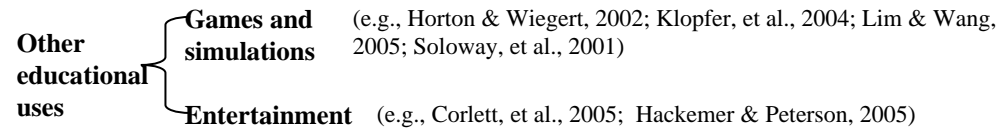


Figure 8 other applications

Reflections on the opportunities and challenges

- **Why the handheld device?**
- **Issues of the handheld educational
uses**

Why the handheld device?

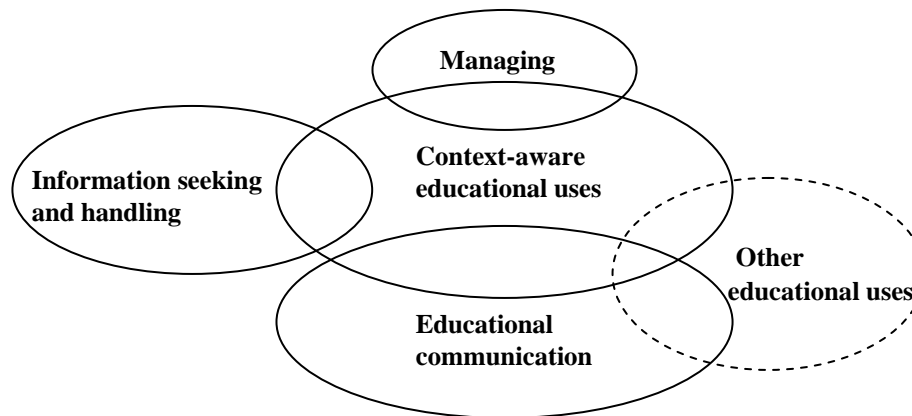


Figure 9 Handheld educational uses

Why the handheld device?

Without taking the “context-aware” information into handheld educational applications, almost all these applications listed in the literature review could have been easily accomplished using other devices, like desktops or laptops

How should technology be used?

As “students do not learn from technology, they learn from thinking. Technology can engage and support thinking when students learn with technology” (Jonassen, Howland, Moore, & Marra, 2003, p. 11).

How should technology be used?

- technology as tools to support knowledge construction;
- technology as information vehicle for exploring knowledge to support learning by constructing;
- technology as context to support learning by doing;
- technology as social medium to support learning by conversing;
- technology as an intellectual partner to support learning by reflecting.

(Jonassen et al., 2003, p. 12)

Issues of the handheld educational uses

- Handhelds as presentation tools
- Complicated design for controlled practice
- Issues of context-aware educational uses
- Technical issues
- Other issues

Handhelds as presentation tools

- Lack of interactivity (e.g., SMS)
- Usability of handheld with a small screen for reading a large amount of content developed for big screens like desktops or laptops.
- The way students learn and the context of learning remains largely unchanged.

Complicated design for controlled practice

- a local messaging topology among participants in mostly face-to-face settings
- teacher-controlled communications
- asynchronous structured data messages
- spatially directed communications
- aggregation that a shared public display was used to make these aggregates available for discussion

Context-aware educational uses do not seem significant, or apparent.

Issues of context-aware educational uses

- Wireless connectivity was limited to certain contexts.
- Technological complications may sometimes result in limited educational benefits (e.g. context-aware computing).
- The context that individual learners are involved is varied, and individual learner's needs, goals need to be investigated.

Technical issues

- Screen size
- Lack of standard platform
- Wireless connectivity
- Battery life
- Inputting method
- etc.

To summarise

Handheld educational applications seem to have attempted the “first-level effects” in ICT use rather than “second-level effects”.

(Lankshear et al, 2000, p. 36; Sproull & Kiesler, 1991).

First level effect of new ICT use

“The effects of planned or anticipated benefits when new technologies are implemented”.

(Lankshear et al, 2000, p. 36; Sproull & Kiesler, 1991).

based not on what we know about new technologies' benefits and limitations, but on unsubstantiated claims about their capacity to enhance teaching and learning.

Rationale of this study

- Necessity for context-aware research work
- Taking learner context into consideration
- Trying out the uncertainties of the handheld devices
- Using the available features of the handheld for context-aware educational uses
- Target users of the handhelds

Necessity for context-aware research work

- Even if the handhelds are developed to be as powerful as desktops, they still cannot replace the traditional computers because they are two different technologies.
- Portability and connectivity: context-aware educational uses

Taking learner context into consideration

- Prescribed learning tasks/environment
- Lack of opportunities to make use of the handheld themselves

“Changes in environments of social practice and in practices themselves result from participants actually using the technologies” (Lankshear, Green, & Snyder, 2000, p. 36).

Trying out the uncertainties of the handheld devices

- The potential of the handhelds has not been fully exploited.
- Problems exist.
- Existent research into exploring the overall potential and constraints of the handheld educational uses have been rare.

Using the available features of the handheld for context-aware educational uses

- Successful educational practice depends on how the handhelds are used by the students.
- Simple features of the handheld without any complicated design can also benefit students if used properly.

Target users of the handhelds

- Conflict between students and teachers in schools
- School students have less time at their own disposal.
- University students are more flexible in time arrangement

This research study focus

This research study aims at investigating context-aware educational uses of handheld devices based on undergraduate student's own experiences.

Based on the handheld educational application literature, to date, there has been no such readily available study reported.

Research questions

Main research question:

What context-aware educational uses emerge from undergraduate student experiences in using the handheld devices?

Research questions

- What context-aware educational uses of the handheld do the students prefer?
- Why do they prefer these uses?
- Where do the students usually use the handheld?
- When do the students usually use the handheld?
- What tasks do the students usually do using the handheld?
- How do the students use the handheld to achieve their tasks?

Implications

- The feasibility and constraints of the handheld technology for context-aware educational use will emerge.
- A better understanding of the context in which the students use the handhelds and the educational uses they prefer will be obtained.
- The results of the research may shed some light on how to integrate the technology into the curricula for the researchers and programme designers.

Methodology

Qualitative case studies

Three stages in the study

- Stage 1: the preparation of the case studies
- Stage 2: exploratory case studies
- Stage 3: in-depth case studies

Stage 1 (January 06 - April 06)

- choosing the handheld devices
- choosing participants: purposefully
- Choosing site: for convenience

Exploratory case studies (May 06 - August06)

Data collection method

- Semi-structured interviews (face-to-face)
- student e-journals
- artifacts created using the handheld
- Retrospective interviews

In-depth case studies (September 06 - April 07)

Revised research design based on
exploratory study

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