Open Research Online

Cognitive, Ergonomic and Affective Aspects of PDA Use for Learning

Conference or Workshop Item

oro.open.ac.uk

Cognitive, Ergonomic and Affective Aspects of PDA Use for Learning

Agnes Kukulska-Hulme
Institute of Educational Technology
The Open University
a.m.kukulska-hulme@open.ac.uk

Abstract

A study of learners' use of PDAs for reading and note-taking on an online course, together with findings from staff development workshops, have shown that there are numerous issues underlying effective, efficient, and satisfying use of this new technology. The paper reports on the issues by examining cognitive, ergonomic and affective aspects of learners' experience.

1. Research Background

During 2001, a study was conducted to evaluate the use of PDA devices by students on a Masters level course [1]. This paper gives a focused account of selected aspects of the findings, namely the cognitive, ergonomic, and affective aspects of PDA use, as they emerged in online conference discussions. This is supplemented by data collected during workshops in which other participants used the same PDA in a different learning context.

The research reported here relates to the usability of a PDA and texts delivered on that device. Usability is typically defined as being the effectiveness, efficiency and satisfaction with which specified users can achieve identified goals in particular environments [2]. Another way of expressing this is to say that what is at stake are the cognitive, ergonomic and affective factors that impact on student learning. There is current interest in student use of e-books and handheld readers [e.g., 3] and research into user interaction with new reading appliances [e.g., 4]. This project taps into both strands: general usability issues and the specifics of technology-supported reading.

2. Participants, aims and methods

The study centred on students taking the postgraduate course 'Applications of Information Technology in Open and Distance Education.' This Open University course is primarily delivered online, making use of web resources and First Class conferencing. In the final block of the course (August-September), however, students use print-based reading materials. The idea was to give students the option of reading some course materials on a PDA.

Students could choose to read on a PDA or only the print version, or both.

Students on the course are typically studying part-time and are involved in other professional activities. They are mostly in their 40s and come from a variety of cultural backgrounds, as the course is delivered globally. All 65 students enrolled in the course were supplied with Palm m105 PDAs in July 2001. Most were new to PDAs, although there were some students who had used palmtop computers in the past and some who owned a PDA or similar device.

The study aimed to assess the benefits and constraints introduced by PDAs, and to examine how this new tool impacts upon students' reading strategies. In learning contexts, readers often like to make notes (e.g. by underlining words, writing in the margins, etc.) or on a separate piece of paper, therefore annotating and note-taking were included in the investigation. WordSmith, a document editor and viewer, was used to present course materials on the PDA. The document viewer mode enables users to read and search the text in several ways.

Evaluation data was collected through questionnaires, interviews, and conference messages. Twenty-seven students contributed to the conference discussion on PDAs. The discussions were not mediated or directed. The qualitative data from conference messages brings to light a number of interesting issues which are presented in the next section.

3. Issues in conference messages

A conference was opened up to students in the run-up to the distribution of PDAs. It became a focal point for 'early adopters', i.e. those students who were already users of handheld computers, or who were immediately interested in the technology. A number of issues emerged spontaneously in this conference.

Cognitive challenges:

- what one notices in print can differ to what one notices on a screen
- using a PDA means re-visiting information that is already known about other devices, e.g. battery life or memory on one's PC, laptop, other handhelds

- conceptions of paper-based study tools may need to be re-visited, e.g. is a PDA like a paper organiser?
- PDAs can open up new information gathering strategies, e.g. via a news clipping agent

Ergonomic preferences:

- predictive text (automatic word completion); concern whether this is available on PDAs
- preference for a good quality colour screen, as used on another handheld
- backlight feature useful for reading under bedclothes
- desired compatibility with other devices, e.g. one's mobile phone

Affective issues:

- an emotional attachment to one's gadget or tool; impossible to lend it to someone else
- some learners naturally look for fun, e.g. games
- overwriting diary or personal information by mistake
- concern about possible health hazards of PDAs, by analogy with mobile phones

Once the PDAs were distributed, the conference was accessed by a wider circle of students. There was a tendency towards technical queries and mutual support. In addition, the following issues emerged:

Ergonomic issues:

- reading 'the minute text on the little screen'
- when font is enlarged, the text is difficult to scan
- eye ache and visual disturbance; choosing to print the instruction manual, designed to be read on screen
- preference for beaming information to the PDA
- preference for portable keyboard
- dislike of clicking noise when selecting a function
- problems caused by cleaning the PDA screen while the device is switched on

Affective aspects:

- reluctance to switch over from own handheld
- some affection towards the Palm m105: 'this little chap', 'enjoying the little beasty'
- aspiring to join the 'illustrious group' of those who were already PDA users

4. Observations of users in workshops

Data was also collected during two staff development workshops, during which 20 participants used Palm m105s, the same as the Masters students. The workshops aimed to give an understanding of PDAs through hands-on experience. Participants completed reading and note-taking tasks individually. Discussion of experiences and opinions took place in small groups. Group facilitators observed participants and took notes.

Several *cognitive isses* were identified. For example, skim-reading seemed to be slower than skim-reading print materials. Participants found that if they changed font size in the middle of reading, they lost their place in the text. There was a feeling that it would be difficult to absorb complex concepts. Readers wanted to be able to mark the text, to underline, highlight, circle words. Taking electronic notes was difficult, as this disrupted reading. *Ergonomic issues* included screen contrast, room lighting, needing to re-calibrate the screen, and accuracy with the onscreen keyboard. Some people found it hard to grip the very thin stylus, or tended to lean heavily on the PDA, inadvertently pressing buttons at the bottom of the device.

5. Summary

Cognitive issues revolved around effects on the reading process, new skills and strategies, the design of texts, and how the PDA was conceptualised. Ergonomic issues concerned features such as screen sensitivity and quality, constraints of text input, lighting, and physical impact on the user. The conference messages drew out affective aspects which were not so evident in workshops.

References

[1]J. Waycott and A. Kukulska-Hulme. An Evaluation of the Use of Personal Digital Assistants for Reading Course Materials on H802. Institute of Educational Technology, The Open University, CITE Report 9, December 2001.

[2]ISO 9241-11 International Standard - Ergonomic Requirements for office work with VDTs. Part 11: Guidance for specifying and measuring usability. Geneva, Switzerland: ISO, 1998

[3]Young J.R. A university that reveres tradition experiments with e-books. The Chronicle of Higher Education Information Technology 2001: Available from htttp://chronicle.com/free/v47/i36/36a03901.htm

[4]Adler A. Gujar A. Harrison BL. O'Hara K. Sellen A. A diary study of work-related reading: Design implications for digital reading devices. In: Proceedings of CHI 98, ACM Press, Los Angeles, 1998, 241-248.