Chapter 12
A Design of Collaborative Learning System Based on PDA for Improving Performance of Real-Time Learning

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ABSTRACT

In conventional classroom, when a student's progress is stymied by the lack of direct contact with his or her instructor and peers, mobile devices offer new forms of communication that break down the traditional barriers to education. Personal digital assistant (PDA) has been a popular choice – more so than cell phone – for implementing m-learning in the last few years. However, how to design a collaborative learning system based on PDA to create an appropriate interface for content presentation on small screen in order to improve performance of learning is the major objective of this study. The authors used principles of human-computer interaction (HCI) and utilized task analysis, literature review, experimental design, small-screen design to construct a collaborative learning system based on PDA, and addressed potential issues with appearance in order to design a friendly PDA interface whose performance was analyzed with a post-experiment user satisfaction questionnaire. The results of this experiment show that the principles of Interface design based on HCI used in design of the learning system would help students to improve performance of learning and become capable, self-reliant, self-motivated and independent. The findings also demonstrate that variations among students' preference or content are associated with differences in the display presentation mode in which the landscape interface is recommended for use.

INTRODUCTION

Mobil Technology in Learning Assistance

While the new technologies open new horizons for personal development, it is with the advent of mobile learning (m-learning) that the true potential of e-learning to happen "anytime, anywhere" has finally started to be realized. The potential value of learning via mobile devices has been widely demonstrated ([ab]Holzinger, Nischelwitzer, & Meisenberger, 2005; Naismith et al., 2005; Leung & Chan, 2003; Sharples, 2000). A number of pilot projects have sought to discover how these mobile devices (Pocket PC, Tablet PC, Personal Digital Assistant (PDA), and Smart Phone etc.) could be integrated into learning settings (Chen et al., 2002; Lundby, 2002). Ring (2001) found that students enjoyed reading course outlines and texts on mobile phones while commuting, and Thornton and Houser (2003) found that students highly rated web and video teaching materials viewed on mobile phones and PDAs. In the long run, says Quinn (2002), "We'll realize that learning should move from an organizational function to an individual necessity." Sharples (2000) identified m-learning, based on mobile devices, as the next generation of e-learning.

As we review, the learning model of a single instructor interacting with many students that is applied in conventional classrooms forms a passive bottleneck ([ab]Holzinger, Nischelwitzer, & Meisenberger, 2005). Moreover, the instructor cannot effectively record students' individual learning histories for instantaneous and suitable feed back, the new emphasis in education is on supporting the student, in collaboration with his or her peers and instructor, both within and outside the classroom. When a student's progress is stymied by the lack of direct contact with his or her instructor and peers, mobile devices offer new forms of communication that break down the traditional barriers to education. Mobile devices include mobile phone, PDA, laptop (convertible tablet, slate tablet) and hybrid devices (smart phone). Different mobile devices have unique features and purposes. The eTForecasts (2003) forecasts in 2002 that the "total worldwide PDA in use will jump from 24,920,000 devices in 2000 to over 227,400,000 in 2007. The capabilities of the PDA will improve impressively by 2007 and it will become a multifunction device with built-in Internet access, digital camera, music player, scanner and other functionality." PDA has been a popular choice – more so than cell phone – for implementing m-learning in the last few years, likely due to their larger screen size and higher resolution (Sampson & Zervas, 2008; Aburas & Khalifa, 2007; McAlister & Peng, 2005). However, both the display capabilities and the data capacity of a PDA are much smaller than those of a desktop. Thus, intelligent presentation of data is required to optimize the layout of the display and the structural presentation of information with minimal loss of information. This is a critical issue to consider for achieving effective communication among the participants.

Mobile Human-Computer Interaction (M-HCI)

PDA-based information systems are suitable for m-learning, enabling ubiquitous and idle-time utilization. However, the use of small devices and mobile systems requires special quality attention in order to get the desired benefits (Gafni, 2009). The design of mobile devices and services cannot be merely technology-driven (as it often happens today), but needs to be prompted by human needs and should properly take into account human abilities, limitations, and preferences. When users/operators use a computer, generally they don't understand the computer's inner world of bits, bytes, files, RAM, etc., but they understand the computer through its interface, and the text and images that appears on the screen. Hence, a popular saying in the computer world is that for

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