Guest Editorial: Special Issue on Mobile and Ubiquitous Technologies for Learning

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Mobile learning is the study of how to harness personal and portable technologies for effective education. The term also covers research into technology-enabled learning across contexts and learning in an increasingly mobile society.

The first phase of mobile learning, originating more than 60 years ago, was to equip classrooms and lecture theatres with handheld response systems to aggregate individual responses from students and to provoke discussion based on differences in answers to open response questions. The more recent technologies of graphing calculators and wireless handheld devices offer new learning opportunities for rapid sharing of data and knowledge, simulation and visualization, and computer-managed groupwork.

The second phase was strongly influenced by two major projects funded by the European Commission, MOBIlearn and m-Learning, with related efforts occurring across the globe. These projects explored the opportunities for learning with mobile technologies in nonformal settings, including homes, museums, workplaces, and outdoors. The emphasis of these projects was on the mobility of the learner and support for learning across contexts and life transitions. Studies by Livingstone and colleagues have shown that adults, on average, engage in 13-17 hours per week of active learning and this is maintained throughout their lifetimes. Yet, less than 5 percent of this learning is within a school or formal education setting. So, we have a significant opportunity for personal technology to support the other 95 percent of lifelong learning.

During the course of this second phase and continuing into the present, a huge wave of mobile technology adoption has swept throughout the world. Now, almost every adult and adolescent child in industrially developed countries owns a multimedia communicator with more computing power than guided the first landings on the moon. For many people in developing countries, the computing power that powered the first landings on the moon is available for use in everyday life. In “A Mobile Live Video Learning System for Large-Scale Learning—System Design and Evaluation,” Carsten Ullrich, Ruimen Shen, Ren Tong, and Xiaohong Tan describe a large-scale learning system that provides university students with access to live streamed lectures after work and on weekends, responding to the quadrupling of students in China enrolled in university education. Efficient compression provides high quality images of the lecture slides on students’ mobile phones, along with audio and video of the lecturer. The students can interact with the lecturer using SMS messaging and can respond to polls and activities initiated by the teacher. Two classes from Shanghai Jiao Tong University, with about 1,000 students in each, successfully used the system to study from lectures at home and on the move.

At the other end of the spectrum of technology access, Divya Viswanathan and Jan Blom describe a design workshop in India with children aged 8-11 that proposed concepts for an engaging mobile learning device for children in their paper “New Metaphors from Old Practices—Mobile Learning to Revitalize Education in Developing Regions of the World.” They converge on the simple design metaphor of an electronic “slate” with the properties of touch interaction, small size, support for social use, and audio output. Two general requirements for effective learning are the ability to use the device across multiple contexts, for informal as well as formal learning, and to support both individual and group use.

In a seminal 1991 paper, Weiser argued “The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.” In an emerging third phase of mobile learning, learning becomes embedded into everyday life. Children own tools for learning that they can carry with them from home, to school, to college, and into the workplace, constructing a personal and shared history of knowledge enrichment. Buildings, parks, and cities can be augmented to explain their history, ecology, or structure, enriching a tourist visit or field trip. Such pervasive learning technologies pose substantial practical and ethical problems. How can schools manage the disruption of children bringing their powerful personal technologies into the classroom? How far should formal education and training extend into the daily lives of children and employees? What rights do people have over learning-related materials they originate and share?

A common theme of this special issue is the lowering of barriers between these three types of mobile learning: in the classroom, outside the classroom, and as part of everyday life. In “A Mobile Live Video Learning System for Large-Scale Learning—System Design and Evaluation,” Carsten Ullrich, Ruimen Shen, Ren Tong, and Xiaohong Tan describe a large-scale learning system that provides university students with access to live streamed lectures after work and on weekends, responding to the quadrupling of students in China enrolled in university education. Efficient compression provides high quality images of the lecture slides on students’ mobile phones, along with audio and video of the lecturer. The students can interact with the lecturer using SMS messaging and can respond to polls and activities initiated by the teacher. Two classes from Shanghai Jiao Tong University, with about 1,000 students in each, successfully used the system to study from lectures at home and on the move.

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market imposes some strong requirements for mobile learning technology, including the need to operate in harsh environmental conditions, to support oral learning, and to fit into a culture of low waste of resources.

Student-led design of mobile learning technology is also the theme of the paper, “m-Learning in the Education of Multimedia Technologists and Designers at the University Level: A User Requirements Study,” by Vanja Garaj. Students in a Bachelor of Science course in Multimedia Technology and Design were asked to develop user requirements for mobile learning applications to enhance their student performance and experience. The designs covered five themes: administration, presentation of teaching content, feedback from colleagues and lecturers, motivation and creativity, and innovative ways of understanding the content that was taught. Although this setting is very different from that of Viswanathan and Blom, the study also emphasizes the importance of learning across contexts (for example, to take photographs on location as part of a visual design activity) and of merging individual and group use.

Gill Clough describes a community that already exploits mobile technology for contextual and group learning in her paper “Geolearners: Location-Based Informal Learning with Mobile and Social Technologies.” Geocaching is a form of GPS-guided treasure hunt, and its exponents coordinate their activities through a blend of technologies. They jointly create “digital narratives of location” by visiting locations and both leaving physical objects for future visitors and sharing their experiences online. Learning is not central to this community, but emerges through the practice of viewing and then creating location-based experiences. Geocaching offers an insight into the design needs and opportunities of a new generation of mobile learners who blend activities in real and virtual worlds.

In “Deploying a Wearable Computing Platform for Computing Education,” Grace Ngai, Stephen C.F. Chan, Joey C.Y. Cheung, and Winnie W.Y. Lau show how learning can literally be woven into the fabric of everyday life. Their paper connects classroom and pervasive learning by describing a set of computer-based tools for teaching students about wearable computing. An authoring environment that combines text and icon programming enables students to build software designs for wearable computing. The students test their designs on T-shirts containing patterns of conductive strip wiring that can rapidly be configured to demonstrate interactive clothing.

Advances in learning theory are needed to complement the new technological possibilities. In this vein, Jungho Park, David Parsons, and Hokyoung Ryu investigate the psychological construct of “flow” (a person’s deep engagement and focus on a task) in relation to learning with mobile technology in their paper “To Flow and Not to Freeze: Applying Flow Experience to Mobile Learning.” They create a simulated learning system for training security guards and compare traditional paper-based learning across locations, an indoor game-based simulation, and an outdoor learning activity with mobile devices. Although they find no difference in learning performance between the paper and technology-mediated outdoor learning, there is a difference in the subjective ratings of aspects of flow experience. Learning with mobile devices arouses greater curiosity and interest than its paper equivalent. The authors suggest that the flow experience of users needs to be considered when designing new mobile learning applications.

An important lesson for the successful adoption of mobile technology in formal settings is that it requires attention to implementation, not just provisioning of technology. In “Mobile Learning in School Contexts: Can Teachers Alone Make It Happen?” Don Passey draws on two case studies of the successful adoption of mobile technology into schools to propose a framework for implementation of mobile learning. The paper proposes that a systemic approach, in which learning activity and technical, political, and cultural factors form a holistic system, needs to be considered through the process of design, implementation, and adoption. The adoption of mobile technologies for learning is substantially different from the adoption of other school-based technologies. Making connections between informal and formal, home and school, and individual and collaborative learning is central to the new system of mobile learning.

Overall, we see this collection of papers as heralding an important and necessary phase of mobile learning technology research and development that emphasizes the growing pervasiveness of learning technology through our lives, along with the thoughtful attention to learning theory and implementation needed to harness the technology to address important societal trends and needs.

REFERENCES


