Trends of Mobile Learning in Computing Education from 2006 to 2014: 
A Systematic Review of Research Publications

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ABSTRACT

The majority of the existing research regarding mobile learning in computing education has primarily focused on studying the effectiveness of, and in some cases reporting about, implemented mobile learning solutions. However, it is equally important to explore development and application perspectives on the integration of mobile learning into computing education and identify practical implications for learning and teaching practices. In this study, the authors performed a systematic review of scientific publications related to mobile learning in computing education. After identifying relevant publications, they analysed them from three main aspects: technology and development, design of mobile learning solutions and applications, and implications for learning. The authors’ study reveals that mobile learning in computing education has the potential to increase several affective traits of learners. In addition, mobile learning in computing education has matured enough to be mainly concerned with the mainstreaming of the computing curriculum rather than basic research.

KEYWORDS
Computing Education, Design, Mobile Learning, Pedagogy, Technology

INTRODUCTION

The current enrolment crisis in computing fields stems from the decreasing appeal of computing as an academic discipline or a career of choice. If we are to reverse this trend, it is increasingly important for the curriculum to stay relevant to today’s reality. Introducing students to mobile applications in computing education may help students to make connections between the learning content and the real world applications and gadgets they use every day (Kurkovsky, 2013a). Traxler (2009) defines mobile learning as the provision of instruction and learning on PDAs/palmtops/handhelds, Smartphones and mobile phones. Several limitations such as technical, security, social and pedagogical issues posing challenges to mobile learning have been identified (Oyelere, et al. 2016) but most of these challenges are being addressed with the current advancement in technology and research. Thus, with high mobile penetration networks, mobile learning has the potential to overcome some of the educational challenges (Motlik, 2008).

Shackelford (2006) describes the major disciplines in computing such as Computer Science, Information Systems and Software Engineering. We wanted to know the kind of research studies that have been reported for mobile learning in computing education during the past ten years. To
achieve this end, the following questions serve as lenses to understand trends of mobile studies in computing education:

1. What are the recent technological developments for mobile learning in computing education?
2. What study subjects have been covered and pedagogical approaches applied?
3. What are the practical effects and learner contexts of mobile learning in computing education?

We deliberated on these questions by making an investigation of recent literature related to mobile learning in computing education, and analysed the identified literature from three main perspectives: recent technology and development, design of mobile learning solutions and application to, and implications for, learning.

We claim that this study calibrates research efforts on mobile learning in computing education and provides guidance for educators and designers on the integration of mobile learning content in educational curricula.

BACKGROUND

Mobile learning (m-learning) offers several possibilities to enhance current educational settings, such as supporting communication and increasing learner-to-learner interactions (Litchfield et al. 2007). M-learning can be used to provide access to educational content and tools through the use of mobile devices by anyone, anytime and anywhere (Brown, 2005). Thus, opportunities for lifelong and continuous learning without limitation of time and space are opened, providing flexibility, freedom, just-in-time learning and focused self-centered learning (Asabere, 2013). Some learners are especially attracted to technological innovations, exciting features and applications found on mobile devices, thereby increasing engagement and overall output of positive learning (Mehdipour & Zerehkafi, 2013). Also, mobile devices are more easily accommodated in the classroom than desktop computers. The lightweight nature of mobile devices in comparison to textbooks is a huge source of attraction to learners (Asbere, 2013). However, there are limitations for using mobile technologies for learning such as battery life and screen size, which course designers must overcome to fit course contents (Fong, 2013).

We have identified several similar studies about the application of mobile learning, which have connections to our study. Kennedy et al. (2006) made a survey that students already more than decade ago had access to broadband internet and they used mobile devices for learning. Yordanova (2007) proposes integration of media and wireless technologies to learning in order to attract young students. Zhang et al. (2011) researched global themes and future trends of mobile learning. These researchers attributed an exponential increase in publications on mobile learning several years back to an upsurge in the use of 3G and fixed wireless broadband technologies. Similarly, Korkmaz (2014) identified the following knowledge gaps related to research in mobile learning. First, there are only few studies related to mobile learning’s impact on different courses, learning design and interaction approaches. Second, the impact of mobile learning on various cognitive variables of learners has not been extensively investigated. Third, there is no consensus on which instructional design approach should be used when implementing mobile learning environments. Fourth, issues around integration of mobile technologies into the curriculum have not been extensively explored. These findings are consistent with Baran (2014) who observed that the majority of the existing research has focused primarily on the value of mobile learning for students, with little attention paid, for instance, to how to integrate mobile learning into specific fields of study. Baran (2014) maintains that research in mobile learning needs to focus on establishing pedagogical and theoretical models that can guide educators in designing mobile learning experiences for learners in all fields of study. These models should provide strategies for educators to integrate mobile learning into their teaching practices. We
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