

MOBILE LEARNING AND HIGHER EDUCATION: A THEORETICAL OVERVIEW

MÓNICA ARESTA

University of Aveiro, Portugal
m.aresta@ua.pt

LUÍS PEDRO

University of Aveiro, Portugal
lpedro@ua.pt

CARLOS SANTOS

University of Aveiro, Portugal
carlossantos@ua.pt

Nowadays, mobile technologies play an important role in Higher Education students' academic and social lives. When the digital and "always-connected" dimension of the students' lives becomes an issue of crescent importance, Higher Education Institutions face the need to develop approaches focused on the integration of mobile devices in learning processes. When the adoption of mobile technology for teaching and learning is recognized as an important area of educational research, this paper reviews recent literature on mobile learning in Higher Education settings and summarizes the findings of empirical investigations. Reviewed literature uncovered some benefits and limitations of the adoption of mobile devices in education, showing that Higher Education students' value the opportunities and improvements brought by mobile learning as well as reveal some frustration and concerns. In the centre of everything and as one of the mains reason for either adopting or rejecting mobile learning, lies the perception of students regarding the added value of mobile devices in their learning processes.

Key words: Mobile learning, literature review, Higher Education, students' perspectives

1 Introduction

Nowadays, mobile technologies play an important role in Higher Education students' academic and social lives. Mobile phones, smartphones, tablets and e-book readers are being used by students to communicate, access and share content, create and join online communities, a process able to create a bridge between campus and students' everyday lives.

In this scenario, the digital and "always-connected" dimension of the students' lives becomes an issue of crescent importance, with mobile applications being considered as a key emerging technology in Higher Education. No longer able to position themselves away from the changes mobile technologies brought to the educational context, Higher Education Institutions need to develop approaches focused on the integration of mobile devices in education. More than just transferring activities from classroom to the virtual environment by using technology to perform tasks that were previously completed without the use of a mobile device, Universities need to think how mobile devices can be used to improve learning, to promote collaboration and interaction between educational

agents, to foster the development of social relations and even to support learning, by providing services able to ease administrative-related tasks.

When the adoption of mobile technology for teaching and learning emerges as an important area of educational research, this paper reviews recent literature on mobile learning in Higher Education settings. Section 2 addresses the adoption of mobile learning, namely the use of mobile devices in Higher Education settings and its implication in learning and education. Section 3 presents a theoretical overview of mobile learning and Section 4 reflects on how mobile devices can be used to improve learning.

2 Mobile learning in Higher Education settings

Mobile applications are considered as key technology in Higher Education settings [1]. As students are adopting mobile devices in their everyday and academic lives, the integration of these technology in learning-related activities may provide unique opportunities for developing a personalized, stated and connected learning [2].

Mobile devices are becoming more prominent in the lives of students, evidencing its potential to transform learning [2]. Due to its portability, instant connectivity and context sensitive characteristics, they may – when integrated in a learning strategy – evolve to become a unique learning experience [3], thus being useful as didactic resources for developing subjects in both distance and face-to-face university studies [4].

Students are bringing cellphones, smartphones and tablet computers to the Higher Education settings, believing that these technologies are important to their academic success [5]. Because of that, Higher Education Institutions in developed and developing countries are working on the development of strategies able to adopt the use of smartphones in the learning process [1] [6], namely through the development of mobile learning approaches to education.

2.1 Mobile, learning and education

Mobile learning – or m-learning – is a concept that has evolved along the years, from the simple notion of acquiring and developing knowledge and competencies through the use of mobile devices [7][8][9] to the current approach that emphasizes learners' mobility and personalized learning [2][4][10]. As an educational approach, it embraces several characteristics of e-learning, such as the use of multimedia contents and the communication and communication - through technological devices - with peers, teachers and staff [3].

By enabling the student to take advantage of learning opportunities offered by mobile technologies [11], mobile learning may ease and promote collaboration and interaction between educational agents, fostering the development of social relations and motivating disengaged or at-risk student [12][13]. It may also contribute to improve the accessibility and reusability of education resources and to enhance learning independently of time and place [1][8][14][15]. Due to the easiness in repairing mobile infrastructures in conflict and disaster areas, mobile learning can also contribute to minimize educational disruption [6] and, by enabling learners to acquire learning content anytime anywhere via portable devices [16], it may also extend educational opportunities to learners who may not have access to good schooling [6].

The adoption of mobile devices in educational context, namely due to its portability and instant connectivity [3], may bridge formal and informal learning and enable anytime, anywhere learning [6], emerging as a useful mechanism to enrich students' learning experience [10].

2.2 Issues to be addressed

Nevertheless of its unique benefits, mobile learning should not be considered as a universal and fail-safe solution for educational problems. According to the [6] report, "mobile learning is not and will never be an educational panacea" [6:8], with several issues to be addressed when developing a mobile-learning strategy. Amongst those issues, authors mention the low transmission rate, limited education resources [Li, 2010, apud 19]; the disengagement and disinterest of students regarding the use of m-learning, namely at the end of academic projects [17]; the devices' technical limitations [Haag, 2011 and Huan, Kuo, Lin, & Cheng, 2008, apud 3][18]; the students' own use of mobile technology, more focused on social and recreational activities than in learning activities [18][19]; and pedagogical limitations, related with disturbances on attention and concentration while using mobile devices during class [3][18][19].

Moreover, mobile learning should not replace traditional education, with mobile devices being use just to perform the same tasks previously completed without the use of a mobile technology [2]. It should, instead, ensure the productive use of classroom time by scheduling passive tasks such as reading texts to home, thus liberating classroom time for discussion and sharing [6]; by creating new and faster channels for delivering information, thus improving communication and administration and easing teaching, leaning and even administrative-related tasks [2][6].

3 Mobile learning in the educational research field

Discussions of mobile learning usually focus on selecting an appropriate mobile device specific learning activities. However, it is more important for educational agents to approach mobile learning from a wider point of view, that is, on how mobile devices can be used to improve learning.

In literature, mobile learning is defined as learning that is personalized, situated, contextualized and connected through the use of a mobile device [2][6]. In the educational research field, it has been the focus of several literature reviews, from the discussion of the main differences between e-learning and m-learning – namely regarding terminology [14], to the effectiveness of mobile learning system design [20].

Also in this field, [21] makes a systematic review of 37 articles on mobile learning and education, presenting evidence-based discussion on mobile learning and its implications in the educational field. Another relevant literature review was conducted by [2], providing examples of types of activities organized according to the SAMR model [Puentedura, 2013, apud 2]. The SAMR model - a framework for evaluating mobile learning activities – classifies technology used for learning activities according to their role: Substitution activities, where the technology provides a substitute for other learning activities without practical change; Augmentation, when technology offers a substitute for other learning activities but with functional improvements; Modification, when technology allows the redesign of the learning activity; and Redefinition, when technology fosters and promotes the creation of tasks that could not have been done without the use of the technology. According to

Puentedura [2013, apud [2], learning activities included in the substitution and augmentation classifications are said to enhance learning, while learning activities included in the modification and redefinition classifications are said to transform learning experience.

3.1 Mobile learning in Higher Education: students' perspectives

The Educause “The Future of Mobile Learning” report, published in 2012, provided an overview of the state of mobile learning in education, speculating on future directions and pointing out questions able to emerge when preparing for implementing mobile in educational settings. Addressing the implications for Higher Education of adopting mobile learning, the report recommends that, rather than imposing traditional pedagogical guidelines on mobile learning, Higher Education agents need to innovate, experiment, and be prepared to fail.

When asked about their perception regarding mobile learning, college students value mostly the immediacy of communication, the possibility of collaborating with peers, the quick access to information and possibility of learning anywhere and anytime. In 2012, [22] studied the attitudes and self-efficacy of using mobile learning devices, for 58 second-year English learning students at a Taiwan University, by employing task-based instructions. The study analysed the perception of students regarding the improvements brought by combining reading sessions in classes with problem-solving discussions in an m-learning environment. Students considered that m-learning offered them more opportunities to access more information and agreed that their motivation for English learning was enhanced. In fact, mobile devices were used by all students after class for searching information, posting, answering questions and finding reading material. Using their mobile devices, students took environmental pictures and filmed authentic scenarios related to what they had learned in the textbooks, shared pictures via mobile and related authentic material with learning material.

As result of a survey made to 220 students from the iCollege (National Defense University, Washington, DC) aiming to analyse their perceptions regarding a specific set of mobile functions, [23] point out that students mostly value: the possibility of receiving alerts and reminders regarding course-related tasks; the possibility to communicate individually with faculty, advisors or other students; to participate in polls, discussion boards or other applications; to be able to search for course-related web-based information; and to download and review lesson materials from attending courses.

In a qualitative study based on individual interviews and focus groups made to students and lecturers from three universities in England (UK), [24] explored teaching and learning changes brought by mobile devices in Higher Education. Preliminary results indicate that students value: the possibility to access information in a quick way, namely the ability to access course content, discussion boards and video clips; the possibility to upload and post content to their course websites and the immediate feedback from teachers and instructors; the ability to communicate with peers and teachers, even while gathering information outside the campus for class-related tasks; and being able to learn in a variety of ways, such as through recorded video or voice memos. Students also valued the possibility of learning in a highly situated and contextualized way: by immediately capturing information to be used for their classes, they were able to establish important connections among instructional content and authentic contexts.

[25] examined the students' attitudes regarding mobile technology in a second and foreign language course from two Universities (China and Sweden). 345 students participated in the study, and their perceptions were evaluated through Kearney's pedagogical framework to mobile learning [Kearney, Schuck, Burden, & Aubusson, 2012, apud [25] and Hofstede's cultural dimensions. According to authors, students value the individualization (83%), collaboration (74%) and authenticity (73%) provided by mobile learning.

In a survey on 388 students from the Spanish National University of Distance Education (UNED, Spain), aiming to assess the didactic use of smartphones and mobile applications to promote enhanced student learning through modular audio-visual and text content, [4] found out that students were satisfied to have their course content available in their smartphones. Students said that mobile learning increased learning quality and was convenient for communicating with other students: they also considered mobile devices specially useful for their learning, by enhancing the course subject's development and by fostering collaborative work. The study was developed upon an app that allowed students to access course subject's contents and share tweets via a specific Twitter channel. The app included the presentation of PDF files, mini-videos with presentations and demonstrations, and subject curriculum was decomposed into small pieces of curricular content.

3.2 Mobile learning: limitations and drawbacks

Nevertheless acknowledging the potential and value of mobile learning, students also point out some problems and concerns.

Amongst the possible constraints of The Open University staff on adopting mobile learning, [26] named the fear regarding the perceived amount of time and effort necessary to understand mobile learning, namely when it was considered non-essential to the delivery of courses, and the scepticism about the use of mobile technologies in delivering courses.

[24] study participants', although recognizing mobile learning benefits, revealed some frustrations from learning with mobile devices: the "anti-technology" approach of teachers from other classes who hindered the use of mobile phones in classes, even for looking for course-related information; equipment and application issues, related with applications that did not work as they were expected to, and small devices keyboards that made typing long responses difficult; and the distraction provided by mobile devices, namely because of social networking interactions.

Through a survey made to 85 students from a cyber-University, [27] examined what factors facilitate and constrain the adoption of a LMS based mobile campus. They concluded that learners had different attitudes towards the use of the new technology, and that the simple act of using it wasn't an indicator of change in the learning experience. Like the web-based LMS, mobile campus provided administrative related information (e.g. academic calendar, bulletin board) and virtual classroom with multimedia learning contents (delivered in streaming audio or video format) and monitoring learning activities; online discussion, chatting and surveys, although, were not available. Users acknowledged the positive facts and advantages of using the mobile LMS but questioned if whether the innovation (i.e., the mobile device approach) would improve the learning experience and be different or better than the traditional web-based LMS.

Technological and pedagogical issues are also a students' concern regarding the adoption of mobile learning. In an analysis of studies on mobile learning and teacher education that included 37 articles and papers, [21] – after noticing that there is little report of challenges associated with the adoption of mobile learning, with studies emphasizing the benefits of mobile learning without detailing its problems – identifies problems and concerns related with: privacy issues and cyber-bullying, archiving and record keeping, and e-safety; the lack of pedagogical and technological assistant, from Higher Education Institutions to school staff; digital equity, related with the need to provide mobile devices to teachers and with technical limitations (including low bandwidth on wireless networks, small screen size, insufficient memory capacities, and limited software); the lack of expertise on integrating mobile technologies; and school directives, namely the ones prohibiting the use of cell phones within schools. As a result of his work, [21] presents a set of recommendations for future research and practice, emphasizing the need for supporting teachers in learning about mobile technologies rather than learning with them.

3.2 Mobile learning, pedagogy and practice

Mobile devices are no longer simply tools for communication. In many cases, they have become an instrument of students' social and work life, and a powerful tool in educational settings. [28] describes how mobile Web 2.0 has been influential in fostering pedagogical change, namely in the development of new e-learning strategies in a tertiary education institution in New Zealand. By developing a series of m-learning projects within a variety of educational contexts and at different educational levels, during a three years period and involving cycles of reflection and refinement, the project fostered the development of an intentional community of practice model that led to a shift to social constructivist teaching and learning paradigms. According to the author [28], the resulting mobile Web 2.0 support and implementation models influenced the institution's e-learning strategy, having a significant positive impact on both the Institution and the learning community.

In a similar line of thought, [29] argue that mobile learning technologies provide a good opportunity for integrating technology into students' learning experiences. In a study aiming to understand how mobile devices can be integrated into course designs, authors present, as examples of mobile learning approaches, a set of tasks conducted during a Chinese entrepreneurship course. The tasks, conceived to incorporate mobile technology into learning activities, included taking pictures outside the University and sending it, via e-mail, to a collaborative Flickr account; an SMS-enable treasure hunt, during which students explored pedagogical topics outdoors, in an engaging manner; the development of a Wiki; and recording and sharing podcasts.

Emphasizing the importance of understanding the reasons behind the adoption or resistance to adopt mobile learning, [3] recommend that Higher Education institutions should implement strategic efforts when establishing guidelines and plans to implement mobile learning; moreover, sustain that as faculty members “significantly influence students' use of m-learning” [3:1062], there is a need for faculty staff to be more familiar with m-learning.

In 2013, [30] studied the factors that influence or affect University students' intentions to accept m-learning. By applying the UTAD model - a model that posits that performance and effort expectancy, social influence, and facilitating conditions are direct determinants of the user's behaviour – to 174 students from Brunel University (England, UK), authors found out that the belief that the

using an m-learning system will be benefit to their studies; that the belief that the system will be ease to use and not need great instruction on how to use it; and the belief that the quality of service will be good for their learning process. Based on these factors, authors sustain that lecturers have an important role in promoting students acceptance of mobile learning, by adding value to their traditional teaching methods. Institutions should, therefore, promote sufficient and quality training to their educational agents.

In the same year, [31] conducted a study aiming to investigate if and how mobile devices can be used to support a blended-learning program in a teacher education degree at Mount Royal University (Calgary, Alberta, Canada). All 20 students enrolled in the course during the fall 2011 semester were provided with a tablet; faculty interviews, student online surveys, and a post-course focus group were conducted as part of the research. Students that participated in the study indicated that educational design and personal choice were fundamental to the successful adoption of mobile devices, emphasizing that without a specific strategy for using it to support the learning outcomes of a course assignment or to engage in field-based learning experiences, the use of mobile devices could become a frustrating distraction. Students also claimed that, in order to ensure the efficient use of mobile devices, the institutional IT infrastructure must consider the development of proper mobile apps, devices and provide a wireless Internet connection in campus.

4 Next steps on mobile learning

Discussions on mobile learning often focus on choosing the proper device for a specific activity. Nevertheless, and as pointed out by [2], educational agents should focus on how mobile devices can be used to improve learning.

When used to perform tasks similar to those completed without mobile technology, mobile devices become just another way to deliver information. In this scenario, one major challenge for mobile research in higher education is the adaptation of university subjects to a specific usage with mobile devices: decomposing subjects in small pieces or curricular content [4], adopting videos and other media content to deliver information, allowing the submission of assignments via mobile, and even by using augmented reality based mobile learning material [32]. In order to achieve these changes, both professors and students need to be trained to successfully integrate mobile technology into pedagogical practice [4].

In the technical domain, there is also a challenge: as the submission of assignments (from students to teachers) and the share of comments (from teachers to students) must be enabled via mobile, it requires for online repositories to be accessible via mobile devices [4]. This requires an adaption at the media level, namely dividing content in small or modular pieces, and replacing explanatory material with audio or video resources.

Finally, there is the need to promote additional learning methods that allow learning to continue beyond the classroom [4], namely by assigning tasks that can be solved outside the classroom and promoting web searches in authentic scenarios [22], creating new didactic activities that can be use to connect formal and informal learning settings.

5 Conclusions

These days, with mobile technologies and communications being an important aspect of students' academic and social lives, mobile applications are being considered as a key technology in Higher Education settings.

When technology becomes a part of everyday lives of individuals and institutions, recognizing both formal and informal dimensions of the learning process may value and recognize the knowledge built and acquired through everyday experiences and activities. Therefore, Higher Education Institutions need to develop approaches able to foster the integration of mobile devices in education.

As presented in previous sections, Higher Education students' value the opportunities and improvements brought by mobile learning, namely the easiness in accessing information, the possibility of immediate feedback, the connection between formal and informal learning and the possibility to communicate and collaborate with peers. Nevertheless, they also reveal some frustration and concerns, from technical limitations of devices (e.g. small keyboards, making it difficult to type long responses to questions made by teachers) to issues related with safety and inadequate pedagogical strategies. In the centre of everything, as one of the mains reason for either adopting or rejecting mobile learning, lies the perception of students regarding the added value of mobile devices in their learning processes.

When the adoption of mobile technology for teaching and learning emerges as an important area of educational research, this paper presents a review on recent literature on mobile learning in Higher Education settings, benefits and limitations included.

References

1. Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2014). NMC horizon report: 2014 higher education edition. Austin, Texas: The New Media Consortium.
2. Romrell, D., Kidder, L., Wood, E. (2014). The SAMR Model as a Framework for Evaluating mLearning. *Journal of Asynchronous Learning Networks*, v18 (2). Retrieved Feb 17, 2014, from <http://0-files.eric.ed.gov.opac.msmc.edu/fulltext/EJ1036281.pdf>
3. Cheon, J., Lee, S., Crooks, S. & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. in *Computers & Education*, 59, pp. 1054-1064
4. Vázquez-Cano, E. (2014). Mobile Distance Learning with Smartphones and Apps in Higher Education. *Educational Sciences: Theory and Practice*, v14 (4), pp1505-1520. Retrieved January 28, 2015, from <http://files.eric.ed.gov/fulltext/EJ1045122.pdf>
5. Dahlstrom, Eden, with a foreword by Charles Dziuban and J.D. Walker. ECAR Study of Undergraduate Students and Information Technology, 2012 (Research Report). Louisville, CO: EDUCAUSE Center for Applied Research, September 2012, available from <http://www.educause.edu/ecar>.

6. United Nations Educational, Scientific and Cultural Organization. (2013). Policy guidelines for mobile learning. Paris: France.
7. Geddes, B.J. (2004). Mobile Learning in the 21st Century: benefit for learners. Knowledge Tree e-Journal, No.6
8. Kukulska-Hulme, A. (2005). Mobile usability and user experience. In A. Kukulska-Hulme, & J. Traxler (Eds.), *Mobile learning: A handbook for educators and trainers* (pp. 45–56). London: Routledge.
9. Gedik, N., Hanci-Karademirci, A., Kursun, E. & Cagiltay, K. (2012). Key instructional design issues in a cellular phone-based mobile learning project. in *Computers & Education* 58,1149–1159
10. Liu, Y., Li, H., & Carlsson, C. (2010). Factors driving the adoption of m-learning: an empirical study. *Computers & Education*, 55(3), 1211–1219.
11. de-Marcos, L., Hilera, J., Barchino, R., Jiménez, L., Martínez, J., Gutiérrez, J.A., Gutiérrez, J.M. & Otón, S. (2010). An experiment for improving students performance in secondary and tertiary education by means of m-learning auto-assessment. in *Computers & Education*, Volume 55 (3), pp. 1069-1079
12. Naismith, L., Peter, L., Giasemi, V., & Sharples, M. (2004). Literature review in mobile technologies and learning. Bristol: Futurelab.
13. Sharma, S. K., & Kitchens, F. L. (2004). Web services architecture for m-learning. *Journal of e-Learning*, 2(1), 203–216.
14. Korucu, A. & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia Social and Behavioural Sciences* 15, pp. 1925-1930
15. Ozdamli, F. & Cavus, N. (2011). Basic elements and characteristics of mobile learning. *Procedia Social and Behavioural Sciences* 28, pp. 937-942
16. Wang, M., Chen, Y. & Khan, M. (2014) Mobile Cloud Learning for Higher Education: a Case Study of Moodle in the Cloud. *The International Review of research in Open and Distance Learning*. Vol 15 (2), pp. 254-26. Retrieved Feb 18, 2014, from <http://files.eric.ed.gov/fulltext/EJ1030103.pdf>
17. Attewell, J. & Savill-Smith, C. (2004). *Learning with mobile devices: research and development – a book of papers*. London: Learning and Skills Development Agency.
18. Park, Y. (2011). A pedagogical framework for mobile learning: categorizing educational applications of mobile technologies into four types. *International Review of Research in Open and Distance Learning*, 12(2), 78–102.
19. Wang, Y., Wu, M., & Wang, H. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92–118.
20. Wu, W., Wu, Y., Chen, C., Kao, H., Lin, C., and Huang, S. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education* 59, pp. 817–827

21. Baran, E. (2014). A Review of Research on Mobile Learning in Teacher Education. *Educational Technology & Society*, 17 (4), 17–32.
22. Yang, S. (2012). Exploring College Students' Attitudes and Self-Efficacy of Mobile Learning. *Turkish Online Journal of Educational Technology - TOJET*, v11 (4), pp148-154. Retrieved January 30, 2015, from <http://files.eric.ed.gov/fulltext/EJ989264.pdf>
23. Alden, J. (2013). Accommodating Mobile Learning in College Programs. *Journal of Asynchronous Learning Networks*, v17 (1), pp109-122. Retrieved February 8, 2015, from <http://files.eric.ed.gov/fulltext/EJ1011363.pdf>
24. Gikasa, J. & Grantb, M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, Vol 19, pp.18–26. <http://dx.doi.org/10.1016/j.iheduc.2013.06.002>
25. Viberg, O. & Grönlund, A. (2013). Cross-cultural analysis of users' attitudes toward the use of mobile devices in second and foreign language learning in higher education: A case from Sweden and China. *Computers & Education* 69, pp. 169–180. <http://dx.doi.org/10.1016/j.compedu.2013.07.014>
26. Kukulska-Hulme, A. (2012). How should the higher education workforce adapt to advancements in technology for teaching and learning?. *Internet and Higher Education*, n°15, pp. 247–254. doi:10.1016/j.iheduc.2011.12.002
27. Insook, H. & Seungyeon, H. (2014). Adoption of the Mobile Campus in a Cyber University. *International Review of Research in Open and Distance Learning*, v15 (6), pp 237-256. Retrieved February 18, 2015, from <http://files.eric.ed.gov/fulltext/EJ1048247.pdf>
28. Cochrane, T. (2011). Beyond the Yellow Brick Road: Mobile Web 2.0 Informing a New Institutional E-Learning Strategy. *Journal of Asynchronous Learning Networks*, v15 (4), pp. 60-68. Retrieved February 10, 2015, from <http://files.eric.ed.gov/fulltext/EJ951830.pdf>
29. Menkhoff, T., & Bengtsson, M. (2012). Engaging students in higher education through mobile learning: lessons learnt in a Chinese entrepreneurship course. *Educational Research for Policy and Practice*, 11(3), 225–242. doi:10.1007/s10671-011-9123-8
30. Abu-Al-Aish A., & Love, S. (2013). Factors Influencing Students' Acceptance of M-Learning: An Investigation in Higher Education. *International Review of Research in Open and Distance Learning*, v14 (5), pp 82-107. Retrieved February 18, 2015, from <http://files.eric.ed.gov/fulltext/EJ1017537.pdf>
31. Vaughan, N. & Lawrence, K. (2013). Investigating the role of mobile devices in a blended pre-service teacher education program. *Canadian Journal of Higher Education Revue canadienne d'enseignement supérieur* Volume 43 (3), pp. 56 – 77. Retrieved December 13, 2014, from <http://files.eric.ed.gov/fulltext/EJ1018278.pdf>
32. Liu, P.-H. E., & Tsai, M.-K. (2013). Using augmented-reality-based mobile learning material in EFL English composition: An exploratory case study. *British Journal of Educational Technology*, 44(1), E1–E4. doi:10.1111/j.1467-8535.2012.01302.x