

MOBILE LEARNING CONSIDERATIONS IN HIGHER EDUCATION: POTENTIAL BENEFITS AND CHALLENGES FOR STUDENTS AND INSTITUTIONS

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ABSTRACT

The field of mobile learning has received much attention in both the academic research fields and the practical fields. Yet the implementation rate is low with very few higher education institutions (HEIs) offering full support for this channel. The aim of this research is to evaluate the different mobile learning considerations as identified in available literature with a focus on key benefits and potential challenges which have been identified for students and institutions. A general inductive approach was used to analyze the academic articles as secondary data sources. The final result of the study is a summative framework to be used by HEIs considering fully fledged support for mobile learning.

KEYWORDS

Mobile Phone, mLearning, Optimise, Bandwidth, Information Security

1. INTRODUCTION

Mobile devices have become ubiquitous and in turn have inevitably become a part of our lives. Individuals are using mobile devices to store, process and retrieve information anywhere and anytime. These devices have also become powerful communication tools in the wake of pervasive communication networks such as LTE and WiFi. Not surprisingly, mobile devices are now being used for learning as students integrate these devices with learning processes. Mobile hand held devices have become much cheaper, more powerful and more accessible than computers (Hashemi, Azizinezhad, Najafi, & Nesari, 2011). These and other factors, have made mobile devices to be more popular among university students and the youth in general.

The phenomenon of mobile learning also commonly referred to as m-learning, emerged in recent years through the increased integration and adoption of mobile devices in learning. However, there is lack of consensus on the definition of mobile learning since scholars defined mobile learning in different contexts. This can be attributed to the fact that mobile learning has two distinctive components, notably mobile and learning. The lack of common understanding develops due to the different perspectives from which one views it since mobile learning merges diverse phenomena.

Geddes (2000 as cited in Hashemi et al., 2011) defines m-learning as, "the acquisition of any knowledge or skill through using mobile technology, anywhere, anytime." (p. 2477). Ozdamli and Cavus (2011) describes mobile learning as a model which allows learners to obtain learning material from anywhere at any time using mobile technologies and the internet. It can be noted that the anywhere and anytime attributes are inherent in both definitions. Kinash, Brand and Mathew (2012 as cited in Marzouki, Idrissi & Bennani, 2013) define mobile learning as simply "the use of mobile devices that can connect to the Internet for educational contexts" (p.567). However, the authors accede to the fact that questions may still abound and that no clear and precise definition can be obtained.

This study will use the following definition as most suitable within the context of the study: "*The exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning.*" (Hashemi et al., 2011 p.2478).

Various studies allude to the fact that mobile learning has become popular and suitable among university students as these devices become more affordable resulting in widespread ownership (Abachi & Muhammad, 2014; Gikas & Grant, 2013; Santos, 2015). There has also been a lot of research studies done in the past decade on mobile learning (Marzouki et al., 2013). A meta-analysis literature review examining 163 mobile learning studies done between 2003 and 2010 found that the research purpose of most studies on mobile learning focused on the effectiveness followed by the system design (Wu et al., 2012). The review also found out that the most commonly used device for mobile learning is mobile phones and that mobile learning is being practiced mostly at higher education institutions.

It is in this light that this study seeks to embark on research specifically in higher education institutions. This analysis of academic literature will first look at the key concepts inherent in the title of this research study before identifying the key benefits and challenges of mobile learning as experienced by students on the one hand, and the institutions on the other. The review will then aggregate these into a summative framework to be considered by institutions envisaging the adoption of mobile learning.

2. KEY CONCEPTS

2.1 Smart Phone

A smartphone can be described as a personal digital assistant (PDA) with additional functionality (Park & Chen, 2007). Essential features of a smartphone include the phone function, ability to connect to the internet, camera, and a wide diversity and ecosystem of mobile applications which offer extended functionality.

2.2 Learning

Learning in general can be viewed as a lifelong process. Driscoll (2000 as cited in Siemens, 2014), defines learning as, “a persisting change in human performance or performance potential...[which] must come about as a result of the learner’s experience and interaction with the world” (p.2). This definition raises two important attributes of learning, i.e. a change of state and the learner’s experience. The former being the result of the latter.

Learning can be classified into two i.e. informal learning and formal learning. Informal learning is when an individual undertakes to develop themselves personally so that they can add value to themselves in their social standing. Informal learning is not linked to a program of study and does not follow a formal path, but is carried out at will. Informal learning is often unanticipated and sometimes unacknowledged even by the learner (Gikas & Grant, 2013). In this form of learning, mobile learning is perceived as playing a major role. A good example is when integrating a person in a foreign land. They can use their mobile devices at various locations and times to learn at their own pace (Ally, 2013).

Gikas and Grant (2013) defines formal learning as, “where learners are engaging with materials developed by a teacher to be used during a program of instruction in an educational environment, highly structured, institutionally sponsored, and generally recognized in terms of a certificate.” This study will look at this type of learning i.e. from a formal perspective as the study looks at how a smartphone impacts the student’s formal learning experience at university. The study will uncover how students integrate their smartphones into their learning.

2.3 Mobile Technology and Development

There has been a growing emphasis on using information and communication technologies (ICTs) for development in South Africa and other developing countries. ICTs have been considered as crucial for development in society (Magunje, 2013). Mobile technology plays a contributory role as part of the

development. People in developed countries are swiftly moving from desktop computers to mobile devices. However, this is not the case in developing countries. Ally (2013) notes that people in developing countries are going directly to acquiring mobile devices skipping the step altogether of first owning desktop computers. This is because of the attractive and affordable prices of mobile devices (Hashemi et al., 2011).

3. RESEARCH METHODOLOGY

3.1 Data Collection

A qualitative research method informed this research study with secondary data sources being used for evaluation. Data from academic peer reviewed literature i.e. journals and conference proceedings published between 2006 -2016 were used. Given the huge number of articles, instead of employing a systematic literature review, a more pragmatic approach was followed in which articles were selected for their direct relevance using a breath-first approach, then selecting the best articles and using these to snowball into other based on forward and backward citations. Articles were specifically chosen on the basis of their ability to sufficiently cover the area of interest. More specifically articles which covered mobile learning benefits and challenges were analyzed so as to derive the actual mobile learning considerations.

3.2 Data Analysis

This research study followed a general inductive approach to carefully analyze the articles. The purposes of a general inductive approach are to reduce raw text into summaries, establish a connection between the objective of the study and the findings in the data and lastly to develop a framework from the structure of the data (Thomas, 2006).

The general inductive approach allowed for the results to arise from the themes which were identified in literature (Thomas, 2006). The subsequent procedure was used in the inductive analysis of the qualitative data.

1. Preparation of data (Thomas, 2006). The author used various scholarly databases to collect the relevant articles and reviewed articles which focused on mobile learning, mobile learning benefits, mobile learning challenges and mobile learning in higher education. Raw data from these articles was then formatted into a standard format in terms of the font, margins and style. Articles not relevant to the study were filtered out at this stage.

2. Close reading of text (Thomas, 2006). After populating the text and preparing it, the author read the text in detail and identified key themes which emerged from the text. At this point the researcher gained in-depth understanding of mobile learning phenomenon and identified 12 themes.

3. Creation of Categories. The author created the following categories for the benefits and challenges based on the themes that emerged from the data. The benefits to the learner and the benefits to the institution categories were used for the benefits. Similarly, challenges to the learner and challenges to the institution were used to categories the themes that emerged under the challenges for mobile learning adoption.

The researcher analyzed the academic literature and came up with a proposed framework in the form of Table 1 and Table 2. In the following sections, we then discuss the elements in the table in detail.

4. POTENTIAL BENEFITS OF MOBILE LEARNING ADOPTION

This section reviews the potential benefits of adopting a mobile learning approach in an institution. The identified potential benefits are listed under Table 1. There are two categories from this section i.e the benefits to the learner and benefits to the institution. The themes that emerged under benefits to the learner include, affordability, efficient and convenience.

Table 1. Potential Benefits of Mobile Learning Adoption

Benefits To the Learner	Reference
Affordability	Moldovan, Weibelzahl, & Muntean, 2014; Stanton, 2014; Vishwakarma, 2015
Efficiency	Alrasheedi & Capretz, 2013, 2015
Convenience	Briz-Ponce, Pereira, Carvalho, Juanes-Méndez, & García-Peñalvo, 2016; Gikas & Grant, 2013; Jackson, Sc, Gardens, & Da, 2016; Santos, 2015b
Benefits to the Institution	
Scalability	Ally, 2013; Ebba, 2015; Elfeky & Yakoub, 2016
Ease of updating learning materials	Farley et al., 2015; Koole, 2009; Olalere Mudasiru, Bolanle Idayat, & Mary Bose, 2015; Ozdamli & Cavus, 2011
Lower Costs	Farley et al., 2015; Conejar, Chung, & Kim, 2015

4.1 Affordability

One of the main benefits to the learner is the affordability that comes with mobile devices (Vishwakarma, 2015). The prices of mobile devices compared to more robust technology such as desktop computers is much less. In developing countries like South Africa, the uptake of mobile phones far outweighs that of desktop PCs.

4.2 Efficiency

The efficiency which comes from accessing information on the go is one of the benefits enjoyed by the learner (Alrasheedi & Capretz, 2015). Mobile technologies qualities such as instant access can enhance face to face teaching bringing a more efficient means of learning (Guri-Rosenblit, 2005).

4.3 Convenience

Convenience can be attributed to the fact that the learner does not need to be confined to a certain location in order to learn. Learning can take place at any place and at any time (Jackson et al., 2016).

The benefits to the educational institution include scalable, easy to update and reduced IT costs.

4.4 Scalability

Affordability of the mobile devices becomes a benefit to the learning institutions as they are able to offer learning materials to more students. To accommodate more students, the institutions will only need to expand their network capabilities and increase educators to facilitate the online content (Olalere Mudasiru et al., 2015). There will not be a need for more classroom facilities as an alternative to face to face interactions is offered through mobile devices. Thus education becomes more scalable (Ally, 2013).

4.5 Ease of Updating

Learning material offered online is easy to update (Olalere Mudasiru et al., 2015). Mobile devices are able to update the material as soon as it is made available ensuring that learners use the latest available material. Mobile device features are advancing making the devices much more capable of performing many more functions quicker and efficient (Alrasheedi & Capretz, 2013).

5. POTENTIAL CHALLENGES OF MOBILE LEARNING ADOPTION

The challenges for adopting mobile learning are listed in Table 2. These challenged have also been placed under two broad categories i.e. challenges to the learner and challenges to the institution.

Table 2. Potential Challenges of Mobile Learning Adoption

Challenges to the Learner	Reference
Privacy	Afreen, 2014; Alrasheedi & Capretz, 2015a; Elfeky & Yakoub, 2016; Emery, n.d.; S. Nykvist & Lee, 2013
Teacher perceptions	Ally, 2013; Alrasheedi & Capretz, 2015a; Alrasheedi, 2015; Gikas & Grant, 2013; Park & Chen, 2007; Santos, 2015b
Challenges to the Institution	
Security	Abachi & Muhammad, 2014; Ali & Arshad, 2015; Motiwalla, 2007; S. Nykvist & Lee, 2013; Santos, 2015b; Aloul, 2012
Optimization	Chitanana & Govender, 2015; S. S. Nykvist, 2012
Bandwidth	Abachi & Muhammad, 2014; Chitanana & Govender, 2015

5.1 Security and Privacy

Information security and privacy has remained a top priority among IT leaders globally as cybercriminals are on the increase and higher education institutions are no exception. Cybercrime can be described as any criminal activity where a computer or computer network is either a tool, place of crime, source of crime or is a target (Pozar, 2014). According to a leading security firm Symantec, the education sector is now the third most frequently breached public sector (“Internet Security Threat Report,” 2015).

Different forms of threats do exist targeting institutional data, the network or personal data residing on an individual’s devices. Some examples of information security threats include, malware & virus infections, cyber fraud and hacking. As mobile devices become prevalent in universities, more and more mobile devices become susceptible to these threats. Smartphone hacking software is also now easily available online and this software is used to steal passwords and any personal information.

Another information security factor is that mobile devices can be lost or stolen. Once these mobile device land in the hands of criminals, if not secured, can lead to more harm done to the institution or the network. Although this can be countered by remote wiping the devices that are stolen or lost, this responsibility lies in the owner in some cases as the device personally belongs to them. In most cases educational institutions have no control over personal devices.

Other alternative ways of insuring information security and privacy are available. The most common method is enforcing detection software. Programs that detect and filter infections using algorithms and signature based matching techniques have been developed. These programs identify malware before it reaches the computer system or network (Zolkipli & Jantan, 2010). Further advancements in enterprise systems security include endpoint security. With endpoint security, each device must meet certain standards before it is granted access to the organisation’s network. Examples of endpoint security include personal firewalls and antivirus software which is distributed, monitored and updated from the server (Rouse, 2011).

Awareness campaigns can also be done to raise awareness of criminal activities users need to be aware of. An increase in the number of phishing attempts shows that the target is now the user and cybercriminals seek to exploit their lack of knowledge. While organisation are increasing and advancing their security technologies, very little is being invested in increasing safety awareness among the general users consequently causing them to be the weakest link on the organisation’s system (Aloul, 2012). Social awareness campaigns can be run to inform people of prevalent security issues. See attached Appendix for an example of one such campaign run in October each year by the University of Cape Town.

Based on the dominance and persisting nature of information security and privacy as reflected in previous research studies, information security and privacy will continue to be a pressing issue for the next few years. IT leaders in higher education need to prioritise and focus on their security as more cyber-attacks are now coming to the education sector.

5.2 Teacher Perceptions

One of the challenges with mobile learning is people’s perceptions and attitudes with using mobile technologies for education. Some educators feel that mobile devices cause too much distraction for learners, and or associate mobile device use during lectures with bad behaviour (Ally, 2013).

5.3 Optimisation

Optimising the technologies supporting learning is one of the identified top issues for IT leaders in education. This is attributed to the fact that more and more devices are now accessing institutional resources. If unattended to, the devices will put strain on the available technologies possibly rendering them unusable. The main issues to be addressed by most universities is the availability and efficiency of the network itself.

As digital natives take on higher education life, bringing along a myriad of mobile devices and using them to access online content, network saturation becomes an issue. Institutions did not envisage an influx of mobile devices. According to Nykvist (2012) most university networks were never built to accommodate a heavy load of devices. Technology managers in education have found themselves in a more reactive position as they reconfigure networks to accommodate as much devices as possible. As a means of addressing this problem, Chitanana and Govender (2015) propose that if proper application of policies are enforced, that will be reduced strain on the network.

5.4 Bandwidth

Bandwidth has also increasingly become a challenge in universities as students are exposed to vast amounts of data consuming online resources. Online learning resources such as YouTube have become popular among students. These resources allow for creation and sharing of video resources. However, these resources have a big impact on the network in terms of bandwidth utilisation. Chitanana and Govender (2015) state that bandwidth is a valuable resource to the university which therefore needs to be managed properly. They further propose that for a university to effectively manage bandwidth, the following three critical elements need to be looked at carefully, i.e. visibility, monitoring and optimisation as shown in the figure below.

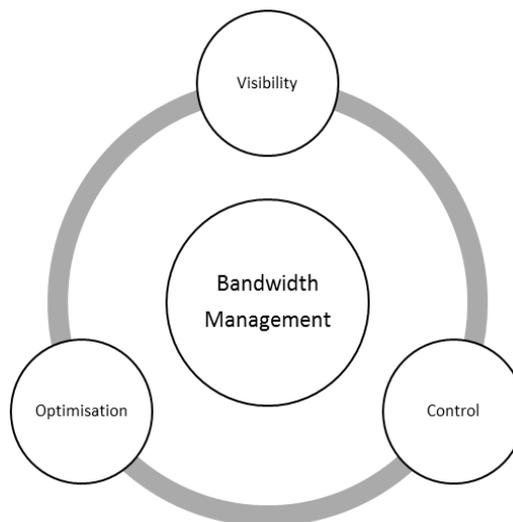


Figure 1. The Critical Interdependent Components of Bandwidth Management (Chitanana & Govender, 2015)

With visibility, the institutions should be able to identify the wireless devices that are connecting to its network. In other words the devices need to be visible in order for policies to be enforced and network access revoked in cases of abuse. Visibility may also include the ability to monitor the applications that run on these devices. The visibility of the apps is relatively important as it allows for the implementation and or enforcement of some policies especially those relating to data usage (Chitanana & Govender, 2015).

Control refers to the network access control whereby the institution is able to control the level of access granted to its users or devices. Andrus (2013) as cited in (Chitanana & Govender, 2015) describes network access control (NAC) as allowing for the defining of the policies which control how users gain access to the network resources on the network. This is of particular importance to university settings with a wide range of users which includes guests and visitors who need to connect to the network.

Optimisation involves the identifying and prioritising of network access to critical applications. In a university setting these can be teaching or research applications. Most universities around the world are making use of learning management systems to deliver learning materials and students can use their mobile devices to access these materials (Abachi & Muhammad, 2014). The resources may include lecture recordings which students through access to the network can download or stream at any time. Such applications can receive priority over others to have a better experience.

6. CONCLUSION

This study has integrated various practical considerations for mobile learning and presented these in a summative framework (Table 1 and Table 2). Previous research studies have not offered a systematic framework for consideration by institutions intending to adopt mobile learning. The practical contribution of this research study is that Higher Educational institutions willing to adopt mobile learning can use the framework as a reference point. The theoretical contribution of this study is that a framework has been proposed which would need to be tested in other studies.

The study only looked at for potential benefits and challenges of adopting mobile learning. Future research could look at other categories to fully address the phenomena, such as necessary capabilities, critical success factors, impacts/outcomes and mediating or contextual variables. Further empirical work to confirm the relative importance of the selected considerations is also essential.

REFERENCES

- Abachi, H. R., & Muhammad, G. 2014. The impact of m-learning technology on students and educators. *Computers in Human Behavior*, 30, 491–496. <http://doi.org/10.1016/j.chb.2013.06.018>
- Ally, M. 2013. Mobile learning: from research to practice to Impact Education. *Learning and Teaching in Higher Education: Gulf Perspectives*, 10(2), 1–10.
- Alrasheedi, M., & Capretz, L. F. 2013. A meta-analysis of critical success factors affecting mobile learning. *Teaching, Assessment and Learning for Engineering (TALE), 2013 IEEE International Conference on*, 8(1), 262–267. <http://doi.org/10.1109/TALE.2013.6654443>
- Alrasheedi, M., & Capretz, L. F. 2015. Determination of Critical Success Factors Affecting Mobile Learning: A Meta-Analysis Approach. *Turkish Online Journal of Educational Technology - TOJET*, 14(2), 41–51. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1057286&site=ehost-live&scope=site>
- Briz-Ponce, L., Pereira, A., Carvalho, L., Juanes-Méndez, J. A., & García-Peñalvo, F. J. 2016. Learning with mobile technologies – Students’ behavior. *Computers in Human Behavior*, pp. 1–9. <http://doi.org/http://dx.doi.org/10.1016/j.chb.2016.05.027>
- Conejar, R. J., Chung, H. S., & Kim, H. 2015. A Study of Delivering Education through Mobile Learning. In *Proceedings of the World Congress on Engineering and Computer Science* Vol. 1, pp. 701–702.
- Ebba, O. 2015. Quality Enhancement for Mobile Learning in Higher Education. *Promoting Active Learning through the Integration of Mobile and Ubiquitous Technologies*, 167–182. <http://doi.org/10.4018/978-1-4666-6343-5.ch010>

- Elfeky, A. I. M., & Yakoub, M. T. S. 2016. The Effect of Mobile Learning on Students' Achievement and Conversational Skills. *International Journal of Higher Education*, 5(3), 20–31. <http://doi.org/10.5430/ijhe.v5n3p20>
- Farley, H., Murphy, A., Johnson, C., Carter, B., Lane, M., Midgley, W., ... Koronios, A. 2015. How Do Students Use Their Mobile Devices to Support Learning? A Case Study from an Australian Regional University. *Journal of Interactive Media in Education*, 2015(1), 1–13. <http://doi.org/http://dx.doi.org/10.5334/jime.ap>
- Gikas, J., & Grant, M. M. 2013. Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *Internet and Higher Education*, 19, 18–26. <http://doi.org/10.1016/j.iheduc.2013.06.002>
- Guri-Rosenblit, S. 2005. “Distance education” and “e-learning”: Not the same thing. *Higher Education*, 49(4), 467–493. <http://doi.org/10.1007/s10734-004-0040-0>
- Hashemi, M., Azizinezhad, M., Najafi, V., & Nesari, A. J. 2011. What is mobile learning? Challenges and capabilities. In *Procedia - Social and Behavioral Sciences*, pp. 2477–2481. <http://doi.org/10.1016/j.sbspro.2011.10.483>
- Jackson, E. A., Sc, B., Gardens, A., & Da, K. 2016. M-Learning devices and thier impact on postgraduate researchers scope for improved intergration in the research community. *The Online Journal of New Horizons in Education*, 6(1), 104–113.
- Kinash, S., Brand, J., & Mathew, T. 2012. Challenging mobile learning discourse through research: Student perceptions of Blackboard Mobile Learn and iPads. *Australasian Journal of Educational Technology*, 28(4), 639–655.
- Koole, M. L. 2009. A model for framing mobile learning. *Mobile Learning: Transforming the Delivery of Education and Training*. Edmonton: Athabasca University Press.
- Magunje, C. 2013. *Using mobile phones to support learning: A case of UCT first year female science students in the Academic Development Program me*. Retrieved from <http://www.thecasecentre.org/files/downloads/research/RP0302M.pdf>
- Marzouki, O. F., Idrissi, M. K., & Bennani, S. 2013. Mobile Education– Effective Integration of new mobile technologies into existing learning systems using MISA Method. In *Proceedings of International Conference on Advances in Mobile Computing & Multimedia - MoMM '13*, pp. 567–575. New York, New York, USA: ACM Press. <http://doi.org/10.1145/2536853.2536862>
- Moldovan, A., Weibelzahl, S., & Muntean, C. H. 2014. Energy-Aware Mobile Learning: Opportunities and Challenges. *IEEE Communications Surveys & Tutorials*, 16(1), 234–265. <http://doi.org/10.1109/SURV.2013.071913.00194>
- Olalere Mudasiru, Y., Bolanle Idayat, L., & Mary Bose, O. 2015. Effectiveness of Using Mobile Technologies in Teaching and Learning. In *Promoting Active Learning through the Integration of Mobile and Ubiquitous Technologies*, pp. 155–166. IGI Global. <http://doi.org/10.4018/978-1-4666-6343-5.ch009>
- Ozdamli, F., & Cavus, N. 2011. Basic elements and characteristics of mobile learning. In *Procedia - Social and Behavioral Science,s*(pp. 937–942. Elsevier B.V. <http://doi.org/10.1016/j.sbspro.2011.11.173>
- Park, Y., & Chen, J. V. 2007. Acceptance and adoption of the innovative use of smartphone. *Industrial Management & Data Systems*, 107(9), 1349–1365. <http://doi.org/10.1108/02635570710834009>
- Santos, I. M. 2015a. Mobile Devices in Higher Education Classrooms : Challenges and Opportunities. In *Promoting Active Learning through the Integration of Mobile and Ubiquitous Technologies*, pp. 37–39. IGI Global. <http://doi.org/10.4018/978-1-4666-6343-5.ch003>
- Santos, I. M. 2015b. Mobile Devices in Higher Education Classrooms : Challenges and Opportunities. *Promoting Active Learning through the Integration of Mobile and Ubiquitous Technologies*, 37–39. <http://doi.org/10.4018/978-1-4666-6343-5.ch003>
- Siemens, G. 2005. Connectivism : A Learning Theory for the Digital Age. *International Journal of Instructional Technology and Distance Learning (ITDL)*, 2(1), 1–9.
- Stanton, G. 2014. *Developing a Method for a Holistic Design of Mobile Learning*.
- Thomas, D. R. 2006. Method Notes A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation*, 27(2), 237–246. <http://doi.org/10.1177/1098214005283748>
- Vishwakarma, A. 2015. Benefits and Challenges of Mobile Learning in Education. In *Promoting Active Learning through the Integration of Mobile and Ubiquitous Technologies*, pp. 24–36. <http://doi.org/10.4018/978-1-4666-6343-5.ch001>
- Wu, W. H., Jim Wu, Y. C., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. 2012. Review of trends from mobile learning studies: A meta-analysis. *Computers and Education*, 59(2), 817–827. <http://doi.org/10.1016/j.compedu.2012.03.016>