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The future is here: m-learning in higher education

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Abstract — **The way we learn has changed dramatically in the new millennium. The introduction of e-learning in higher education in the late 1990s has opened Pandora's Box, and brought radical changes in the way undergraduate and postgraduate programs are designed and delivered. The rapid developments and popularity of handheld devices such as smart phones and tablet PCs using wireless networks and mobile internet have marked new developments in higher education, introducing the so-called mobile learning (m-learning). This means that university students can have access to their studies related content, anytime, anywhere in a personalised manner; this is what renders m-learning so popular and fashionable among university students globally. Nevertheless, instructors are now challenged as they have to adopt new pedagogies in learning and teaching. This paper discusses the concept of m-learning, as well as the current developments and challenges related to the major stakeholders (educators and students) in higher education.**

Keywords—Higher education; M-learning; Teaching/ learning strategies

I. INTRODUCTION

The rapid technological advancements in the context of globalization have changed our everyday lives in individual and societal level. Universities worldwide are among the first to embrace these changes and prepare their students with the appropriate tools to enter the 'real' world of work. Two decades ago the technological advancements infiltrated the traditional classrooms with the introduction of e-learning. The extensive use of Information and Communication Technologies (ICTs) – especially the use of the Internet – revolutionized and changed for good the design and delivery of curricula in universities around the world. During the last decade, an unseen 'revolution' emerged from the introduction of m-learning tools in the classroom. The magnitude of these information technology developments is still not very well understood, simply because practice has run well ahead theory. In addition, it can be argued that the m-learning community is still fragmented among the various stakeholders, with different national perspectives, differences between academia and industry, and between the school, higher education and lifelong learning sectors [1]. Whether one looks at this phenomenon as a fad, threat, or a solution to educators' problems in delivering mainstream learning in higher education [2], it is currently a hot issue that needs our attention. This paper discusses the origins of m-learning, its pedagogical value and the current developments and challenges in higher education context.

II. THE ORIGINS AND CONCEPTS OF M-LEARNING

In higher education context, the term mobile learning (m-learning) refers to the use of mobile and handheld devices, such as smart phones, laptops and tablet PCs, in the delivery of teaching and learning. Simply put, m-learning is defined as "the process of learning mediated by a mobile device" [3]. M-learning can be thought of as a subset of e-learning, which is the "the use of computer network technology, primarily through the Internet, to deliver information and instruction to individuals" [4]. A prerequisite for the delivery of e-learning programs is the use of fixed locations i.e. in a classroom or where a desktop PC and an Internet connection are available. The remedy to this significant e-learning limitation appeared in the mid-2000s with the advent of m-learning applications for a wide variety of uses such as workplace learning, teaching and social networking. Quinn [5] argues that m-learning intersects mobile computing with e-learning. The unique features of the new mobile technologies and the unlimited potential they offer in terms of flexibility and customization to individual needs, place it also in the framework of flexible learning [2]. In this context, students expect training that is "just in time, just enough and just for me" [6], and that can be delivered and supported beyond the boundaries of traditional classroom settings [3].

M-learning also differentiates from a pedagogical perspective in the learning approach. While e-learning is based primarily on the objectivist learning model [7], m-learning is building on a constructivist approach. The objectivist approach is based on the transfer of knowledge from the instructor to the learner; on the other hand the constructivist approach views learning as a process in which learners actively construct or build new ideas or concepts based upon current and past knowledge. In this interactive environment, instructors should let learners participate in meaningful activities so that they can generate their own knowledge [8]. M-learning is also linked with the theory of connectivism which states that learners are actively attempting to create meaning through engagement in networks; learning is the process of creating connections and developing a network [9]. Herrington, Herrington, Mantei, Olney and Ferry [10] placed m-learning in the context of the authentic learning approach. Authentic learning situates students in learning contexts where they encounter activities

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that involve problems and investigations reflective of those they are likely to face in their real world professional contexts.

Researchers have also explored m-learning perspectives from a wider socio-cultural view. Traxler [11] described m-learning as noisy and problematic, featuring three essential elements: the personal, contextual and situated. Klopfer, Squire, and H. Jenkins [12] propose that mobile devices (handheld computers) "produce unique educational affordances," which are: portability, social interactivity, context sensitivity, connectivity and individuality. Based on activity theory approach Liaw et al. [13] investigated the acceptance toward to m-learning as a means to enhance individual knowledge management. They found that factors such as enhancing learners' satisfaction, encouraging learners' autonomy, empowering system functions and enriching interaction and communication activities, have a significant positive influence on the acceptance of m-learning systems. More recently Kearney, Schuck, Burden, and Aubusson [3] presented a framework, which highlights three central features of m-learning: authenticity, collaboration and personalization, embedded in the unique time-space contexts of mobile learning.

III. Opportunities and Challenges
from the use of m-learning in Higher Education

The introduction of m-learning in universities change radically the way we perceive, design and deliver higher education programs. In this mobile and always connected world, a number of benefits and challenges arise for both educators and students.

Literature indicates that three features are most cited by researchers, practitioners and users: mobility/ubiquity (anytime, anywhere), personalization, and collaboration. Current technology allows learners to disseminate information and complete course work even when they are away from their desktop PCs and hard-wired Internet connections. A wireless device has the potential to give instant gratification to students by allowing them to interact with the instructors, other students in the course, and access course related content from anywhere wireless connectivity is available. BenMoussa [14] identifies three key benefits of mobile connectivity for the users. Firstly, mobile devices offer personalized and/or individualized connectivity. Liaw, Hatala and Huang [13] also suggest that the relationship between the owner and the mobile/handheld device provides a 'one-to-one' interaction in a personalized manner. Secondly, mobile connectivity improves collaboration via real-time or instant interactivity that may lead to better decision making. And third, mobile connectivity enhances users' orientation or direction. Kearney, Schuck, Burden, and Aubusson [3] argue that m-learners can enjoy a high degree of collaboration by making rich connections to other people and resources mediated by a mobile device. This often-reported high level of networking creates shared, socially interactive environments so m-learners can readily communicate multi-modally with peers, educators and other experts, and exchange information. Learners consume, produce and exchange an array of "content", sharing information and artefacts across time and place. In addition, Motiwalla [15] suggests that access to information at the point of relevance may make it possible for m-learners to minimize their unproductive time, which may enhance their work-life-education balance.

The challenges generated from the advent of m-learning in higher education programs affect mostly those responsible for the design and delivery and evaluation of teaching and learning. Wang [7] argues that the emergence of Web 2.0. related technologies, brought a radical transformation in e-learning (and thus m-learning) environment: the largely central controlled education system turned to an interactive and conversational learning network. As a direct consequence we observe that learning practices are changing very fast (i.e introduction of e-books instead of traditional textbooks), while the learning theories that support educational practices are not [16]. Educators are currently unable to follow the needs of the younger generations of learners described as digital natives [17]. These learners do not see technology as something foreign: they readily accept it and consider it as part of their everyday lives; they are totally immersed and addicted to mobile technologies. Young learners also created and use their own language and signs when communicating either via Short Message Service (SMS), e-mail or live chat through a mobile Internet or Wi-Fi connection [16]; this is how they were called the text generation. Overall, the traditional teacher-centered, classroom situated learning environment is now challenged by the digitally literate students who view learning as an open collaborate process without boundaries [2].

The flexibility m-learning provides in higher education programs, may result in some challenges that learners may not have imagined [15]. For example, a serious implication from the continuous exposure to information and interaction in a connected world can be the creation of confusion and disorientation to m-learners. Then various security issues regarding the information privacy of the users are raised as in any other commercial application. Mobile devices are currently appear to be more vulnerable than PCs, thus personal data are easily traceable for mobile users [18]. Finally, there are ethical issues reading the use of m-learning in student assessment, where cheating cannot be easily prevented or traced based on the current technologies and learning philosophies [19].

IV. Discussion

Despite the relative recent appearance in literature, the concept of e-learning has fueled a number of debates regarding its usefulness in higher education and more particular, in the development of learning and teaching strategies. The few theoretical models describing this concept are still not adequate to capture the dynamics of the m-learning proliferation in universities globally. The growing body of literature is still too narrow and short-sighted to capture the changes that currently take place in higher education: the future is here, at least from a technological perspective.

Practice has understandably run well ahead of theory, and in some issues and approaches away from theory. For example the use of virtual learning environments (VLEs) and the use of applications to support them in mobile devices. A VLE is a set of teaching and learning tools designed to enhance a student's learning experience by including computers and the Internet in the learning process [20].
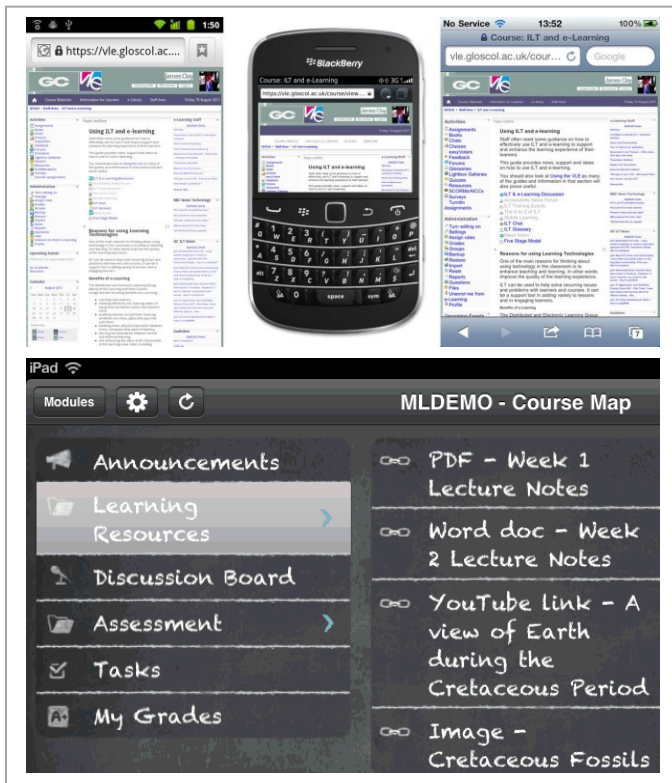
Figure.1. Mobile VLE examples

The principal components of a VLE package include curriculum mapping (breaking curriculum into sections that can be assigned and assessed), student tracking, online support for both teacher and student, electronic communication (e-mail, threaded discussions, chat, Web publishing), and Internet links to outside curriculum resources. There are a number of commercial and customized VLE software packages available, including Blackboard, Moodle and WebCT. A quick search on the Internet reveals that commercial and customized VLEs have introduced m-learning applications to allow ubiquitous access for users (i.e. http://www.blackboard.com/platforms/mobile/products/mobile-learn.aspx). Big search engines for academic content also adopt and follow this trend (i.e. EBSCO, Science Direct, Emerald) as well as international publishers (i.e. Prentice Hall, McGraw Hill, Springer). Fig.1 provides an example of a mobile VLE environment in different types of smart phones (Android; Blackberry; i-Phone) and tablet PCs (i-Pad).

Another recent important development is the use of tablet PCs and e-books as integral parts of the m-learning pedagogy. The optimization of mobile devices such as smart phones, e-book readers and tablet PCs, in conjunction with the digitalization of university libraries currently based mainly on e-books in PDF format, has changed for good the way we perceive study in a university environment. The classic view of a university student spending valuable time in a campus library struggling to borrow the last short-loan copies of the books s/he needs, tends to be an image of the past: virtual or e-libraries allow university students access content and borrow e-books for literary anywhere, anytime they wish for. A recent study undertaken as part of the project of the *Open University's*

Building Mobile Capacity initiative, provides strong indications that m-learning is here for good. Despite the various issues reported in this project, it was found that when combined synergistically, the functionality, portability and comprehensiveness of resources offered by e-books, internet access and mobile group learning, together facilitate rich learning experiences for students [21].

While the technical advancements in m-learning progress rapidly by satisfying a consumer driven demand, there are still many barriers in the development of an appropriate pedagogical framework for its application in teaching and learning. The aging instructor population is apparently one of the primary barriers in the smooth transition to the new era in higher education. The well established learning theories of the past are based on teaching by the text-book and memorizing information. Educating and persuading older instructors to use m-learning as part of their learning and teaching approach poses as one of the most difficult challenges. Another issue in the use of m-learning in higher education programs is that learning practices are changing while learning theories that support them are not [16]. In addition, Wang [7] found that e-learning (including m-learning) development tends to focus on technical issues of design and ignores organizational, social, and pedagogical aspects that are necessary for effective e-learning programs in the workplace. Most applications are lacking of pedagogical underpins on the use of m-learning, and fail to understand learning behavior that takes place in the organizational and social context. It is also suggested that locating distinctive features of learning with mobile devices is an evolving process interwoven with the maturation of the relevant technologies [3]. The design of m-learning content for higher education is a complex and difficult task. Account still needs to be taken of learner's and instructors' specific needs as well as the environment which learning takes place. What also needs to be done is to include appraisal and evaluation for each program, tailored to the different cultural and organizational needs [16]. The way that people and organizations perceive this new era in teaching and learning is the key to shape the new curricula in higher education. Sharples Taylor and Vavoula [22] identify two layers of m-learning, the semiotic (socio-cultural) and technological; they argue that these two layers will eventually converge. This convergence requires though a total rethink and redesign of formal learning as we know it: a more open and collaborative model which places educators as facilitators of learning in a connected and mobile world, where students participate actively in the learning creation process. On the other hand, others believe that m-learning will never fully replace classroom or other electronic learning approaches [13]. However, if leveraged properly, mobile devices can complement and add value to the existing learning models and frameworks.

V. CONCLUSION

M-learning as a relatively recent phenomenon in higher education, enjoys high popularity among university students globally. In order to support a strategic response to the opportunities and demands of mobile learners, the higher education sector needs to be informed about the actual use of mobile devices, and about potential future trends in mobile

learning. This requires the re-examination and re-design of the foundational assumptions and presuppositions on which all previous understandings of the term "higher education" are constructed. It is imperative that this process foregrounds pedagogy rather than technology. In addition, these on-going structural changes in higher education, provide the potential to make learning more efficient, personal and culturally acceptable for learners. Regardless criticisms and debates, m-learning is now part of the academic curricula; what remains to see is how smooth the transition from the traditional to the contemporary teaching and learning environment can be.

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