El-Hussein, M. O. M., & Cronje, J. C. (2010). Defining Mobile Learning in the Higher Education Landscape. *Educational Technology & Society*, *13* (3), 12–21.

Defining Mobile Learning in the Higher Education Landscape

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ABSTRACT

The article seeks to clarify the meaning of mobile learning by applying its key concepts to learning experiences in post-school education. In other words, it seeks not to discuss one fixed meaning of mobile learning but to disassemble the basic components and provide an interpretation of the model in the context of higher education. The article argues that in order to comprehensively understand and define mobile learning, we should from the outset separate its key components and arrange them under three different concepts. The first concept relates to the mobility of the technology. The second concept hinges on increased learner mobility. The third concept examines the mobility and dynamism of the learning processes and the flow of information. The article concludes that knowledge in the modern world is transformed by the development of revolutionary technologies in society.

Keywords

Mobile learning, Mobility, Mobile technology, Mobile learner, Design, Instruction, Higher education, E-learning

Introduction

The evolution of handheld portable devices and wireless technology has resulted in radical changes in the social and economic lifestyles of modern people. Today, many technological devices are produced in portable form and people have become accustomed to them. These devices are reshaping users daily lives in different ways. But the development of digital technologies has so far been limited to social communication and few people have regarded mobile learning as a core pedagogical activity in higher institutions of learning. Although this model has been used as a minor adjunct to learning activities such as lectures and assignments, it is still not the primary mode of delivery in higher education. Currently, the instructional technology transmitted by means of mobile technology is mainly social and, to a lesser extent, economic.

Advanced mobile devices such as “smart” cellular telephones are very popular among people primarily because they are wireless and portable. These functionalities enable users to communicate while on the move. The popularity of these devices is therefore a consequent of their ability to function at multiple levels. Moreover, the intense commercial competitiveness in the mobile device industry is forcing manufacturers to be very innovative, constantly striving to introduce new features that can give them a competitive edge.

Against this backdrop, visionary educators, designers and developers should begin to consider the implications of these devices for the modern teaching and learning environment. In such an environment, contents and services can be relayed to a university student by personal wireless mobile devices. This will add another layer to the personal computer-based model of teaching and learning. This also means e-learning will take place in conditions that will be radically different from those educators and learners are familiar with. Providing university students with services, content instruction and information outside the traditional learning space is becoming more acceptable among education providers who predicate their services on the routine use of advanced information and communication technologies.

This article seeks to provide a comprehensive definition of mobile learning and attempts to understand why actual learning practices are changing very rapidly while the learning theories that support educational practices are not. To find viable answers, the article will describe the different components of mobile learning that reflect on the increasing mobility of learners, learning and learner technology.

The emergence of revolutionary technologies has had a significant impact on educational technology. It has increased the potential of e-learning as a mode of delivery in education. By definition, mobile learning (or “m-learning”) is learning by means of wireless technological devices that can be pocketed and utilised wherever the learner’s device is able to receive unbroken transmission signals (Attewell & Savill-Smith, 2005). For example,

Laouris and Eteokleous (2005) have reiterated the need for a definition of mobile learning that takes into account all the aspects of the mobile learning process Nyir (2002) has also contributed to a philosophy of mobile learning that relies on Dewey's insights into democracy and education. Nyir and his contemporaries argue that mobile devices are responsible for undermining and, in many cases, eliminating the fixity of traditional classrooms such as lecture halls, laboratories and all the paraphernalia of traditional education. For decades, these traditional spaces have depended on static models of communication and devices for subject delivery. Significantly, mobile devices are revolutionary because they transcend the boundaries of the structural stasis of classrooms and lecture halls and their associated modes of communication – they do not have to be confined to one particular place in order to be effective.

Research method

The purpose of this article is to reflect on and understand the position of mobile learning in higher education. It also hopes to develop a succinct definition applicable in the context of university and college education. The bulk of this article is primarily an analysis of the literature about mobile learning. It sets out to critically examine a selection of documents that relate to mobile learning. These documents consist of conferences proceedings, journal articles, reports, projects and pilot studies of mobile learning projects. Nieuwenhuis (2007, p. 82) shows how such texts can shed some light on the phenomenon under investigation. It was therefore necessary to read and reflect on all these documents, to draw conclusions about issues around mobile learning. This approach allowed the authors to identify relationships and connections between the ideas and information from the literature, and explicate existing relationships between theory and practice in the field of mobile learning.

In order to identify the appropriate body of literature in this field, we conducted an online search of the international journals that are devoted to research on mobile learning. The most important of these resources are described in Table 1.

Table 1: Results of a web search to find the most important resources on mobile learning

Name of resources	Rationale	URL
Journal of educational technology and society	ET & S deals with research on knowledge in the modern world and how it is transformed by the development of revolutionary technologies in society.	http://www.ifets.info/others/
International Journal of Interactive Mobile Technologies (iJIM)	(iJIM) describes the most recent trends and research outcomes and presents the various aspects of interactive mobile technologies.	http://www.online-journals.org/index.php/i-jim
International Journal of Mobile Learning and Organisation (IJMLO)	(IJMLO) is a refereed, multidisciplinary journal which publishes research on the latest changes in mobile learning	http://www.inderscience.com/browse/index.php?journalCODE=ijmlo
International Journal of Mobile Communications (IJMC)	(IJMC) focuses on the international scope of overcoming cultural and national barriers. It also publishes articles on the accelerated rate of technological changes in the global economy.	https://www.inderscience.com/browse/inde.php?journalID=40
The Conference Proceedings of MLEARN 2004	The theme of this conference was "Learning anytime everywhere"	http://www.mobilearn.org/mlearn2004/

Most of the articles in these academic journals and conferences capture research evidence on the practicalities of mobile learning. The papers were selected based on the extent to which they have succeeded in explaining and describing how mobile learning is growing in visibility and how it is acquiring an incremental importance in higher education practice throughout the developed world (Traxler, 2007).

After selecting the appropriate articles, they were analysed by tabulating the various themes and sub-themes as mobile technology, nomadic learner and mobile learning addressed by each article. Common themes were then clustered and these clusters were used as the structuring themes of this article.

A conceptualization of mobile learning

The first step to research edification is to explore the wider context of mobile learning.

Mobile learning as an educational activity makes sense only when the technology in use is fully mobile and when the users of the technology are also mobile while they learn. These observations emphasise the *mobility* of learning and the significance of the term "mobile learning". Traxler (2007) and other advocates of mobile learning define mobile learning as wireless and digital devices and technologies, generally produced for the public, used by a *learner* as he or she participates in higher education. Others define and conceptualise mobile learning by placing a strong emphasis on the *mobility* of learners and the *mobility* of learning, and the experiences of learners as they learn by means of *mobile* devices.

The two terms under consideration in this article are therefore *mobility* and *learning*. On the one hand "mobility" refers to the capabilities of the technology within the physical contexts and activities of the students as they participate in higher learning's institutions. On the other hand, it refers to activities of the learning process, the behaviour of the learners as they use the technology to learn. It also refers to the attitudes of students who are themselves highly mobile as they use mobile technology for learning purposes.

Traxler (2007) writes: "so, mobile learning is not about 'mobile' or about 'learning' as previously understood, but part of a new mobile conception of society". Research and reflections on mobile learning should stimulate multidisciplinary and interdisciplinary thinking and methods in education. They should facilitate our understanding of outdated concepts and rigid assumptions about learning and what it may be in a society that has changed (at least from a technological point of view) out of all recognition in the past few decades.

In this sense, it is impossible to attribute one fixed meaning to the concepts of mobile learning. To fully understand this concept, it is critical to consider the relationships between each of the words used to describe the phenomenon of mobile learning. The use of this premise to understand mobile learning presents an enormous challenge because there are many words and terms, which have been used to define and explain mobile learning as a phenomenon.

For example, Laouris and Eteokleous (2005), conducted a Google search in January 2005 by using the formula {+ "mobile learning" + definition} – and the search produced 1,240 items. When they repeated the same search at end of June 2005 - only six months later, it produced 22,700 items.

To this end, the way in which the responses of previous search are understood will depend on who is asking a question; why they are asking it and the context in which question is being posed. It also depends how the concepts contribute to the total meaning and understanding of the phenomenon. This means different people mean different things when they use the terms "mobile learning".

Traxler (2007) notes that there are some definitions and understandings of mobile education, which focus only on the technologies and hardware, whether it is a handheld and mobile device such as personal digital assistants (PDAs), Smartphones or wireless. These definitions undermine a proper understanding of the uses of mobile technology in learning by confining their explanations and descriptions to the actual physical way in which the technology operates. Other definitions place more emphasis on what learners experience when they use mobile technologies in education, while others inquire how mobile learning can be used to make a unique contribution to the advancement of education and other forms of e-learning.

Mobile learning values and defends in its own unique way the introduction of what is radically new in the technological, social and cultural spheres of human life and activity. We argue that human beings are obsessed by the desire to change, to explore, to learn, design and to introduce what is absolutely new into the framework of past conventions and protocols. Mobile learning opens our minds to the possibility of a radically new paradigm and encourages us to abandon the constraints of our habitual ways of thinking, learning, communicating, designing and reacting.

This argument provides a strong theoretical framework for understanding how *mobility* and *learning* are manipulated in design paradigms. However, the pedagogical view of collaborative learning can be regarded as the theoretical fundamental of design perspective and technology also supports the design view of the system. After students

manipulate the mobile blogging system in a learning activity, the use of collaborative and technological perspective should be observed in the experimental process which can further influence the design aspect by evaluating the learning effect of students (Huang, Jeng, & Huang, 2009).

Traxler (2007, 1) again cautions that "the role of theory is, perhaps, a contested topic in a community that encompasses philosophical affiliations from empiricists to post-structuralists, each with different expectations about the scope and legitimacy of a theory in their work". If we are to place the phenomenon of mobile learning within the context of the theories of instructional design, we need to "break down the walls to open up new spaces" (King, 2006, p. 171). This means examining some of the foundational assumptions and presuppositions on which all-previous understandings of the term "higher education", or post-school education, are constructed. By using mobile communication devices to deliver higher education content, we are likely to reduce the physical walls of the classroom and replace them with other virtual barriers or constraints. However, it would support just in time learning and training in higher education context and "the results showed a significant correlation between planning and model quality, indicating an overall positive effect for the support tool" (Järvelä, Näykki, Laru & Luokkanen, 2007, 73).

While the content of the education may remain the same, it is delivered by means of a radically new technology that combines the advantages of the Internet as a convenience of portability and education "at any time and in any place". King (2006, p. 171) highlights how radically different the procedures connected with mobile learning are, when he writes: "by breaking down the assumptions and process behind writing and speaking, we can go beyond them and find new ways of thinking about the world".

The advent of the technology has created new signs, new ways of writing and receiving information, and new ways of transmitting video clips. These activities are rendered new and unique by a similar function: mobility. Mobile technologies permit users to benefit from the changes in language and signs that have entered our language and experience in the wake of these new technologies.

Derrida (2006) proposes that texts consist of "signifiers" (words) and the "signified". The ways in which mobile technologies are used have produced a whole new lexicography of signs and numbers as well as conventions for 'deconstructing' them. One example of this new lexicography is the number "4" (conventionally the signifier for the numerable "four"). But in mobile-jargon, a kind of written patois, for this generation of higher education learners, this numeral signifies the adverb "for", as in "Just for me", which in mobile technology text would be written "just 4 me".

The limitations of mobile technology such as the small screen size of most of the devices, and the exponential increase in the number of messages sent as SMSs (Short Message Services), have resulted in the unforeseen consequence of creating new signs ("signifiers") for new meanings (the "signified"). While these ways of communications have subverted all the forms and conventions of formal language, they are nevertheless widely accepted and understood and therefore considered to be normal in the context of mobile cellular devices. In fact, one of the limitations of mobile cellular hardware (the very limited size of its screen) provided the impetus to design a personal instruction and learning, and utilise a new format for text communication as well as imbue traditional forms with and different meanings.

Mobile devices have therefore encouraged users to redesign old signs of instruction by attributing new meanings to them. They reflect on the processes involved in this activity and point to the fact that: "the danger to meaning [comes] from what is outside the sign {i.e., is neither the acoustic material used as the signifier, nor the signified concept the sign refers to}. In the moment of writing, the sign can always 'empty' itself…for here the general conditions for a deconstruction of metaphysics based on the notions of writing and difference, and first arrived at through a reading of how the notion of the sign functions in the phenomenology, are explicitly stated" (Derrida, 2006, pp. xii-xiii).

The purpose of higher education and the relatively new ubiquity of mobile devices in our culture have imbued the mobile device with new meanings. Higher education can now be presented in a more sustained and interactive fashion to empower those who need it. The ontological irony of the situation is that certain unintended developments in the social lifestyles of those who regularly use mobile technologies have opened up new possibilities for mobile interactions that are not confined to social situations. What is being claimed is that new forms of social life and

human interactions owe their origins to technical developments. Interestingly the limitations have compelled users to design new modes of interaction that utilise text rather than face-to face encounters. This implies that "the ontology design enables for a more generic approach – it provides a common formalism for representing context-relevant metadata for content units of diverse levels of granularity" (Jovanović, Gašević, Knight & Richards, 2007, p. 50).

According to (Huang, Huang & Hsieh, 2008, p, 3), the environments in which the study of mobile learning has been conducted have some similar features with in previous studies. These features include:

1. enhancing availability and accessibility of information networks;
2. engaging students in learning-related activities in diverse physical locations;
3. supporting of project-based group work;
4. improving of communication and collaborative learning in the classroom, and;
5. enabling quick content delivery.

However, mobile learning provides the support for learning and training, and "mobile technologies have contributed to the potential to support learners studying a variety of subjects" (Järvelä, Näykki, Laru, & Luokkanen, 2007, p. 71).

Mobile learning in higher education

The most important yet sophisticated concepts for designing instruction in this context are identifying the technology, learner and learning material as well as mobile technology such as portable devices. It also involves identifying learners who are nomadic and able to understand and interpret learning materials. In general, mobile learning – or m-learning- can be viewed as any form of learning that happens when mediated through a mobile devices, and a form of learning that established the legitimacy of 'nomadic' learners (Alexander, 2004).

These are the developments that have made mobile devices strategic tools with the capacity to deliver higher education instruction in a way that was never anticipated when the first prototypes of these devices were designed and marketed. Designers can deliver successful higher education products to the present generation of learners, by means of a technology, distinctively adapted for its own personal (mostly social) purposes. This makes technology a particularly potent tool for the delivery and reinforcement of content that would otherwise be identified with the higher education "establishment". Devices "such as mobile phone and mp3 players have grown to such an extent over recent years and are gradually replacing personal computers in modern professional and social context" (Attewell & Savill-Smith, 2005). Modes of communication that were spontaneously developed by the younger generation have been subverted to serve the purposes of transmitting higher education. Such structural changes in the delivery of higher educational instruction add a powerful tool to the arsenal of available means that educators can use to make delivery more efficient, personal and culturally acceptable to those who pioneered these new modes of text delivery (Fullan, 2007).

These fundamental changes pose new problems to the designers. What new design paradigms and meanings can be attributed to the use of mobile technology? How can we appreciate their full significance within the context of traditional instructional design theory? Before the development of new forms of information and computer technology such as the current mobile "smart" cellular telephones, the design paradigms by means of which the delivery of higher education was understood remained essentially static. The extraordinary potential inherent in mobile devices, anticipate radical changes in the very structure of educational dynamics especially in the way in which people interact with one another in society.

The kind of informal learning through the use of mobile devices makes it an even more potent tool of educational communication than the customary forms and modes of traditional education. These revolutionary changes developed out of the unforeseen significance of human social life generally more "mobile", creative and opportunistic, than the formal modes of traditional education.

The Definition

The foregoing observations can help designers to understand the position and significance of mobile learning in the context of higher education. It is possible to argue that the portability and mobility of these technological devices

have had strong implications for the meaning of terms that had been extensively defined in existing literature. Using the mobile device as a signifier, the concepts of mobility can be divided into three significant areas: *mobility of technology*, *mobility of learner* and *mobility of learning* especially in higher education landscape.

This tripartite division of mobility is evident in the current literature on the subject and designers who have used mobile technology for educational purposes have confirmed this. Figure 1 is a graphic depiction of the three divisions of mobile devices that can deliver a higher level of educational instruction. In practice, the technology, the learner and the actual learning process operate in an uninterrupted continuum within the social context of education. The subversion of the signifier here (that operates to the advantage of the educator and the educated) is that mobile devices were constructed and marketed as forms of technology, designed solely to enrich and enhance the social and personal lives of users. The successful delivery of higher educational instruction depends on the tripartite significance of the word mobility as it is used in the context of higher education. These three elements are interdependent and are equally important in making mobile devices viable as instruments for the delivery of higher education instructional contents.

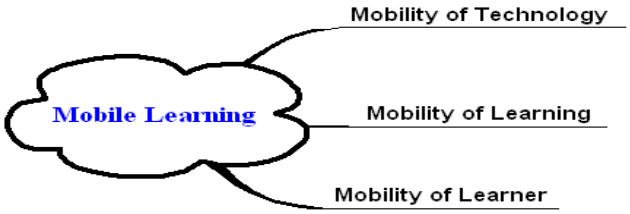

Figure 1: The three concepts of mobile learning

Accordingly, the article's authors define mobile learning as learning environmental based on mobility of technology, mobility of learners and mobility of learning that augments the higher educational landscape.

Mobility of technology

The mobile technology referred to in this article is mainly more advanced cellular telephones. But there are other forms of technology such as "smart" phones, digital cameras, flash-discs, iPods and personal digital assistance devices (PDAs). Mobile devices used to deliver higher education content and instruction can also function as audio-players, media-players and digital cameras. Advanced mobile devices are furnished with Wireless Application Protocol (WAP) and Wireless Fidelity (Wi-Fi) capacities so that a user can connect to the Internet by means of his or her PDA (Trinder, 2005).

The mobile cellular devices mentioned above have the capacity to link to the Internet and deliver content and instruction that can enable learners to learn at anytime and anywhere in a format that is culturally prestigious among people in the same age group. Most of the more advanced models can support a portable, digital and wireless lifestyle and mode of teaching and learning. It is precisely the mobility of these devices that makes them highly prestigious and therefore desirable as instruments of learning among learners in the same age group. In fact they are highly valued by young people in their early twenties because they are visible indicators of wealth, privilege, luxury and modernity. Mobile devices with advanced features like those mentioned above are therefore regarded as more trendy, fashionable and prestigious among these consumers than the standard desktop personal computers that connect to the Internet by means of landlines.

The first designers of this mode of delivery were extremely ingenious in the way in which they exploited the prestige and iconic value of mobile devices among young people in their twenties. Educationists have in effect adroitly utilised one of the most potent symbols of wealth, prestige and fashion among the young. Education by means of mobile devices is therefore nothing if not revolutionary in its design methods, implications and results.

Trinder (2005, pp. 7-8) explains the functionalities of the most popular and expensive mobile phone technologies. These include an organiser, video camera, telephone, GPS and film player. They also include games, e-book, e-mail facility Internet access and musical MP3s. But the most popular functions in all mobile phone remain the short

messaging service (SMS) and the multimedia messaging service (MMS) – frequently used functions in the delivery of higher education instructions. This innovation has been discussed in terms of Trinder's (2005) classification of PDA fuctionality.

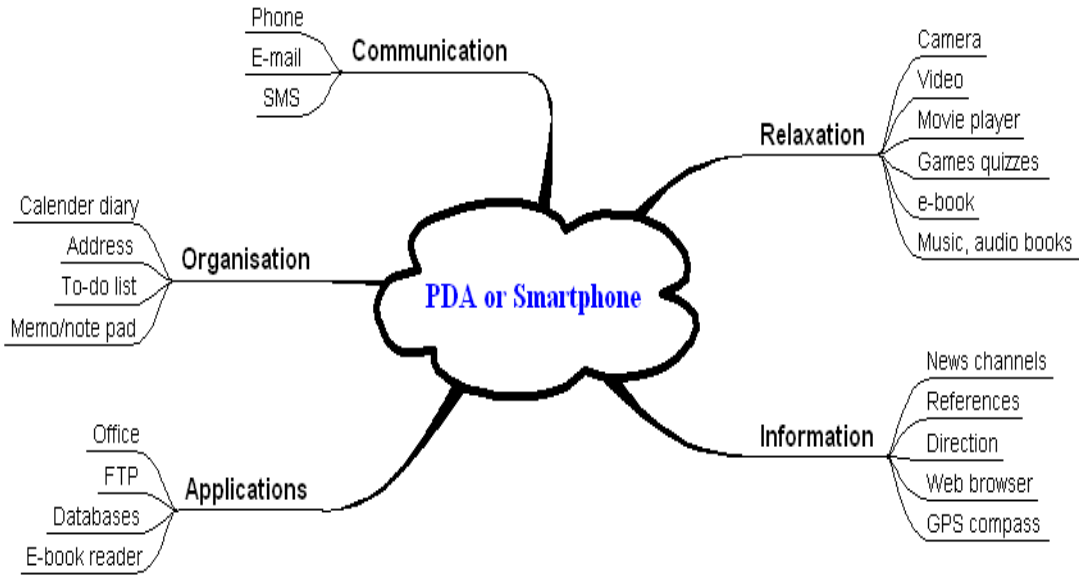

Figure 2: PDA technology (Source: Trinder, 2005, p. 7)

Figure 2 highlights the functions of Personal Digital Assistant (PDA). This device connects easily with the Internet, and enabling it to perform many different functions. (Kukulska-Hulme & Traxler, 2005, p. 2): Also "when combined with wireless connectivity, learning activities can be monitored and coordinated between locations. However, the task of designing such activities and appropriate learner support is complex and challenging. The impacts of new mobile technologies need to be appraised and evaluated" (Kukulska-Hulme & Traxler, 2005, p. 2). This is because of the challenges that still have to be overcome before this mode of educational delivery becomes as widely accepted as e-learning. However, Motiwalla (2007) states that although it is inevitable that m-learning will soon become an essential extension of e-learning, this transition will not happen overnight. Instant access to learning at any time and in many places will obviously be very useful to learners, but only to a privileged few until wireless technology becomes more efficient and widely available. It also depends on designers' ability to apply the appropriate forms of instruction that will make this mode of learning an essential tool in the delivery of higher education.

From a technological point of view, mobile devices are becoming more and more capable of performing all the functions necessary in learning design. Since affordability and sophistication of mobile device technology have increased its popularity within the educational context and, educationalists should determine whether current theories of psychological, educational learning and instructional design are adequate to describe the processes and meet the challenges posed by this new mode of delivery. Traxler (2007) writes: "[designers have] not explored the actual technologies or pedagogies in any detail and [have] sought to define questions for discussion rather than provide answers for what might in fact be premature or inappropriate questions".

Mobility of learners

E-learning mediated by personal computers is mostly bound by location and time (availability) because of the configuration of a personal computer. The computer has no wireless learning tool linked to the Internet, which means that one must always work in one place at a particular time determined by availability and connectivity. But with mobile learning, learning can occurs at any place and at any time. The ordinary (non-mobile) personal computer with landline connections to the Internet is constrained by the places in which they are located and their availability. Non-portable personal computers are too heavy to move easily and so learners are compelled to work in the same place and during the time slots allocated to them by university authorities. By contrast, learning with mobile is a learner-

centric activity because it is both mobile and nomadic, and not pedagogically teacher-centric as in the case of traditional lectures and hardware installed in one particular location under the aegis of the university's authorities.

Ting (2005) makes the following remarks about the advantages of mobile learning: "The overall advantages provided by the mobile learning are [that it is characterised by] more flexible, accessible and personalised learning activities. Such advantages […] keep the learners engaged in the ongoing learning activities and enhance their productivity and effectiveness". Furthermore, Guralnich (2008) suggests that the designer would be better served if he/she considered the entire context in which learners will use particular m-learing programme. However, today's designers often tend to borrow design ideas from their e-learning experience.

Mobile learning devices also have the capacity to enhance a learner's sense of individuality and community as well as his or her motivation to learn through participation in collaborative learning. These devices stimulate a learner's sense of ownership of the content as he/she participates actively in a variety of social, collaborative and cooperative activities - all of which are centred on the mobile learning device.

Educators and designers should address the needs of learners in this age of wireless communication and connectedness. Slogans such as "walk and use", "walk and talk", "just for me" and "just in time" usher in the new phrases in education like "You ring, we bring" ushered in previous developments in society. Instructional theory in this mobile age should be learner-centric rather than technology- or teacher-centric. This is because, as Uden (2007) oberves: "Mobile technologies offer new opportunities for students' educational activities in that they can be used across different locations and times". Students using mobile technologies are not only remote from their instructors; they also fully control the access of information on their mobile devices. In this light,, one of the main advantages of mobile learning is that it allows this generation of learners to enjoy a certain amount of freedom and independence.

Mobility of learning

Researchers and practitioners of mobile learning are engaged in pioneering experiments for transmitting the full content of higher learning to students by means of mobile cellular devices. Walker (2007) points out that the advantages of mobile learning are not dependent solely upon the ability to use a portable and wireless communication device successfully. He argues that the kind of learning experienced by mobile owners is unique because it is received and processed within the context in which the learner is situated. The context is utterly individual – completely different from the rigid outlay of the traditional classroom or lecture room, and the computer laboratory.

The international conference on mobile learning entitled *MLearn 2004* adopted as its guiding statement the desire to provide "learning anytime and everywhere", Attewell & Savill-Smith (2005)'s paper and those of other contributions were designed to indicate how such a vision could be fulfilled. Most of the papers presented at this conference focused on the description and development of theories that would support the practice of mobile learning and the design production of mobile learning materials and systems.

Mobile learning devices have also enriched the theory and practice of e-learning. Contemporary consumers of higher education in developing countries almost always use mobile learning devices as adjuncts to e-learning in higher education. Sophisticated mobile devices are currently capable of delivering a comprehensive range of e-learning materials by means of web connections , infrared and bluetooth transmissions. For Ally (2005) "mobile learning [is at the] intersection of mobile computing and e-learning; [it provides] accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning and performance-based assessment".

There are two well-publicised convergences that are effected by mobile technology:

- Firstly, a convergence between mobile technologies as learning and instructonal design, and the marketing of mobile computer-communicators are combined into a single device. This device is able to access the Internet, function as a telephone, camera, video and audio player and perform wireless computing tasks.
- Secondly, and equally importantly, a "convergence is occurring between the new personal and mobile technologies and the new conceptions of learning as a personally-managed lifelong activity" (Sharples, Taylor & Vavoula, 2007).

Table 2: Convergence between learning and technology (Sharples, Taylor & Vavoula, 2007, p. 4)

New Learning	New Technology
Personalised	Personal
Learner-centred	User-centred
Situated	Mobile
Collaborative	Networked
Ubiquitous	Ubiquitous
Lifelong	Durable

Table 2 encourages the designers to ask the following questions as they reflect on these new modes of educational delivery: "What does this new mobile technology bring to learning?" One of the most significant answers to this question is: "New technologies allow us to develop full digital records of our lives and experiences" Beale (2007). Laouris and Eteokleous (2005) highlight the changes that one can expect to occur in consumers of higher education when "tomorrow's learners will have access to a dynamically changing repertoire of devices and services that will differ in speed, processing power, monitoring (and other outputs) characteristics. As our engagement with technology changes with time, mobile learning becomes a function not only of time, but also of the momentarily available and dynamically changing technology" Laouris and Eteokleous (2005).

For Banks (2008): "further studies are painting a picture of today's youth becoming increasingly comfortable and accepting of their new digital lifestyles, powered by technology such as mobile phones. These phones are, enriched by portable entertainment devices such as iPods, digital cameras, Sony PSPs, and Nintendo's Gameboy. Friendships are made, maintained and lost online often in virtual worlds and on social networking sites such as MySpace and Facebook. Much of what we are seeing today—generally out of the classroom but increasingly in it—is technology-driven, but this technology is not universally accessible to all" (Banks, 2008, p. 53). If Banks's vision is correct, then more and more institutions of higher learning will embrace the potential inherent in emerging wireless and mobile technologies for the purposes of higher education. Despite the importance of mobile wireless technological devices as the sole provider or as an adjunct provider of higher education in the not-too-far future, there are still those who refuse to recognise the potential of this emerging form of educational delivery.

Conclusions

In conclusion, the authors define mobile learning as "any type of learning that takes place in learning environments and spaces that take account of the mobility of technology, mobility of learners and mobility of learning".

Since mobile learning is spreading rapidly and likely to become one of the most efficient ways of delivering higher education instruction in the future, it has become necessary to examine its implication for the design of teaching and learning. The uses and applications of mobile learning have multiplied in different contexts even though the eventual consequences of the proliferation of this medium are not yet entirely clear, either to designers and practitioners themselves or to researchers. .

It is necessary for research on the effects and modes of mobile learning to investigate and explore the practice of this particular medium in terms of the instructional design theories of the past, and to adapt such theories so that they can account for the extraordinary number of changes that have taken place not only in education, but in society at large.

Designers and practitioners of education are therefore responsible to produce coherent and reliable accounts of the likely consequences of the proliferation of mobile devices in the higher education landscape. The proper design of the technologies leads to greater effectiveness of mobile learning. Such accounts should consider the multiplicity of meanings that are implied by the mobility of educational delivery and the mobility of learners. It is also necessary to describe in detail the various advantages and disadvantages of mobile instructional devices as tools for the delivery of higher education. Philosophers of education should explain the philosophical and theoretical assumptions of mobile learning in higher education. They should also clarify the design paradigm shifts that this mode of delivering higher education has introduced into the world of practice.

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