

Adaptive m-learning: technological and pedagogical aspects to be considered in Cyprus tertiary education

Despo Ktoridou^{*1}, Nikleia Eteokleous²

¹ Intercollege, 46, Makedonitissas Ave, 1700 Nicosia, Cyprus

² PA College, 6 Arch. Makarios II Ave, 6307 Larnaca, Cyprus

E-learning (electronic learning) and m-learning (mobile learning) have started to emerge as potential educational environments supporting learning. Handheld devices or mobile devices, one of the most promising technologies, are here to support learning. Even though these new technologies offer new opportunities for individuals who require mobile computer solutions than other devices cannot provide, worldwide, these environments suffer from various technological as well as pedagogical problems.

An attempt is made through this paper to raise awareness for key educators and policymakers regarding the field of m-learning, in Cyprus tertiary education, by integrating some ideas from the engineering and education research. The main aim of the study is twofold: 1) highlight the availability as well as the requirements as far as it concerns mobile devices in Cyprus (Technological aspects) and 2) highlight the pedagogical parameters that should be taken into consideration related to m-learning. The study attempts to set the basis for collaboration in deploying mobile devices and wireless technologies in educational settings as well as their implications for the future of learning. Our further research is to explore new design approaches and innovative uses of wireless and mobile technologies through various experiments in Cyprus tertiary educational settings.

Keywords m-learning, tertiary education settings.

1. Introduction

The walls of the classrooms are torn down. Computer technology evolution has widened the educational activities for instructors and students in the 90's, removing time and space constraints from instructors as well as students themselves. With the rapid diffusion of the Internet, computers, and telecommunications new approaches to learning were created [2]; [6]; [9]. On-line courses appeared as new method of course delivery. Since then, the interest in the development and use of distance learning in higher education has been steadily increasing [7]. The demands of e-learning on one hand, in connection with the possibilities offered by modern technology (evolution of mobile devices), pose new opportunities and new challenges to the educational systems. Tools and devices immerse in the learning environment and surround the educators, students and the environment they operate. Some are purely assistive and supportive in nature and others are becoming increasingly intelligent. These tools can be directly integrated in classroom activities in order to enhance and promote new ways of teaching and learning.

Mobile technology integration has already started. Mobile devices are everywhere, and various attempts and experiments have been made in order to use them in classroom activities. M-learning can be defined as e-learning using mobile devices and handheld IT devices, such as PDAs (Personal Digital Assistants), mobile phones, laptops and tablet PCs. Attempts to integrate mobile devices took place in all levels of education from elementary to higher

* Corresponding author: e-mail: ktoridou@cytanet.com.cy, Phone: +357-22-841732

1 education (formal education) as well as to informal and non-formal educational settings.
2 Various attempts appear to report positive and encouraging results [1]; [8]; [9]; [12].
3

4 In order to be able to meet and follow the pressures of global competition in a knowledge-
5 based, net-centric new economy, as well as apply the new trends and innovations in education,
6 and experience these innovations in our system; Cyprus's educational leaders should
7 increasingly consider mobile devices integration in their practices. This paper focuses on
8 mobile devices integration in tertiary education. As institutions of higher education it is
9 extremely important to start considering the possibility of integrating mobile devices into our
10 educational practices. But what are the challenges that should be taken into consideration for
11 the realization of this integration. Various changes should take place in order for an innovation
12 to be incorporated in a system [4]; [11].
13

14 As previously suggested m-learning poses various technological and pedagogical challenges
15 and opportunities. The new mobile learning arena imposes significant new requirements not
16 only for the technological support and implementation but also for the educational perspective.
17 Talking about technological challenge we mean that we must find ways to create and set up
18 highly supportive environments which could provide support to contribute to different kind of
19 learning settings. A technological opportunity is the fundamental transformation from the
20 existing online learning using the advantages of 3G mobile phones and wireless
21 communication networking. Along the same lines, the pedagogical challenge related to m-
22 learning is to find ways on how mobile devices can be integrated into classroom activities as
23 well as successfully address all the parameters related to and influence mobile devices
24 integration in education. A pedagogical opportunity is that the m-learning widens the
25 educational horizons of students as well as enhances the educational options for educators.
26

27 Consequently, the goal of the paper is to summarize various technological and educational
28 requirements that need to be addressed in order for higher educational institutions in Cyprus
29 to embed mobile devices in their classroom practices. The researchers aim in raising
30 stakeholders' awareness of what they have to face in order to integrate mobile devices in their
31 practices. Since, mobile integration has not yet started in Cyprus it is extremely valuable
32 to take into consideration various parameters in advance in order to achieve a successful
33 integration of mobile devices. The major question that guides this paper can be defined as
34 follows: What technological and pedagogical parameters should be considered in order to
35 successfully integrate mobile devices in tertiary education in ways that are helpful and
36 valuable to students?
37

38 **2. Wireless and mobile technologies in education: Technological** 39 **aspects** 40

41
42 In the past decade computers along with internet's interactive character have become essential
43 educational tools as these technologies are more portable, affordable, effective and easy to use.
44 Since prices of mobile devices such as phones and PDAs are cheaper (though the cost of con-
45 nection higher) we can have a less expensive method of accessing the internet. Tablet PCs now
46 allow mobile internet access with more, functionality than desktops. The process of adding
47 mobility to interactivity will transform the role of the internet and set new beginnings to inno-
48 vations and services. The union of computing and communications is a process that will turn
49 phones and mobile terminals into powerful multimedia units with SMIL (Synchronized Mul-
50 timedia Interaction Language) developed to distribute multimedia content to a variety of de-
51 vices ranging from computers to cellular phones. Data communications with telecommunica-
52

1 tions will eventually computer applications rely on wireless networking that is transform them
2 into mobile.

3
4 This section of the paper addresses the technological aspects that need to be considered in
5 relation to resources and equipment: mobile devices, networks, servers etc; The most widely
6 used mobile devices are: GSM/GPRS mobile phones, smartphones , PDAs, tablet pcs. On the
7 server site apparently any web-server can be used for this purpose. However, in certain special
8 cases additional configuration requires to support WML content.

9 10 2.1 GSM, PDAs, Tablets.

11 12 2.1.1 GSM

13 Technological advances in GSM mobiles are moving beyond SMS (Short Message Service)
14 and WAP (Wireless Application Protocol) to a much more reliable connection and graphical
15 information that includes:

- 16 • GPRS – General Packet Radio Services, continuous connection to the internet not
17 requiring dial-up connection reaching up to 171.2 Kbits /s,
- 18 • Bluetooth, a chip technology wireless standard allows short range data and voice
19 transfer among mobile devices,
- 20 • MMS – Multimedia Messaging Service, incorporating graphics and images into text
21 messages.

22
23
24 In Cyprus still we use the 2G (2nd generation) mobile phones even though Areeba, a private
25 company has launched a 3G network where the subscriber will be able to:

- 26 - make video calls in real time,
- 27 - have fast internet access at speeds reaching up to 384 kbps,
- 28 - receive large e-mails at a very fast rate,
- 29 - watch live feeds like television,
- 30 - be entertained with interactive multimedia services and games.

31
32 With the 3G mobile phones we can have up to 2 megabits per second data transfer rate. This
33 allows steaming video to the phone which means users can see each other as they talk, see
34 view news clips and also download and save videos.

35 36 2.1.2 PDAs

37 Personal Digital Assistants are handheld PCs that use special software and via wireless modem
38 they connect to the internet They can also be used for e-mail and data synchronization as well
39 as backup file exchange with corporate servers. Recently a number of mobile phones and other
40 wireless devices with PDA capabilities have been introduced; on the contrary, the latest
41 handheld devices come equipped with wireless capabilities.

42 In Cyprus PDAs are quite popular for personal use as organizers. We hope that now with the
43 new 3G mobile phones capabilities will be integrated into higher education for collecting and
44 analyzing data. In education we can categorize the application of PDAs uses as follows:

- 45 • PDAs can be utilized as an interface to the main desktop program to that can offer
46 services to the desktop application for certain scenarios. Mobile application in this
47 case can be used for outdoor data input,
- 48 • Stand-alone application running on the PDA with or without connection to the central
49 desktop application. Mobile applications in this case can collaborate via direct
50 communication.

2.1.3 Tablet PCs

A Tablet PC is an adaptation of a laptop PC. They have touch-sensitive screen and they come either with keyboard or without. They can be used either in portrait or in landscape mode, use wireless connection to a network or to the internet. Microsoft Corporation has developed the Microsoft XP Tablet Edition with Windows XP full functionality and enhanced handwriting recognition. Tesco has included Tablet PCs in its campaign “computers for schools” (See <http://www.computersforschools.co.uk/survey.htm>). In Cyprus, Tablet PCs are hardly used. Students have access to wireless networks through their laptops. The above necessary equipment in terms of hardware and software should be available within Cyprus Tertiary Educational institutions in order to be able to integrate mobile devices in their practices.

2.2 Usages of Handheld devices

The aforementioned handheld devices can have various uses in education from both teachers and students. Handheld devices are useful where pupils need to record information during a lesson but moving to a desktop computer would be disruptive or impractical.

For example:

- inputting data, for instance during a science experiment,
- extended writing, where the handheld has a good-sized keyboard and screen,
- shared writing, where text files can be moved easily between handhelds,
- working on individual pieces of work around a table, where face-to-face interaction, would be interrupted by sitting at a desktop computer.

2.3 Advantages and disadvantages of handheld devices

2.3.1 Advantages:

- Highly portable,
- Easily transferable,
- Can be used as soon as they are turned on and don't have to be booted up,
- (Many, but not all) significantly cheaper than desktops or portable machines,
- Simple to use,
- Have a long battery life,
- Allow almost an immediate communication,
- Students are familiar with mobile devices,
- Closed to youth lifestyle – part of their social and cultural life.

2.3.2 Disadvantages:

- Their functionality is limited compared to more powerful devices,
- They have limited potential for expansion and upgrade,
- Connectivity and interoperability options are limited at present,
- Connectivity costs are kind of expensive for mobile devices,
- Concerns about security issues.

3. Learning with mobile technologies: Pedagogical aspects

This part of the paper addresses the pedagogical parameters of m-learning. Since, in Cyprus on attempts have been made to integrate mobile devices into classrooms, it is suggested that the

1 following parameters are of great importance to be considered before implementing mobile
2 devices in tertiary education. In general, the authors raise the following concerns/questions:

3.1 How mobile devices can be used in higher education classrooms?

6 The authors identify mainly two approaches to mobile devices integration: 1) as a supportive
7 tool; and 2) as an instructional tool. As a tool to support educators mobile devices allow the
8 recording and maintenance of the lessons take place, the instructional procedures, the type of
9 mentoring and the pedagogical approach, the role of the teacher and students. Additionally,
10 they facilitate communication between faculty members and students through file sharing
11 capabilities, built-in networking and a friendly interface with on-line discussion and e-mail
12 options.

14 On the other hand, mobile devices can be used as instructional tools to constructive learning.
15 Mobile devices can be treated as tools that help students execute their tasks and promote the
16 balanced development of their mental abilities by functioning as intellectual partners to the
17 instructor and the learner. Educators can provide students with electronic books, school-
18 specific context, internet reference sites, graphing calculator, dictionary, and thesaurus etc.
19 Finally, electronic quizzes and tests can be taken through mobile devices.

3.2 Curriculum and learning materials development

23 The new mobile learning arena imposes significant new design requirements of the curriculum
24 per se. These requirements are not limited to the ways in which it is delivered and received but
25 moreover in the ways the curriculum is structured and the ways in which it is maintained.
26 Curriculum units can be project-oriented and designed by adding a technological angle in well-
27 defined educational tasks. Furthermore, the social and the developmental value of each project
28 task should be explicitly defined for each unit. Along the same lines, Colley and Steady (2003)
29 address the need to produce innovative material that maintains a clear perspective on the
30 learning goal.

32 Activities within the curriculum can be designed to take place in classroom (deskwork) or
33 mainly outside the classroom (fieldwork). It is unrealistic to support that mobile devices could
34 be used for all classroom activities. As Carboni, et al., (2005) mention it is a complementary
35 approach to the classic classroom lessons. It might not be able to deliver three hour course on a
36 PDA but is it feasible to deliver small learning activities and a number of documents, and
37 exercises.

39 To produce materials and design the content to be appropriate to stimulate and support the
40 learner, knowledge of the technological constraints should exist. Consequently, to produce
41 acceptable learning materials for mobile devices there is a need for educators, engineers, and
42 computer scientists to collaborate and coordinate their actions and activities.

3.3 In what contents mobile technology could be used?

46 The contents which mobile devices can be applied varies. Research so far shows that the
47 experiments took place in various fields such as: Business and specifically MBA classes,
48 Accounting, English, Social Studies, Mathematics, Science and Geography classes etc. Other
49 activities include innovative games, exploring museums and exhibitions. Additionally, mobile
50 learning devices can be used in order to evaluate students learning as well as assess attitudes to
51 learning. Cyprus tertiary education (private and public) offers a variety of fields of study
52

1 where mobile devices could be integrated. Educators are advised to embed and apply mobile
2 devices in the context of teaching and learning in various contents and through various
3 activities.
4

5 3.4 What pedagogical methods and instructional approaches could be applied? 6

7 Some might suggest that m-learning technologies support individualism others might say that
8 it facilitates the application of constructivist techniques where collaboration and team work is
9 enhanced and promoted. The authors support that there is a need for a shared, progressive
10 pedagogy for mobile learning that will provide the scientific basis for networked and collabo-
11 rative learning in both a virtual and a virtual-augmented environment. It must accommodate
12 different teacher- and learner perspectives, promote learner-centered environments and col-
13 laboration among learners and between learners and educators. Finally, the new pedagogy
14 must support ambient learning.
15

16 3.5 What is the role of the educators and the students in the design, development and 17 implementation of the innovation? 18

19 Educators should be involved throughout the entire process of designing, developing and
20 implementing mobile technology integration. They need to ‘accept’ and ‘embrace’ this
21 innovation in order to successfully integrate it in their teaching practices; otherwise they might
22 boycott it as in some cases did with computer integration. Educators’ feelings have to be
23 considered regarding this innovation. Positive and negative reactions are expected to emerge.
24 Educators’ willingness to integrate mobile devices in their settings should be examined. Along
25 the same lines, students should be also involved in the process of mobile devices integration.
26 Students need to have direct input on the process and features being developed. We believe
27 that they can provide valuable suggestions since they view mobile integration through
28 different perspective.
29

30 Additionally, educators need to be trained on how to apply mobile devices in their practices.
31 To integrate computers in classroom practices, researchers were addressing the need that
32 educators should be computer literate; in this case they have to be mobile literate. This is a
33 greater challenge because they have to deal with various types of equipment (hardware) and
34 software. Additionally, as Alexander (2004) supports the role of the educators needs to move
35 towards facilitation and not teaching.
36

37 3.6 Collaboration among various stakeholders: educators, students/ learners, 38 engineers, computer scientists. 39

40 Adopting an innovation is a risky process. But in order to minimize that risk and increase the
41 success probabilities, it is important to be proactive and apply a systemic, holistic approach to
42 mobile technology integration. The systemic approach to an innovation implies the
43 involvement and participation of different parties in the design, development and
44 implementation of the innovation. The authors strongly suggest that various stakeholders such
45 as educators, students/ learners, computer scientists and engineers should collaborate. Their
46 collaboration is a critical element to successful mobile devices integration in education.
47

48 The above stakeholders need to communicate, coordinate their actions, transfer and share their
49 knowledge and experiences, as well as align their needs and goals. Educators need the help,
50 support and knowledge of engineers and computer scientists and vice versa. It is not feasible
51 to achieve m-learning without the coordination and knowledge integration of the above fields.
52

3.7 What are the educational benefits and gains that can be achieved?

It is reasonable and expected that some researchers, educators and practitioners are wondering and trying to understand what the educational benefits from m-learning are. This concern is even more “stronger” in Cyprus since there have been made no attempts so far to integrate mobile devices in classroom practices. However, research showed so far that through mobile devices reluctant learners can be motivated, hard-to-reach learners can be reached, various skills can be developed and improved as well as better communication among learners and between learners and instructors can be achieved [1]; [5]. Consequently, there is a need for some experiments to take place in order to examine the integration of mobile devices and their effects on various parameters such as students’ learning, performance, and behavior, before moving further.

4. Conclusion

Wireless and mobile computing enables students to share information, coordinate their tasks and carry out a number of educational activities in original ways. New 3rd generation mobile phones combining PDA functions with cameras live videos, MP3 players and tablet PCs combining the portability of PDAs and functionality of desktops teaching and learning process becomes more mobile, more flexible and more stimulating.

Mobile and wireless technologies, the “new learning environments” that can take place anyplace/anytime in comparison to the traditional classroom environment must be designed to adapt to the learning needs and not vice versa. Let us hope that new generation technologies should adapt and serve teaching and learning better. The current study highlights important policy and practical issues for tertiary institutions. It summarizes the main parameters need to be addressed by stakeholders in order to be proactive and successfully incorporate mobile devices in their practices. All the possibilities provided by technology have to be incorporated as well as aligned at the same time with the pedagogical parameters. A blend of the above should be achieved in order to set the basis/ foundation for successful mobile integration. It is important to be proactive, avoid and prevent mistakes and unnecessary actions, and that is what the paper aims in achieving.

4.1 Further research

The concerns and parameters that authors addressed above is the basis/ foundation to further research various aspects related to integrating mobile devices in Cyprus tertiary education. Since, they have been no attempt so far in Cyprus higher education context to apply mobile devices; the authors’ next step is to design various experiments. Specifically, they are in the process of developing two experiments in order to integrate mobile devices into Cyprus tertiary education context and examine their effects on students’ learning, performance, behavior, skills developed etc. There is a need to uncover the appropriate uses of mobile devices in the Cyprus tertiary education, and that is the focus of the authors. Their goal is to investigate what the future holds for mobile education within Cyprus Context.

References

- [1] Attewell, J., 2005. Mobile learning: reaching hard-to-reach learners and bridging the digital divide. *In: G. Chiazzese, M. Allegra, A. Chifari, S. Ottaviano, ed. Methods and Technologies for Learning*. Southampton: WIT Press, 361-365.
- [2] Berge L.Z., & Collins, M.P. 1995. Computer mediated communication and the online classroom. eds. *Distance learning: Volume III*. Cresskill, NJ: Hampton Press.
- [3] Carboni, et al. 2005. Mobile Lessons and GPSWeb: mobile classrooms with goerefernced information. *In: G. Chiazzese, M. Allegra, A. Chifari, S. Ottaviano, ed. Methods and Technologies for Learning*. Southampton: WIT Press, 349-353
- [4] Carr-Chellman, A.A.1998. Systemic Change: Critically Reviwing the literature. *Educational Research and Evaluation*, Vol. 4, No. 4, pp 369-394.
- [5] Colley, J. & Stead, G. 2003. Take a bite: producing accessible learning materials for mobile devices. *In: J. Attewell, C. Savill-Smith, ed. Learning with mobile devices, research and development*.UK: Learning and Skills Development Agency, 43-47.
- [6] Crosta,. L. 2004. Beyond the use of new technologies in adult distance courses: an ethical approach. *International Journal on E-Learning*, Vol. 3, No. 1, pp 48-61.
- [7] Dabbagh, N., & Kitsantas, A. Supporting self-regulation in student-centered web-based learning environments.*International Journal on E-Learning*. Vol. 3, No. 1,pp 40-48.
- [8] Dawabi, et al. 2004. Using mobile devices for the classroom of the future. *In: J. Attewell, C. Savill-Smith, ed. Learning with mobile devices, research and development*.UK: Learning and Skills Development Agency, 55-60.
- [8] Giroux, S., et al. 2002. Mobile Lessons: Lessons Based on Geo-Referenced Information. *Proceedings of E-Learn 2002 Conference, World Conference on E-Learning in Corporate, Government, Healthcare and Higher Education*. pp. 331-338.
- [9] Hewitt, J. S. M. 1998. Design Principles for the Support of Distributed Processes, *Educational Pschology Review*, Vol.10, No. 1,pp 75-96.
- [10] Hawley, C. 1997. Systemic change in Education: A roadmap. *Educational Technology*, pp 57-64.
- [11] Trifonova, A. & Ronchetti, M. 2005. Prepare for a bilingualism exam with a PDA in your hands. *In: G. Chiazzese, M. Allegra, A. Chifari, S. Ottaviano, ed. Methods and Technologies for Learning*. Southampton: WIT Press, 343-347.
- [12] Turban E., McLean E., & Wetherbe J. 2004. Information Technology For Management: Transforming Organizations in the Digital Economy, John Wiley& Sons, inc.
- [13] Wood, K. 2003. Introduction to Mobile Learning (MLearning). Available [On-line] <http://ferl.becta.org.uk/display.cfm?resID=5194&printable=1>, 18 March, 2005