Economides, A. A. & Grousopoulou, A. (2010). **Mobiles in education: Students' usage, preferences and desires**. *International Journal of Mobile Learning and Organisation*, Vol. 4, No. 3, pp. 235-252. Inderscience. ISSN (Online): 1746-7268, ISSN (Print): 1746-725X. [ARC/ERA = C (2010)]

Mobiles in education: Students' usage, preferences and desires

Anastasios A. Economides and Amalia Grousopoulou

Departments of Information Systems and Economics
University of Macedonia, Egnatia 156, Thessaloniki 54006, GREECE
economid@uom.gr, amalia.grous@hotmail.com

Abstract: Mobile devices have become some of the fastest advancing communication gadgets. This study investigates the use, preferences and desires of mobile devices in education by male and female students. Conducting a survey among University students, it was found that students use their mobiles mostly for arranging meetings with their classmates and being mutually informed about courses. They consider as most important the access to exam results, exams' timetable and previous exams. Furthermore, they would mostly like to use their mobiles for acquiring information about lessons and exams. Finally, some gender differences emerge in the use of the mobile devices in education but they are not big.

Keywords: gender difference; handheld device; mobile learning; mobile phone; survey.

Biographical note: Dr Anastasios A. Economides is an Associate Professor and Chairman of the Information Systems Department at the University of Macedonia, Thessaloniki, Greece. He holds a M.Sc. and a Ph.D. degree in Computer Engineering from the University of Southern California, Los Angeles. He is the Director of Computer Networks and Telematics Applications (CONTA, http://conta.uom.gr) laboratory. His research interests include techno-economics of networks, e-learning and e-services. He has published over 150 peer-reviewed papers. He has been the Plenary Speaker in two international conferences.

Amalia Grousopoulou received a B.Sc. in Economics from the University of Macedonia, Thessaloniki, Greece. Currently, she is pursuing post-graduate studies. Her research interests include gender issues and information systems.

1 Introduction

Today, the penetration of mobile phones is almost twice as high as that of personal computers (ITU, 2006). Specifically, the mobile penetration rate in European Union has now exceeded the notional 100% mark (COM, 2007). The worldwide mobile cellular subscribers are likely to reach the 4 billions before the end of 2008 (ITU, 2008). Furthermore, users would like to carry devices supporting multiple functionalities (Mifsud, 2004). Thus, there is an exponential growth of the number and variety of handheld devices (e.g. mobile phones, smart phones, iPhones, Palm PCs, PDAs - personal digital assistants, Netbooks, mp3 players, iPods, navigators). These devices provide the following functionalities (Economides and Nikolaou, 2008): (a) information and knowledge access, process and storage, (b) communication (synchronous and asynchronous), (c) entertainment and amusement (e.g. games, music, video, radio, TV, etc.), and (d) organization and management (e.g., scheduling, planning, calendar, address book, calculator, etc.). They are extensively used in various everyday life occasions. A person could always carry such a mobile device everywhere throughout his life (Sharples, 2000). He could input data and access information whenever he feels it is necessary. In this way, portable devices could become lifelong learning tools that release the learner from situational

constraints imposed by desktop computers. They are also being used in the workplace. So, if a student becomes familiar with these devices early on, this will give him an advantage when starting a new job (McDonough, 2006). Two important matters regarding handheld devices are wireless connectivity and data synchronization (transfer to PDA of the data stored in desktop and vice versa) (McDonough, 2006). Next, we consider the terms handheld, mobile and portable to have the same meaning.

2 Mobiles in education

Today, there is a great interest in the use of mobiles in education. Several initiatives explored the use of mobiles in education and developed educational resources for mobiles (e.g. SEIRTEC, 2002). Wireless network access is considered the most important feature in the success of laptops in education (Cutshall et al., 2006). The use of mobiles in education provides several benefits. It makes class management easier and more effective, it enhances coordination and it provides students with better access to course (Katz, 2005). University students in Korea used the mobile phones in the following activities: confirm attendance, enter libraries, buy food and prove identity. In an experiment, students were loaned wireless PDAs. Communications tools, the web browser and the timetabling features were among the most useful characteristics for students. Moreover, a student used the PDA as a mobile Internet phone (Corlett et al., 2005). Another survey found that many students were impressed with the size, performance and functionality of the devices and they found useful the use of the lecture notes on the handhelds. Some others though, wanted wireless connectivity, web and e-mail access, support for Microsoft applications or even a smart phone (Traxler and Riordan, 2004). Furthermore, the combination of handheld computing and wireless communication could support collaborative learning (Chung et al., 2003; Vasiliou and Economides, 2007), exams (Triantafillou et al., 2008a; Triantafillou et al., 2008b), or various types of pervasive and ubiquitous learning (Economides, 2009).

There are many capabilities that digital technologies have brought to the classroom but according to some researchers, computing and communication technology has been introduced slowly into education for a variety of reasons. These reasons include insufficient programs and preparation of teachers, lack of curriculum, and administrators without the appropriate skills (Hardin and Ziebarth, 2000). Factors which influence mobile technology adoption in an educational context include the learners' expectations, previous methods of study, level of interaction and ways of assessment (McAlister and Peng Hui Xie, 2005). Furthermore, teachers have to understand and accept the mechanisms of a device if it is going to be used. Some universities trained and supported the staff in order to achieve this goal (McDonough, 2006). It was found that students had positive computer attitudes which might occur due to the fact that computers were available to them at various school stages (Teo and Beng Lee, 2007). According to Hardin and Ziebarth (2000), universities need to become leaders in applying technology to education for learning and collaboration. Administrators need to understand their students' perceptions towards Internet so as to make it an effective educational tool. Since the use of Internet in university education is not developed yet, many issues regarding its use have not been clarified (Cheung and Huang, 2005). In the transition from mass teaching to personal learning, it is also the responsibility of educators to support students and help them obtain the appropriate skills so as to succeed as self-directed learners (Corlett et al., 2005). Moreover, one should not forget that handheld technologies were developed as business and not as pedagogic tools (Mifsud, 2004).

Mobile communication benefits education but has negative aspects too. The main problems are related to the usability problems of the hardware, including weight, screen size, the limited memory and the battery life (Corlett et al., 2005). The mobile's small size results to

small screen size and unfriendly text input mechanisms. Moreover, it may be difficult to take notes in the same device that is used for reading (Waycott and Kukulska-Hulme, 2003). In addition, mobile-communication activities included cheating, disruption of class, harassment and delinquency. Finally, it was found that one out of three students felt addicted to their phones (Katz, 2005). This sense of addiction may occur due to dependency and heavy usage.

3 Gender and technology

Recent literature presents a complicated picture regarding the relationship between gender and technology use. While most scholars agreed that the gender gap in Internet use has narrowed significantly in the college age group (Odell et al., 2000; Goodson et al., 2001; Jennings and Onwuegbuzie 2001) as well as the general population (Brenner, 1997; Newburger, 1999; Jackson et al., 2001; Shaw and Gant, 2002; Ono and Zovodny, 2003), some gender differences have been found in attitude towards technology, intensity of Internet use, online applications preferred and experience in cyberspace. Sometimes, there is a contradictory relation between gender and web use, demonstrating the nature of interaction, as well as the need for continued investigation. Generally, as technology continues to spread worldwide, some of the differences between genders have vanished. Nevertheless, there are some differences regarding the ways of using the Web between men and women, particularly in the academic environment (Mitra et al., 2005). It was suggested that women had to increase their level of involvement with computers, and both teachers and parents had to support females in this (Shashaani and Khalili, 2000).

One of the early studies found that male college students had significantly more positive attitudes toward computers than females did (Smith and Necessary, 1996). A recent study among Chinese and British students reported that men in both countries used email and chat, played computer games and were confident about their computers skills more than their female counterparts (Li and Kirkup, 2007). Another research pointed out that men were more interested in experimenting and trying new things, while women often preferred traditional approaches. However, girls who get used to a certain media type tended to use it more often (Trifonova et al., 2006). On the other hand, another study found that female college students possessed more positive attitudes than males (Zhang, 2002). It was argued that gender differences moderate the effects of social influence and self-management of learning in on the intention to use m-learning (Wand et al., 2009). The disparity in findings related to gender might be attributed to differences in methodology or might show the increasing adoption of technology by women (Mitra et al., 2005).

The most pronounced gender difference in the web use was found in the online applications. Male college students were more likely to use the Internet for recreational purposes, information gathering and entertainment while females preferred to use the Internet for communication (Shaw and Gant, 2002). According to Media Report for Women (2000), females were using e-mail and instant messaging for reasons of sociality, more than men. Another survey reported that females made more cell phone calls and sent more SMS messages than their male peers. Also, teenage girls used their devices more frequently for the expression of feelings while boys were more interested in the technical aspect (Doring et al., 2004). Moreover, it was stated that male students used the new technology so as to get easy and quick answers and they worked alone or sometimes even in pairs. On the other hand, females were interested in the quality of the product and they preferred interactive group work (Saunders and Quirke, 2002). It is worth mentioning that females tended to study online more than men as online learning could be appropriate for women's lifestyles and they were also more likely to look for further views of education (Selwyn, 2006). Generally speaking, it was

suggested that further investigation needs to take place because the gender balance changes continuously (Doring et al., 2004).

The present study examined gender differences in educational usage of mobile devices among students and was conducted to provide a better understanding of how mobile devices were used in university from the students' perspective. This study explicitly investigates the students' use of and attitudes towards mobile educational services. Actually, no previous study investigated similar questions as the present study. A survey was conducted among university students to explore these issues. The students had to state how much they use their mobile devices for a variety of educational activities. They also had to declare how important they consider the access via their mobile devices to a variety of educational activities. Finally, they could freely suggest any desirable educational activities to be available via their mobile devices. The results indicated that students use their mobile devices mostly for arranging meeting with their colleagues and being mutually informed about courses. They are also mostly interested to access exams' results, exams' timetable and previous exams/ items via their mobile devices. There were some gender differences with respect to the educational activities that participants considered important and the access they would like to have to educational resources via the mobile devices. However, these gender differences were not statistically significant.

The next section describes the methodology of this study. Then, the results are analyzed. Finally, conclusions are drawn.

4 Methodology

During spring 2006, a questionnaire has been designed to determine in what ways students use mobile devices for educational activities and whether they consider important the access to educational resources via their mobile devices. The questionnaire was developed based on the authors' research (Economides, 2008; Economides and Nikolaou, 2008; Economides and Grousopoulou, 2008; Triantafillou et al., 2008a; Triantafillou et al., 2008b; Economides, 2009; Economides and Grousopoulou, 2009) and teaching experience and after initial discussions with colleagues and students. During 2007-2008, the questionnaire was distributed to 416 university students during class hour as well as via personal contacts. Most of the students were undergraduate students in two Informatics courses in an Economics Department. The two courses were: (a) a first-year required course on Introduction to Computers, and (b) an elective course on E-Commerce in the third and fourth year of studies. The students were asked to voluntarily and anonymously answer the questionnaire. Currently, this European Union (EU) university does not officially support mobile educational services. Neither the university administration nor the professors require any students' engagement with mobile activities. So, the students are not required to use their mobile devices for any educational activities. In order to move towards mobile educational services (e.g., administration, learning), a lot of research is needed to investigate the cost-benefit results. This study was an initial investigation on the students' uses of and attitudes towards mobile educational services.

In EU, the mobile phone penetration in the population is among the highest worldwide. Actually, in many EU countries, it is over 100% meaning that there are more mobile subscriptions than the population. However, most students use their mobile devices for personal communication (e.g., phone, SMS). A student using a mobile device for personal uses does not mean that s/he will use it for educational purposes. We were interested in investigating the students' willingness for such mobile educational services. So, the questionnaire covered three topics:

1) How much time per day does a student use her/his mobile device for specific educational purposes?
2) How much important does s/he consider the access via her/his mobile device to specific resources?
3) What educational activities would s/he like to use her/his mobile device for?

The first two topics include multiple choice questions and the third is an open question to express their desires. In similar researches about mobile devices in education, there were some questions about the services that the mobile learning must provide, about the aims that students would like to use their mobile devices for, and about mobile phone as a source of distraction (Trifonova et al., 2006; Liukkunen et al., 2005; Campbell, 2006). However, our questionnaire asked comparative and detailed questions among relative educational issues which were not found in other studies.

There were completed 384 questionnaires. Most of the respondents were between the ages of 18 and 25. Female students accounted for 55 per cent of the respondents. All the answers to the questionnaires were entered into excel sheets; male and female answers were classified separately. This was done in order to find gender differences that might emerge among students' answers. The answers of male and female population for every question were tabulated into tables, so that we could compare the answers. By this way, there were obvious similarities and differences with respect to the educational activities preferences of male and female students. After that we used figures in order to illustrate any differences that might found between the two genders. Moreover, it was used a statistical tool, the unpaired t test in order to statistically test the relationship between genders and their preferences and determine if there was any statistically significant difference between gender and individuals' preferences. Further discussion about the preferences and generally the answers of the two groups takes place in the next section.

5 Results & Discussion

The present study investigates the educational use of mobile devices among male and female university students. Next, their responses regarding usage, preferences and desires are analyzed extensively.

5.1 Usage

Most of the time, all students use their mobile devices in order to arrange meetings with their classmates. Moreover, females spend much time to inform mutually with classmates. Tables 1 and 2 show the percentages of males and females using their mobiles for educational purposes for various times during the day. On average, both genders spend most of their time (men: 6 min; women: 7.42 min) for arranging meetings with their colleagues. Furthermore, women spend more than 5 min for scheduling tasks, attendances and exams as well for informing mutually with colleagues about courses. They spend 2 to 5 min for using the calculator as well for exchanging ideas, thoughts etc. about the courses with their colleagues. Finally, they spend less than 2 min for other educational activities. Correspondingly, men spend 2 to 5 min for scheduling tasks, attendances and exams, for informing mutually with colleagues about courses, for using the calculator, as well for exchanging ideas, thoughts etc. about the courses with their colleagues. Finally, they spend less than 2 min for other educational activities.

[Take in Table 1]

[Take in Table 2]

More specifically, the 31.6% of women and the 30.8% of men use 1 minute per day their devices so as to do calculations with the calculator. The result of the unpaired t test showed that there was not a statistically significant relationship between gender and usage (t=0.4905, df=12, p=0.6326). Afterwards, the 29.8% of women and the 27.2% of men use their devices 2-5 minutes per day to arrange meetings with their classmates. The result of the test indicated again a not statistically significant relationship between gender and individuals' usages (t=0.5824, df=12, p=0.571). Moreover, the 27.9% of women spend 2-5 minutes per day to talk with classmates about lessons while most men do not. The results of the unpaired t test found that the differences between the two groups were not statistically significant (t=0.5499, df=12, p=0.5925).

According to the results, the majority of females do not use at all their mobile devices so as to schedule their homework and exams, to keep notes from the lesson and to record the lectures. Also they do not try to find information about lessons or tasks from the Internet, use the dictionary, take advice from professors or exchange ideas and thoughts about lessons with classmates. The results are almost the same for males. In addition to the above, the unpaired t test did not show a statistically significant relationship between gender and individuals' usages. It is remarkable to find out that both genders do not use their mobiles for important educational activities. Smart phones are very advanced devices with a lot of operations which could be used for a variety of tasks by students and also as a way of interaction. The main reason for the low educational use of the mobile devices should be attributed to that the mobile devices were not officially integrated into the curriculum and administrative services. Also, it could be attributed to the students' lack of experience and support on how to use their mobile devices for educational services. However, one could expect that the students would be interested in using their mobile devices for facilitating their university life. Furthermore, it is possible that there was a lack of teachers' eagerness to deal with technology, to motivate and support students in accommodating mobile devices for educational activities.

5.2 Preferences

Students consider important to use their mobile devices in order to receive announcements about lessons through SMS and e-mail, to access exams' archives, exams' timetables and exams' results. In order to interpret their qualitative answers to numbers, let assign marks as follows: NONE=0, LITTLE=1, ENOUGH=2, MUCH=3, VERY MUCH=4. Then, the "average importance" can be calculated. Tables 3 and 4 show the percentages of males and females for various importance levels to access educational resources via their mobiles. On average, students consider the access to examples, educational games and simulations, forums, bibliography of lessons, frequently asked questions and answers and exams via their mobile devices of little importance. Moreover, they consider the access to lessons timetable, lectures, solved exercises and problems, educational software, announcements about lessons through SMS or e-mail and reminders about task deadlines through SMS or e-mail of enough importance. Finally, they consider the access to exams' results, previous exams' items and exams' timetable of much importance.

[Take in Table 3]

[Take in Table 4]

Both genders in their majority consider 'enough' important the access to lessons' schedule via their mobile devices. Specifically, the 31.6% of women and the 42.6% of men would like to see the schedule of their lessons' via their mobiles. The result of the unpaired t test indicated that there was not a statistically significant relationship between gender and this preference (t=0.7318, df=8, p=0.4852). Moreover, the majority of both groups, over the 25% of women and the 30% of men, consider 'enough' important the access to lectures and the access to examples and worked out exercises via their devices. Students might consider m-learning very useful if for some reason they can not be present at the lectures or they might want to substitute traditional learning; this was also reported in another survey (Trifonova et al., 2006). The result of the unpaired t test indicated that there was not a statistically significant relationship between gender and any of these preferences (t=1.119, df=8, p=0.2958), (t=0.7410, df=8, p=0.4799), (t=1.090, df=8, p=0.3075) subsequently. It is noticed that even if the majority of both genders consider important some educational tasks, they do not spend time to deal with them.

Next to that, most males and females consider of 'none' importance the access to educational games and simulation as well as the access to forums. According to the results of the t test, the differences between men and women were not statistically significant (t=0.5364, df=8, p=0.6063), (t=0.4865, df=8, p=0.6396). Afterwards, the 26.5% of females and the 27.8% of males do not consider important the educational software. The relationship between gender and preference was found not statistically significant (t=1.042, df=8, p=0.3278). These results could be expected as the preference distributions were very similar between both gender groups. The two groups voted in the same way for the access to FAQs. As it is obvious from figure 1, the 27.44% of females and the 29.59% of males do not consider it important but according to the figure the respondents of both genders are allotted as most percentages differ slightly. The results of the unpaired t test found that the differences between the two groups were not statistically significant (t=0.7456, df=8, p=0.4772).

[Take in figure 1]

The results among the participants differ regarding the access to lessons' announcements. In figure 2, it is obvious the difference in the percentages of the two genders. The 29.77% of women consider this service 'much' important while the 25.44% of men consider it to be 'very much' important. In general, the respondents are allotted as the percentages do not differ a lot. It is assumed that most participants would like to learn the announcements of lessons and results via their mobiles as it is not required for them to go to the university and they can take any information they might need by distance. This is a very important factor and it can support essential applications such as learning-by-distance or even on-line courses. This was reported in another study where the answers of students included expectations of time-saving, real-time information, flexibility and accessibility of learning materials (Trifonova et al., 2006). The result of the unpaired t test indicated that there was not a statistically significant relationship between gender and this preference (t=1.257, df=8, p=0.2441).

[Take in figure 2]

Another service to investigate was the reminder of deadlines about tasks via an e-mail or SMS. As it is indicated in figure 3, most women consider this service to be 'much' important while most men consider it 'enough' important. Of course, we notice that the second biggest percentage of women, the 23.72%, considers the reminder of deadlines 'very much' important

but the second biggest percentage of men considers it of none importance. The result of the unpaired t test indicated that there was not a statistically significant relationship between gender and this preference (t=1.449, df=8, p=0.1855). Also, the majority of women (22.8%) consider 'little' important the access to library via the mobile device while the 29.6% of men do not consider it important. The differences among the participants are not too big as they are allotted. The result of the unpaired t test found that the differences between the two groups were not statistically significant (t=1.151, df=8, p=0.2831). Regarding the access to bibliography of lessons, it is indicated that the 33.73% of men do not consider it important while the 29.77% of women consider it 'little' important (figure 4). The unpaired t test showed that there was not a statistically significant relationship between gender and individuals' preference (t=0.8436, df=8, p=0.4234).

[Take in figure 3]

[Take in figure 4]

Over the 35% of both groups consider 'very much' important the access to old examination questions and to examinations' schedule as well. The biggest percentage of males and females rated 'very much' important the access to examination results. The 43.2% of males and the 44.2% of females consider this service 'very much' important. Nevertheless, the fact of taking exams via the mobile device is considered to be of 'none' importance by the majority of the respondents. The result of the unpaired t test indicated that there was not a statistically significant relationship between gender and this preference (t=0.5787, df=8, p=0.5787). Over the 40% of both groups do not consider important the examinations via the mobiles and this indicates that participants prefer to take exams in the traditional way. According to another survey, students feel that there might be lack of interaction between teacher and students (Trifonova et al., 2006). It is noticed that students consider 'very much' important only a few services which are related to education. Most of them do not use a lot their mobile devices for educational purposes and at the same time they do not consider these services important. As mentioned before, they do not even deal with the tasks they consider significant. Most of the respondents would like to have information about lessons and examinations by using their devices but the use of technology in university education is still at its early stages. It is the responsibility of the educational system to help students obtain the relevant skills and learn how to use the technology in an appropriate way so as to make them competitive in their works and lives.

5.3 Desires

The last question was an open one. Students could freely express their desires regarding for which educational activities they would like to use their mobile devices. Not many students expressed any strong desire. We tried to classify their answers in tables 5 and 6 so as the results and the desires of all participants to be better presented. The results about men are presented in table 5 and the results about women are presented in table 6. It is obvious that there are some differences between the two groups. First of all, none of the women mentions that she wants to use her device so as to communicate with professors or take an exam. On the other hand, men, even in a small percentage, mention both activities. Moreover, females want to have information about the lessons, the exams and the university in general, in a bigger percentage than men.

[Take in table 5]

[Take in table 6]

Also, there are some small differences among the participants regarding the dictionary, the search in Internet and the exchange of ideas with classmates. For example, there is a difference in Internet search as men tend to be more intensive Internet users than women. This fact has also been found in other surveys (Bimber, 2000; Ono and Zavodny, 2003) as men deal more with the Internet services. The differences between genders are not big and tend to disappear, something that is indicated in the results of other similar studies (Mitra et al., 2005; Shaw and Gant, 2002; Ling, 2000). The majority of both genders did not show any strong desire to use their mobiles for any educational activities. So even if both groups consider the access to some educational activities via their mobiles important, they do not use it or use it only in a very small percentage. As many researchers mentioned (Hardin and Ziebarth, 2000; Corlett et al., 2005; Cheung and Huang, 2005), this may happen because students are not yet used and prepared to utilize the mobile phone for educational purposes. Moreover, they may not have the support required from teachers to do so. In this research, we have noticed that most students use the device for personal reasons and there is not a contrast among males and females related to this.

6 Conclusions and future research

Before an educational reform towards mobile education is adopted by a school or a country, many issues should be carefully examined. All players (e.g. students, teachers, administrators, policy makers, mobile device manufacturers, software developers, mobile operators) involved in such a reform should be seriously taken into consideration. Otherwise, the reform will fail. The main players in such a reform are students. So, it is important to investigate their behavior and opinions. Administrators and instructors need to understand what their students' attitudes are towards using mobile devices in education. Moreover, one must keep in mind that current mobile devices were developed as personal and business tools and not specifically for schools. In general, as mentioned before, there are many issues regarding technology in education which should be solved and a lot of work is still to be done. Many studies should be performed in several countries in order to make a cross-cultural comparison (Turel and Serenko, 2006).

This study contributes to the literature by providing data related to students' usage, preferences and desires regarding the use of mobile devices in education. Although students use a lot their mobile devices they do not use them for educational activities. This may be attributed to the fact that they are not motivated and supported to do that. Administrators and teachers have to guide students towards using their mobile devices for educational activities. Of course, administrators and teachers need to be prepared and qualified so as to succeed in doing this. It was found that students are mainly interested to have information about previous exams, exams' timetable and exams' results as well announcements about the lessons and reminders about task deadlines. So, schools could introduce mobile educational services by first offering exams related information, announcements and alerts.

In addition, this study investigated the existence of any gender differences among the students in their use of and their attitudes towards the mobile devices in education. It seems that any gender differences found in previous studies start disappearing. As demonstrated here, women have positive attitudes towards mobile devices as they use them as well as men do. Some small differences, though, exist as women tend to use mobile phones and talk with classmates a bit more than men do. Moreover, they consider the access to library, deadlines,

bibliography, dictionary and information about lessons more important than their male counterparts. On the other hand, men (even in a small percentage) want to write exams or communicate with professors via the mobile devices while women do not mention it at all. Eventually, males appear to use Internet via the mobiles more than women. Nevertheless, according to the unpaired t test, the relationship between gender and individuals' preferences was found statistically not significant. These results could be expected as the preference distributions between both gender groups were alike or had very small differences. The objective of this study was to explore the preferences and existing modes of mobile devices' usage for educational activities by university students. Obviously, further investigation is required to evaluate the results and the differences between the two genders and generally the needs of students so as to make mobile devices a more effective pedagogic tool.

A direction for future research could be to repeat this research among students not only at the university level but also at the elementary and high school levels in various countries. In order to implement successful mobile educational services, all participants (e.g., Government, university administration, officials, professors, teachers, parents and students) should be considered. So, further investigation should examine not only students' thoughts but also others' opinions.

References

Bimber, B. (2000) 'Measuring the gender gap on the Internet', *Social Science Quarterly,* Vol. 81, No. 3, pp. 858-876.

Brenner, V. (1997) 'Psychology of computer use: XLVII. Parameters of Internet use, abuse and addiction: The first 90 days of the Internet Usage Survey', *Psychological Reports*, Vol. 80, No. 3, pp. 879-882.

Campbell, S., W. (2006) 'Perceptions of mobile phones in college classrooms', *Communication Education,* Vol. 55, No. 3, pp. 280-94.

Cheung, W., and Huang, W. (2005) 'Proposing a framework to access Internet usage in university education: An empirical investigation from a student's perspective', *British Journal of Educational Technology*, Vol. 36, No. 2, pp. 237-253.

Chung, C., Rockwell, D., Bai, T., Laufer, K., and Thiruvathukal, G. K. (2003) 'Using handheld and wireless technology for classroom and community-based south Asian language pedagogy', Retrieved on November 19, 2006 from http://cs.luc.edu

COM (2007) 'European electronic communications regulation and markets 2006 (12th Report)', Commission of the European Communities, 155, SEC(2007) 403, Retrieved on January 2, 2009, from http://ec.europa.eu/information_society/policy/

Corlett, D., Sharples M., Bull, S., and Chan, T. (2005) 'Evaluation of a mobile learning organizer for university students', *Journal of Computer Assisted Learning,* Vol. 21, pp.162-170.

Cutshall, R., Changchit, C., and Elwood, S. (2006) 'Campus laptops: What logistical and technological factors are perceived critical?', *Education Technology and Society*, Vol. 9, No. 3, pp. 112-121.

Doring, N., Hellwig, K., and Klimsa, P. (2005) 'Mobile communication among German youth', In K. Nyiri (Ed.) *A sense of place*: *The global and the local in mobile communication*. pp. 209-217 Vienna,Austria: Passagen Verlag.

Economides, A. A. (2008) 'Requirements of mobile learning applications', *International Journal of Innovation and Learning,* Vol. 5, No. 5, pp. 457-479.

Economides, A. A. (2009) 'Adaptive context-aware pervasive and ubiquitous learning', *International Journal of Technology Enhanced Learning*, Vol. 1, No 3, pp. 169-192.

Economides, A. A. and Nikolaou, N. (2008) 'Evaluation of handheld devices for mobile learning', *International Journal of Engineering Education (IJEE)*, Vol. 24, No. 1, pp. 3-13.

Economides, A. A. and Grousopoulou, A. (2008) 'Use of mobile phones by male and female Greek students', I*nternational Journal of Mobile Communications (IJMC*), Vol. 6, No. 6, pp. 729-749.

Economides, A. A. and Grousopoulou, A. (2009) 'Students' thoughts about the importance and costs of their mobile devices' features and services', *Telematics and Informatics*, Vol. 26, No. 1, pp. 57-84.

Goodson, P., McCormick, D., and Evans, A. (2001) 'Searching for sexually explicit materials on the internet: An exploratory study of college students', *Archive of Sexual Behavior*, Vol. 30, No. 2, pp. 101-118.

Hardin, J. and Ziebarth, J. (2000) 'Digital technology and its impact on education', *The Future of Networking Technologies for Learning*. Retrieved on November 19, 2006 from: http://www.ed.gov/Technology/Futures/hardin.html .

ITU. (2006) 'International Telecommunications Union: World Telecommunications Indicators'. Retrieved on November 19, 2006 from http://www.itu.int/ITU-D/ict/statistics/

ITU. (2008) 'Worldwide mobile cellular subscribers to reach 4 billion mark late 2008'. Retrieved on January 2, 2009 from http://www.itu.int/ITU-D/ict/newslog/

Jackson, L., Ervin, K., Gardner, P. D., and Schmitt, N. (2001) 'Gender and the Internet: Women communicating and men searching', *Sex Roles*, Vol. 44, No. 5/6, pp. 363-379.

Jennings, S. E., Onwuegbuzie, A. J. (2001) 'Computer attitudes as a function of age, gender, math attitude and developmental status', *Journal of Educational Computing Research*, Vol. 25, No. 4, pp. 367-384.

Katz, J. E. (2005) 'Mobile phones in Educational Settings', In K. Nyiri (Ed.) *A sense of place*: *The global and the local in mobile communication,* pp. 305-317. Vienna: Passagen Verlag.

Li, N., and Kirkup, G. (2007) 'Gender and cultural differences in Internet use: A study of China and the UK', *Computers & Education,* Vol. 48, pp. 301-317.

Ling, R. (2000) The adoption of mobile telephony among Norwegian teens. Telenor notat 57/2000, Kjeller: Telenor R&D.

Liukkunen, K., Tolonen, P., and Laru, J. (2005) 'Developing new mobile services for the Universities-University students' conceptions of their needs for mobile tools for scaffolding learning activities', In Proceedings of *World Conference on Educational Multimedia, Hypermedia and Telecommunications (EDMEDIA 2005)*, pp. 1579-1586, AACE, Canada.

McAlister, M. J., and Peng Hui Xie. (2005) 'Using a PDA for mobile learning', Proceedings of the *IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE '05)*, pp. 282-284.

McDonough, K. (2006) 'PDAs: Revolutionizing the Way We Learn and Teach', *Turkish Online Journal of Distance Education- TOJDE,* April 2006, Vol. 7, No. 2, Article 14.

Mifsud, L. (2004) 'Research in the use of handheld technologies in compulsory education: A review of literature', In Proceedings *IRIS27*, Falkenberg, Sweden.

Mitra A., Willyard J., Platt C., and Parsons M. (2005) 'Exploring Web usage and selection criteria among male and female students', *Journal of Computer-Mediated Communication*, Vol. 10, No. 3, article 10. Retrieved on November 19, 2006 from: http://jcmc.indiana.edu/vol10/issue3/mitra.html.

Newburger, E. C. (1999) Computer use in the United States. October 1997. Current Population Reports, U.S. Census Bureau (pp. 1-11). Retrieved on November 19, 2006 from: http://www.census.gov

Odell, P. M., Korgen, K. O., Schumacher, P., and Delucchi, M. (2000) 'Internet use among female and male college students', *Cyberpsycology and Behavior*, Vol. 3, No. 5, pp. 855- 862.

Ono, H., and Zavodny, M. (2003) 'Gender and the Internet', *Social Science Quarterly,* Vol. 84, No. 1, pp. 111-121.

Saunders, B., and Quirke, P. (2002) 'Let my laptop lead the way: A Middle Eastern Study', *Education Technology and Society*, Vol. 5, No 1, pp. 1436-4522.

SEIRTEC (2002) 'Using handheld technologies in schools', *NewsWire,* Vol. 5, No. 2, pp. 1-34. Retrieved on November 19, 2006 from: http://www.unc.edu/learnnc/handhelds.pdf

Selwyn, N. (2006) 'E-Learning or she-learning? Exploring students' gendered perceptions of education technology', *British Journal of Educational Technology,* Vol. 38, No 4, pp. 744- 746.

Sharples, M. (2000) 'The design of personal mobile technologies for lifelong learning', *Computers and Education,* Vol. 34, pp. 177-193.

Shashaani, L., and Khalili, A. (2000) 'Gender and computers: Similarities and differences in Iranian college students' towards computers', *Computers and Education,* Vol. 37, pp. 363-375.

Shaw, L. H., and Gant, L. M. (2002) 'Users divided? Exploring the gender gap in Internet use', *Cyberpsychology and Behavior,* Vol. 5, No. 6, pp. 517-527.

Smith, B. N., and Necessary, J. R. (1996) 'Assessing the computer literacy of undergraduate college students', *Education,* Vol. 117, No. 2, pp. 188-193.

Teo, T., and Beng Lee, C. (2007) 'Attitudes towards computers among students in higher education: A case study in Singapore', *British Journal of Educational Technology*. Doi: 10.1111/j.1467-8535.2007.00724.x

Traxler, J., and Riordan, B. (2004) 'Using personal digital assistants to support computing students', Higher Education Academy. *LTSN-ICS 5th Annual Conference*, Belfast.

Triantafillou, E., Georgiadou, E., and Economides, A. A. (2008a) 'CAT-MD: Computerized adaptive testing on mobile devices', *International Journal of Web-Based Learning and Teaching Technologies*, Vol. 3, No. 1, pp. 13-20.

Triantafillou, E., Georgiadou, E. and Economides, A. A. (2008b) 'The design and evaluation of a computerized adaptive test on mobile devices', *Computers & Education*, Vol. 50, No. 4, pp. 1319-1330.

Trifonova, A., Georgieva, E., and Ronchetti, M. (2006) 'Has the time for university's mobile learning come? Determining students' readiness', *WSEAS Transactions on Advances in Engineering Education,* Vol. 3, No. 9, pp. 1790-1979.

Turel, O., and Serenko, A. (2006) 'Satisfaction with mobile services in Canada: An empirical investigation', *Telecommunications Policy,* Vol. 30, pp. 314-331. Elsevier Ltd.

Media Report to Women, (2000) 'U.S. women surging online, closing gender gap, reshaping social landscape' *Media Report to Women,* Vol. 28, No. 2, pp. 1-2.

Vasiliou, A. and Economides, A.A. (2007) 'Mobile collaborative learning using multicast MANETs', *International Journal of Mobile Communications (IJMC),* Vol. 5, No. 4, pp. 423-444.

Waycott, J., Kukulska-Hulme, A. (2003) 'Students' experiences with PDAs for reading course materials', *Personal and Ubiquitous Computing,* Vol. 7, pp. 30-43, Springer- Verlag London Limited.

Zhang, Y. X. (2002) 'Comparison of Internet attitudes between industrial employees and college students', *Cyberpsychology and Behavior,* Vol. 5, No. 2, pp. 143-149.

MALE	0 (min)	1	2 - 5	6-10	11-30	31-60	> 60	Average (min)
To organize your tasks, attendances, exams	43,20	16,57	26,04	9,47	4,14	0,59	0,00	2,95
To take notes during your lessons	65,09	11,83	14,79	5,92	1,78	0,59	0,00	1,74
To record the lectures	81,07	5,33	4,73	7,10	0,00	1,78	0,00	1,59
To find material for your tasks and courses in the internet	68,05	7,10	17,16	4,14	2,96	0,59	0,00	1,88
To do the calculations in the calculator	28,40	30,77	26,04	10,65	2,37	1,78	0,00	3,36
To translate words with the dictionary	75,74	6,51	7,69	7,69	1,78	0,00	0,59	1,67
To arrange meetings with your classmates	24,26	18,34	27,22	20,71	4,73	4,14	0,59	6,00
To inform mutually with your classmates about courses	30,18	18,93	28,40	15,38	4,14	2,37	0,59	4,70
To exchange ideas, thoughts etc. about the courses with your classmates	42,60	18,93	20,12	14,20	2,96	1,18	0,00	3,17
To consult your professors	79,88	5,92	7,69	2,96	1,78	1,78	0,00	1,74

Table 1. Male population (in percentages) using the mobile device every day for various educational purposes and time averages (min).

FEMALE	0(min)	1	2 - 5	6 - 10	11 - 30	31 - 60	> 60	Average (min)
Total for educational purposes	13,95	3,72	17,21	25,58	23,72	13,49	2,33	15,08
To organize your tasks, attendances, exams	32,09	14,88	23,26	19,07	7,44	3,26	0,00	5,50
To take notes during your lessons	77,21	6,98	9,30	3,72	1,40	1,40	0,00	1,61
To record the lectures	85,12	5,58	4,65	1,86	1,86	0,93	0,00	1,17
To find material for your tasks and courses in the internet	76,28	5,12	8,37	6,51	2,79	0,93	0,00	1,86
To do the calculations in the calculator	19,53	31,63	27,44	14,42	3,26	3,26	0,47	4,86
To translate words with the dictionary	80,00	8,84	4,19	3,26	2,79	0,47	0,47	1,56
To arrange meetings with your classmates	13,95	14,88	29,77	26,98	10,23	3,72	0,47	7,42
To inform mutually with your classmates about courses	20,00	17,67	27,91	25,12	5,12	4,19	0,00	6,12
To exchange ideas, thoughts etc. about the courses with your classmates	33,49	15,35	24,19	18,14	7,44	1,40	0,00	4,61
To consult your professors	88,37	4,65	3,26	1,86	0,93	0,93	0,00	0,92

Table 2. Female population (in percentages) using the mobile device every day for various educational purposes and time averages (min).

MALE	NONE	LITTLE	ENOUGH	MUCH	VERY MUCH	Average
Lessons timetable	18,93	15,98	42,60	12,43	10,06	1,79
Lectures	22,49	18,93	31,36	14,79	12,43	1,76
Examples	31,36	17,75	31,95	13,02	5,92	1,44
Educational games and simulations	39,05	28,40	21,89	6,51	4,14	1,08
Forums	43,20	23,67	21,30	9,47	2,37	1,04
Frequently asked questions and answers	29,59	23,08	26,63	15,38	5,33	1,44
Solved exercises and problems	18,93	11,24	28,99	24,26	16,57	2,08
Educational software	27,81	18,93	25,44	19,53	8,28	1,62
Announcements about lessons through SMS or e-mail	19,53	13,61	23,08	18,34	25,44	2,17
Reminders about task deadlines through SMS or e-mail	20,71	14,79	27,22	18,34	18,93	2,00
Library	29,59	20,71	27,22	13,02	9,47	1,52
Bibliography of the lessons	33,73	21,30	20,71	11,83	12,43	1,48
Previous exams' items	13,61	12,43	20,12	18,34	35,50	2,50
Timetable of exams	13,61	12,43	18,34	18,93	36,69	2,53
Exams through your mobile phone	40,83	21,89	14,79	9,47	13,02	1,32
Exam results	10,65	10,06	16,57	19,53	43,20	2,75

Table 3. Male population (in percentages) rating the importance of access various educational resources via the mobile device.

FEMALE	NONE	LITTLE	ENOUGH	MUCH	VERY MUCH	Average
Lessons timetable	16,28	17,21	31,63	24,19	10,70	1,96
Lectures	23,26	19,07	26,05	21,86	9,77	1,76
Examples	26,05	23,72	29,30	13,95	6,98	1,52
Educational games and simulations	34,42	31,63	21,40	8,84	3,72	1,16
Forums	41,86	28,84	16,28	8,84	4,19	1,05
Frequently asked questions and answers	27,44	26,51	26,51	15,81	3,72	1,42
Solved exercises and problems	18,14	12,09	27,44	26,98	15,35	2,09
Educational software	26,51	18,14	24,65	21,86	8,84	1,68
Announcements about lessons through SMS or e-mail	15,35	12,56	19,53	29,77	22,79	2,32
Reminders about task deadlines through SMS or e-mail	19,07	14,42	15,35	27,44	23,72	2,22
Library	21,40	22,79	22,33	21,86	11,63	1,80
Bibliography of the lessons	27,91	29,77	17,67	16,74	7,91	1,47
Previous exams' items	10,70	9,77	20,00	22,79	36,74	2,65
Timetable of exams	15,81	5,58	20,00	20,00	38,60	2,60
Exams through your mobile phone	42,33	21,86	14,42	11,63	9,77	1,25
Exam results	9,77	9,30	16,28	20,47	44,19	2,80

Table 4. Female population (in percentages) rating the importance of access various educational resources via the mobile device.

.

MALE	Wisher to use mobile
Information about lessons (schedule etc.)	18,34
Information about exams (schedule, results etc.)	13,02
Communication with professors	2,96
Exchange ideas with classmates	5,33
Calculator	0,59
Worked out problems and tasks	2,36
Examinations	2,96
Dictionary	1,18
Search in internet	4,73
Record the lectures, notes	0,65

Table 5. Male population (in percentages) desired to use the mobile device for educational activities.

FEMALE	Wisher to use mobile
Information about lessons (schedule etc.)	25,12
Information about exams (schedule, results etc.)	20,47
Exchange ideas with classmates	6,05
Calculator	0,93
Worked out problems and tasks	0,93
Dictionary	2,79
Search in internet	2,33
Record the lectures, notes	9,77

Table 6. Female population (in percentages) desired to use the mobile device for educational activities.

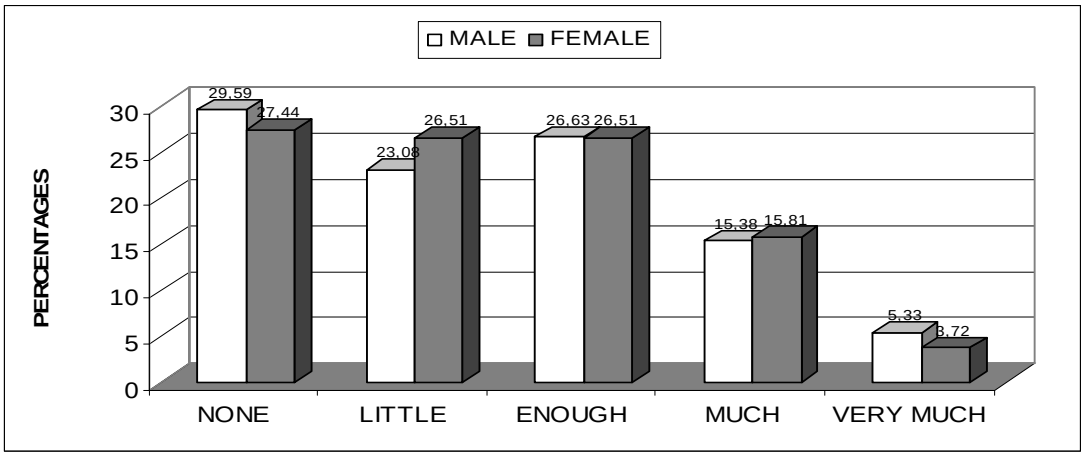

Figure 1. Access's importance to Frequently Asked Questions (FAQS) via the mobile device

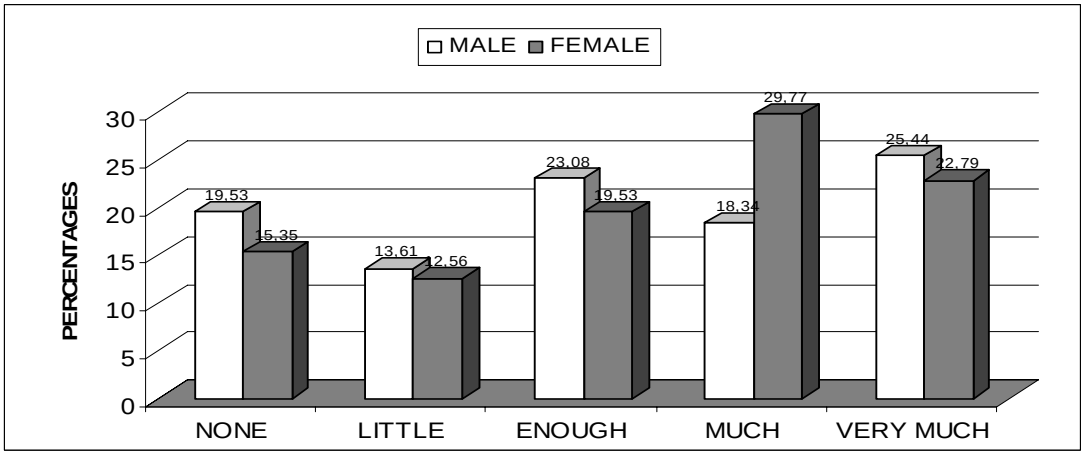

Figure 2. Access's importance to lessons' announcements via the mobile device

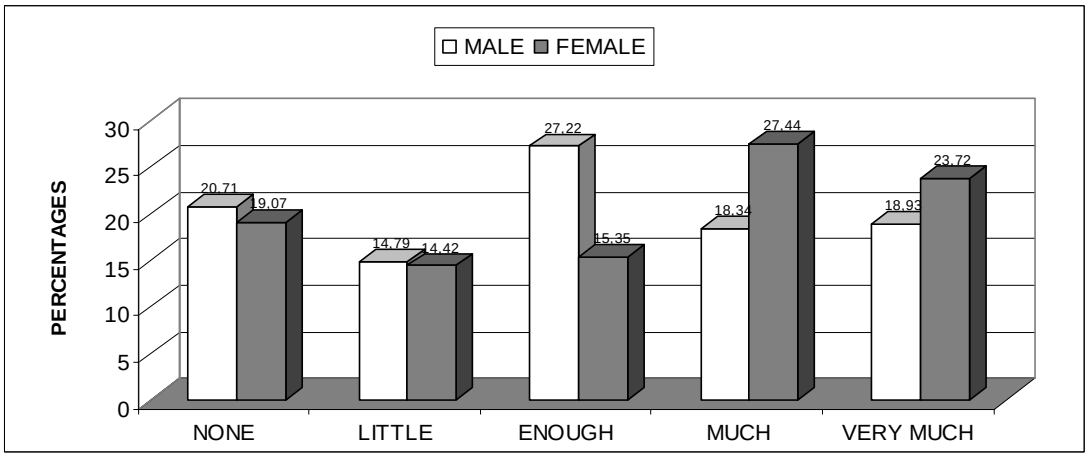

Figure 3. Access's importance to deadlines' reminding via e-mail or SMS (via the mobile device)

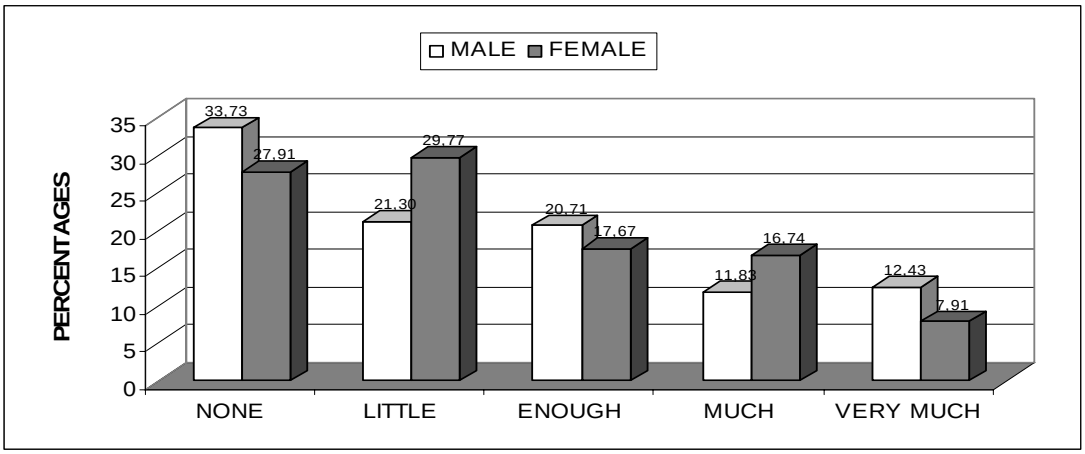

Figure 4. Access's importance to bibliography of lessons via the mobile device