Work Package 7 - Mobile learning course development, teaching and evaluation

Plovdiv University case – DIPSEIL/mDIPSEIL

Summary

The key finding is that students and teachers recommended that the university continue to explore the potential of wireless networks and devices for teaching and learning. The other conclusion from this project is that a broad investigations and field trials have to be performed, because the results and conclusions need to be confirmed in the future.

More precisely, the project's objective was to assess the effectiveness and efficiency of handheld wireless technology in a first-year college Information technology course as a value-added class room tool that could:

- enhance student success and achievement of intended learning outcomes,
- increase student access to learning materials,
- enlarge the teaching and learning availability.

We committed to a comparative design involving students with HTC P4550 (PDA), Sony Ericsson P1i (GSM), Nokia N82 (GSM) and Nokia E90 (Communicator), and Control group with the LAN/wireless access to DIPSEIL system – in the class, or out of the classroom. The students and teachers self-reported perceptions and quantitative, data were collected and analyzed using SPSS; tests of significance were conducted where appropriate. Approximately 45 students participated in the study: 19 in the Experimental group (EG), 26 in the Control group.

Based on end-of-semester survey results, two student groups, thought that the digital content helped them to learn Information technology. EG and CG students reported that the content students thought most helped their learning was also the content that they used the most, i.e., Instruction how to perform, Additional materials, Examples. Students indicated that the best possibility will be to use the mobile devices not only in the class. They prefer to use their own mobile devices.

In their final survey, teachers reported that the mobile devices are good alternative, and that the performance-support learning method is useful, but that the PDA device as such did not make Information technology subject more interesting to teach. On the other hand, they were moderately satisfied with the wireless PDA as a learning tool, although they did not think that it contributed much to student learning and believed that students were dissatisfied with the PDA as a learning tool. They thought that the most important new teaching strategy was more student interactivity with content. They also noted that use of the PDA enabled them to encourage independent student learning.

When final grades were examined, the results were there was no statistically significant difference between the average grades of students in the Experimental and Control groups. These results should be interpreted with caution, especially since learning is a multi-faceted process that mitigates attribution of a result such as this to only one factor such as the effect of technology.

Three key lessons emerge from this pilot that could be useful to anyone contemplating similar work in future. First, the technology has to work reliably. While small screen size and the lack of a keyboard were noted as PDA/GSM limitations, they did not generate the level of dissatisfaction that the poor wireless WAN network functionality did. Second, a multi-factor approach to assessment is required. The teaching/learning process is a complex one that needs to be reflected in the assessment of learning. As has been noted in the literature about other technology interventions, it is very difficult to isolate reliably specific cause and effect relationships. Technology also has many dimensions, as demonstrated by the varied levels of satisfaction with the PDA/GSM, the wireless networks and " the course overall." Third, the learning activities with a high level of learner-content interactivity were the most used and were perceived as most helpful to learning.

Four recommendations are offered to guide future experimentation with wireless networks and devices:

- First, replicate learning content with different wireless devices. Students perceived the content to enhance learning. The PDA/GSM devices was seen as too small for the content and the mobile devices are not tools commonly used for learning purposes.
- Second, re-examine affordability issues. There are issues to be addressed regarding student accountability for, and ability to absorb, project costs, especially wireless WAN usage.
- Third, explore a range of content. The exploration of content delivery by PDA in only one subject in a student's timetable is not an adequate basis for long-term decisions. Students seemed to indicate that they would integrate wireless devices and networks into their life more fully if such technology were used in more than one course.

Experiment description

While wireless technology is new and emergent, its application to teaching and learning as an alternative to traditional e-learning has the potential to offer significant advantages. For example,

- Students would have more flexibility and choice in where and when they learn outside of the wired (or un-wired) classroom.
- Students would be using technology in their study that would enhance their readiness for tomorrow's workplace where employers want graduates who know how to use technology for learning and working.
- Given the trend to lifelong learning, many "students" are working adults with full- or part-time jobs. Mobility offers them an opportunity to maximize learning while commuting or during what might otherwise have been "down time."

However, important questions such as the following need to be researched or documented:

- What value-added learning will result?
- How much will students actually take advantage of the potential flexibility offered by the technology?
- What content works best to support learning on a wireless device?

- How will wireless/mobility change traditional analog (i.e., books and documents) and
- wired web-enabled learning and teaching?

Experiment goal

More precisely, the project's objective was to assess the effectiveness and efficiency of handheld wireless technology in a first-year college Information technology course as an alternative to the using e-learning system and method and value-added tool that could:

- enhance student success and achievement of intended learning outcomes,
- increase student access to the learning materials, and
- enlarge the teaching and learning possibilities.

Within this broad goal, specific objectives were developed:

- Test the usability of content and services in terms of the technical repurposing to wireless technology.
- Ensure technology functionality on and off the classroom wherever content and/or services are to be used by students.
- Test the efficiency and effectiveness of mobile learning in a conventional university semester, using the evaluation design, instruments, and methods.

Course content and design principles

The course content consists: reference information about a task or closely related set of tasks; task-specific training; expert advice about a task; instructions for task performance; additional materials and examples.

Reference information describes the task that the user has to perform. This reference information supports the user by making immediately available information, which (s)he previously had to memorize or look for in a book or a manual. The reference section allows the user to learn more deeply about a given task and is always available for her/him to read and *provides the theory behind the task it supports*.

Task-specific training reduces preliminary training by helping the user to learn while performing the task. This type of *training is learner-centred* because the learner asks for help when he needs it to perform a task, and the help gives him the specific information that (s)he requests.

Educational performance support systems contain specific advice on performing tasks and it is its greatest advantage. The advice is usually provided by an *expert system*.

Automated tools for task performance are most helpful when a supported task involves the use of *specific software*.

The self-test provides an opportunity for the students to measure their own understanding of the content of the learning object. The students may revisit the test/reflective activity as many times as they want. The test doesn't involve any interaction with the facilitators. The tests use computer-scored multiple choice items.

The course is organized in modules and tasks for performance in each module:

MODULE	TASK	TASK OBJECTIVE
Computer networks	Task1 Network fundamentals	What are packets? What is the difference between fiber optics and metal cable? What do routers, switches, and hubs? Network's topology and different kinds of networks.
Internet	Task1 Internet fundamentals Task2 IP addressing Task3 Routing Task4 Servers names Task5 Gateway Task6 Connection to the Internet	How the Internet was started and why it was successful. Internet's model. What the operating levels of the Internet are and what they do. What is IP address? Kinds of IP addresses, subnetworks ARP and Netstat commands and their usage Organization and content of Hosts and Lmhosts files Information flow and the way of the packets Different types of connection – organization, software installation, settings
Internet applications	Task1 File transfer via Internet Task2 Web	Main principles of files transfer using SSH Web organization, Web hosting, Web servers, Web search
Data-bases	Task1 Planning a relational data-base Task2 Data-base development	The elements of a data-base. Planning a data-base. The relational model of data-base organization. Non-relational data-base. SQL language. Data-base management systems. Data-base markets.
Computer modeling and simulation	Task1 Design and development of a computer model Task2 Computer simulation	Main principles of computer modeling, steps. Different kinds of models. Main principles of computer simulation, results and analysis. Different kinds of simulations.

Technology configuration

Students had access to two types of networks during the experiment, the Local Area Network (LAN) and wireless 3G MTel using wireless cards.

MTel is currently the biggest GSM operator in Bulgaria. It offers a wide range of services for its clients. They are divided in two groups – business clients and normal clients. For both of these groups there is also a wide range of mobile phones, which are supported. For the first ones, of course, there are the “business”-class phones – Nokia E-series, different kinds of PDAs and the Blackberry phones, which are especially developed for the business clients. Important for the M-class clients (important clients which is equal to business class clients) are the different so called group-tariffs. They allow big, medium and even small companies to be consolidated in one big talk group. All the workers in one of these companies talk absolutely free between each other and because of the big taxes these firms pay, they are also allowed to speak at very low costs to other clients outside these groups. For the business class clients there is also a high-speed internet service – Wi-DSL. This allows such clients to have internet wherever their buildings are (of course in the network of Mtel (99.9 % territory of Bulgaria). For those clients, which want to be really mobile there is also high-speed internet over the so called Mtel Vodafone 3G PCMCIA cards. You plug it in your laptop and you have a fast 3G internet connection in 12 major cities in Bulgaria and also an EDGE connection in all other places. This service is not only available to M-class client, but also to normal clients. For them there is also a wide variety of GSM phones (and of course they may buy these business GSM phones), but only the business clients have the possibility to “order” a phone which is currently not available on the market. Normal clients also may use the internet services of Mtel but for them they are a little bit more expensive. Still since January there are more then 20 000 3G cards sold, 5000 from which to normal clients. They also have different kind of tariffs like “Friends and Family”, which allows clients to choose from 10 numbers, with which they speak without any costs.

Current situation:

UMTS/3G/HSDPA services - current speed 3,6Mbps download/upload; currently testing new speed at 7.2Mbps download and 3.6Mbps upload

UMTS coverage of Bulgaria - 25%; HSDPA coverage - 22%

costs: 0,65 stotinkas (0,33 euro cents) per minute - video call

3g mobile internet costs: (packets)

1. included MB in packet: 250
cost: 24,5 leva (12,3 euro)
2. included MB in packet: 500
cost: 39,5 leva (19,8 euro)
3. included MB in packet: 1000
cost: 49,5 leva (24,8 euro)
4. included MB in packet: 5000
cost: 99,5 leva (48,8 euro)

costs per MB over the limit: 0,29leva (0,145 euro)

Course management software

MDIPSEIL is a mobile educational system based on the IPSS-EE system. Both are developed and tested at the Plovdiv University “Pisii Hilendarski”. The idea of

MDIPSEIL is to provide our students with the opportunity to study their DIPSEIL tasks, even if they don’t have a computer by side, using their mobile phones. Due to the limits caused by the use of mobile technologies we had to develop a whole new system, which inherits the IPSS-EE model. The MDIPSEIL application consists of two parts – client and server.

Client: this is a Java (or WM 5/6) application developed by us, which the user has to install on his mobile phone. It needs a fast internet connection and some memory to work properly. All the data is being downloaded from our servers and for displaying pictures and playing sounds it needs memory. It is developed in a special way, so it shows data conveniently on the screen and also it keeps the design idea of IPSS-EE and DIPSEIL. Everything in the client application is with a step-by-step design.

Server: the server side of MDIPSEIL is a PHP+MySQL application running on one of our servers. It can be divided in two parts: 1) web-interface for tutors to create, upload and edit their courses; 2) application which serves the data in a special way so the mobile devices can download it fast and display it in a convenient for the user way.

The web-interface for the tutors eases the upload of data to the courses but also places some limitations to them. Since everything should be shown on mobile phones it must be small, with as less details as possible, but it still mustn’t lose its idea: to give knowledge to the students. The screens of the web-interface are with one and the same design, so the uploader can learn to work with the system very fast and without any difficulties. Everything that’s uploaded is stored in one MySQL database or as files for easier download later. Every step, which the student should perform on its mobile phone in order to successfully understand the task, is stored in separate tables. Using this approach we also inherit successfully the IPSS-EE approach. Our MySQL database also contains data about the registered teachers, which can create/upload and edit courses in the system. The students log themselves with the same password they use in the parent system – DIPSEIL. The server system sends data to the mobile users using special expressions through the internet using a specially designed PHP scripts. It also contains an algorithm for converting to wav and compressing sound files. Since there are many companies, developers and models of mobile phones (every one of which may have its own operating system) we need to use a well-popularized sound standard – WAV. Our algorithm compresses the wav sounds, so they’re fast for downloading and playing by the mobile devices. The web-interface of MDIPSEIL also allows only upload of PNG images, since that’s the most used format by the mobile operating systems.

MDIPSEIL has been tested with the following operating systems: Symbian 9.1, Windows Mobile 5/6 (java and c# version), OS of Siemens Phones. MDIPSEIL is not compatible with SonyEricsson phones although it is again a Symbian OS.

Student Recruitment and planning the experiment

First-year **students** in the “Information technology” course in Bulgarian language were the primary target group. They were chosen for reasons such as: (1) large numbers, (2) differing levels of commitment and interest in the subject of IT, and (3) diversity of learning styles. A continuing focus on student success guided all stages of the experiment. 45 students participated in the pilot. Students volunteered to be in the EG – 19 and rest of the students, 26, were assigned to the Control group.

Adapting e-learning materials to mLearning

- mDIPSEIL has Editor for teachers to put task-oriented learning objects - Tasks for performance, in mDIPSEIL data-base

- mDIPSEIL has Student Area to be used from learners for mLearning by PDA, GSM
- Teachers adapt designed materials – task-specific training, instruction how to perform etc., towards short and clear explanation, no animations if it's no necessary, size of the files etc.

The title of the course

- "Information Technology" for first year students, "Physics" and "Physic engineering" specialties
- Summer semester 18/02/08 till 15/06/08

The target date for completion of the learning materials

- Most of the tasks are developed for mDIPSEIL
- Each Task is performed in one week
- Each task has a deadline
- Task performance in electronic format is sent to the server (students use PC and Internet to prepare and send task performance)

The schedule for the teaching of the course

- We started on 31 of March
- The experiment took 7 weeks for tasks
- In 8 week we gave to the students the Questionnaire and they performed Final knowledge test
- July we were working on the Report from the experiment

The target student audience

- First year students, "Physics" and "Physic engineering" specialties
- 45 students
- Half of students from "Physics" and "Physic engineering" specialties (randomly chosen) will perform tasks in DIPSEIL
- Another half will perform tasks in mDIPSEIL

The plans for evaluation

- We had 2 groups – Control group working in DIPSEIL and Experimental group working in mDIPSEIL
- We gave them the Mobile questionnaire[1] after all tasks performance and collected their opinion on using both systems
- We had the Final knowledge test and final marks from tasks performance during the semester

Example questionnaire to be used in the evaluation process

- Final knowledge test is on DIPSEIL, link Test manager
- We used statistical analysis to receive results from the experiment

[1] See Annex 1 – Questionnaire on Mobile Learning

Orientation and technical support

We gave to the students, using mDIPSEIL, mobile devices we bought in this project, some of them use their one mobile phones. We bought for this experiment sim data cards from MTel and paid for the data transfer. The students use these mobile devices in the class room, each week 4 student hours.

We provided students with a number of sources of technical support. The start-up process was:

- To expedite student use of the device, all software that was required for the project had
- been installed and configured ready for student use.
- In-class training was delivered in the first week of the experiment or so of the semester by appropriate staff. Covered topics included the features of the PDA/GSM, the network cards, the installed software, access to the Internet, the course learning materials using mDIPSEIL, how to set up given PDA/GSM, how to use them to start Information technology course.
- At that same training, students were informed of technical support resources, including
- the Website. A printed student orientation guide was distributed and students were informed about the manual how to use mDIPSEIL

We also provided other services, including (1) in-class demonstrations by teachers on specific components and features of the PDA/GSM as needed, (2) a support available via email and phone, and (3) drop-in assistance by technical staff during class time if possible. A volunteer student who was technically knowledgeable assisted students and drop-in sessions were scheduled outside of class time.

Methods

A comparative approach was adopted; one key variable was the type of device used (PDA, GSM, or PC) and another was wireless access. Self-reported data were verified wherever possible with quantitative measures. Final student grades were retrieved and analyzed. All data collection instruments have been tested and revised during the previous projects PU and DIPSEIL Lab. have been involved. A summary of the approach is contained in the following Table:

Evaluation Category	Timing and Method		
	Pre-start	**During the experiment**	**End-after**
Learner characteristics	Self-report questionnaire		
Student success		Self-report of the content usage	Self-report of success + grades
Technology functionality: PDA/GSM and network			Student assessment and administrator log in
Tech training and support			Student assessment

A survey was administered to students at the beginning of the semester that collected data such as computer expertise, previous experience with online course materials, existing computer hardware, and connectivity.

Survey instruments were administered at the beginning and end points of the semester to gather student self-report data. Typically, a member of the project team administered the survey during class time.

Final grades were collected at the end of the semester, converted to a common 6 mark scale and a test of significance applied.

A tool were used at the beginning and end points of the semester: survey instruments Surveys were administered in class at the start and end of the semester:
Start: The baseline survey asked students to indicate their general expectations regarding the use of the PDA and GSM to access curriculum materials. The survey asked students to rate the usefulness of several parts of the course to their learning, e.g., class lectures, digital content, etc. It went on to ask them very specifically about how often they used and enjoyed each type of learning activity and how much they thought each contributed to their learning. The survey also verified their perceptions that teachers used the activities in class and/or assigned them as homework, that they themselves were comfortable using the PDA/GSM, and whether they thought that they were learning valuable IT skills by participating in the pilot project. Students were also asked the same questions regarding access to other applications software in the PDA.
End: The survey asked students to summarize how useful the content was to their learning, their views on technical support and their recommendations for the future.

Results and discussion

The key finding is that students and teachers recommended that the university continue to explore the potential of wireless networks and devices for teaching and learning. The other conclusion from this project is that a broad investigations and field trials have to be performed, because the results and conclusions need to be confirmed in the future.

Response rates for the survey results are summarized in the following Tables:

Response rates for baseline student survey

Type of Group	**Respondents**		
	Enrolled	**Completed Form**	**Response Rate %**
PDA/GSM	19	19	100
Control	26	26	100
Totals	**45**	**45**	**100**

Response rates for final student survey

Type of Group	**Respondents**		
	Enrolled	**Completed Form**	**Response Rate %**
PDA/GSM	19	19	100
Control	26	25	96,2
Totals	**45**	**44**	**97,8**

Student profiles

The baseline data on all students indicate that the students recruited for the experiment are fairly representative of the first-year physic student population.
Salient characteristics of the students in this study include:

- A majority of students in all groups rated themselves as competent in software applications such as e-mail and word processing.
- At least 90% of the students in each group had access to a computer at home.
- Very few (15 to 20%) of the students had previous experience learning with online curriculum materials.
- There were slightly more males than females in the both groups.
- There was no difference among groups in age; the vast majority of the students were under 24 years old.
- There was no difference among the groups in terms of grades; all are finished the secondary school.

Students viewed the project as an opportunity to enhance their learning technology tools and saw the experiment as an inexpensive way to access leading-edge technology. The “cool” factor was also a significant attraction for most students. Convenient access to course materials, enjoyment, and improved chance to succeed were highest expectations of PDA/GSM group. The both groups expected improved access to materials, improved chance to succeed and better management of course notes.

Didactic efficiency

Based on end-of-semester survey results, the both student groups thought that the digital content and the performance-support method helped them to learn IT. On the other hand, when they had the chance during the semester to compare digital content with other teaching approaches, for example teacher explanation, reading books and printed materials, the PDA/GSM and Control students rated these in that order as more useful than digital content available through DIPSEIL and mDIPSEIL as learning tools (i.e., 4 or 5 on a 5-point scale). These results may be interpreted to mean that students value both digital and traditional learning activities.

On a scale of 1 to 5 (where 1 is strongly disagree and 5 is strongly agree), please check the number that shows how much you agree with the following statement: “Course learning objectives can be met by mobile learning.”

	PDA/GSM		**Control**	
	Number	*Percent*	*Number*	*Percent*
Disagree (1 or 2)	6	31,6	5	20
Neither Agree nor Disagree	5	26,3	8	32
Agreed (4 or 5)	8	42,1	12	48
Totals	**19**	**100**	**25**	**100**

Using the standard normal statistic to evaluate the null hypothesis—*that the proportion of Control students who agreed with the statement is equal to or less than the proportion of PDA/GSM students who agreed with the statement*—yields a low Z value of 1.04. Thus the null hypothesis cannot be rejected; the test fails to support the contention that Control students are more in agreement than the PDA students are with the statement that learning objectives can be met by mobile learning. Thus it can be concluded that the learning objectives are independent of the device used to access it.

What was evident when the issue was stated as one of overall satisfaction with a course taught “this way,” i.e., whichever way the student experienced? As shown in the next table that summarize the replies to Section 2. Student userfriendliness, there was no statistically significant difference between two groups satisfaction. It is thought that the PDA students’ satisfaction may have been affect ed more by the technology than by the content.

	PDA/GSM		**Control**	
	Number	*Percent*	*Number*	*Percent*
Disagree (1 or 2)	3	15,8	2	8
Neither Agree nor Disagree	4	21	3	12
Agreed (4 or 5)	12	63,2	20	80
Totals	**19**	**100**	**25**	**100**

Using the standard normal statistic to evaluate the null hypothesis—*that the proportion of the CG students who are satisfied with their learning is equal to or less than the proportion of EG students who are satisfied with the learning* —yields a low Z value of 1.29. Thus the null hypothesis cannot be rejected and it is assumed that the proportion of CG students who are satisfied with their learning **is not** significantly greater than the proportion of EG students who are satisfied. Wireless access to digital curriculum did not enhance student satisfaction with the class; indeed, such access detracted from student satisfaction, perhaps because of poor wireless WAN network functionality.

Grades

Average student grades on final exams

	Average Grades by Student Group	
	PDA/GSM	**Control**
	59,95	64,89

There was **no statistically significant difference** between the average grades of the PDA and Control group students.

However, these results showing that the PDA might have had a positive effect need to be interpreted with caution. Key issues to be considered include:

- Learning is multi-faceted process that should encourage caution in attributing a result such as this to only one factor, such as the effect of technology.
- The mean grade of the Control group may not be typical when compared to the results of previous years. We have no results on this.
- The results could be interpreted to mean that the PDA had an adverse effect on student grades, an intriguing finding given that because of that it is a class using new technology, is a “special” class, could have led to improved grades due to extra teacher attention.

A larger sample size would be required to explore this variable further.

Technical feasibility

Despite their frustrations, fully 50% or more of both student groups reported being satisfied (4 or 5 on a 5-point scale) with the course. A slim majority of PDA/GSM students (52%) would recommend that colleges continue to explore the value of mobile devices in teaching and learning. One of the student's comment: "*The PDA is too small and slow and is frustrating to use when I can just use a regular computer instead.*"

In addition, 65% of the 69 PDA students who answered the question would not recommend that other students purchase a PDA, and 28% said it would depend on the cost. Another comment: "*If GSM data transfer were cheaper, there would be more students using PDA/GSM. Some people just can't afford the extra cost.*"

The final survey data confirmed a number of important points. Students indicated that they used the PDA in class, if they have their own PDA/GSM, they would use out of class, and were very comfortable using it themselves. However, use of the PDA was constrained by factors other than teachers' behavior and attitudes. First, roughly 80% of PDA students preferred to access digital content on their PC. Although students were encouraged to access content with their PDA, they knew that they could also use a PC to perform the tasks. In some tasks, the use of PC is mantadory, it depends on the task.

According to students' remark, the two most desired changes to a PDA were to add a keyboard for text entry and increase the screen size.

A substantial majority of students in each type of student group in the project favored university continuing to explore the value of using wireless networks in teaching and learning. The on-campus wireless LAN network was perceived as good. In the final survey, the majority of the PDA students were not dissatisfied with the quality of the 3G network, although they wished that they have at home the possibility to use such a connection.

The data from the students' remarks seem to indicate that, with the right device, students will make extensive use of wireless networks and that there is considerable variation in individual levels of use. Whether they can/will pay for such use is another matter.
However, the network was not likely the only limit on PDA/GSM student activity; features of the PDA may also have had some effect.

Conclusions

For maximum success, the technology has to work reliably. While small screen size and the lack of a keyboard were noted as PDA limitations, they did not generate the level of dissatisfaction among PDA students that the poor wireless network functionality did. Despite the dissatisfaction with network quality, students made recommendations to explore wireless networks than to continue using the PDA devices.

Device features may be a critical factor, as poor network quality did not seem to adversely affect wireless network usage. The device characteristics need to be matched to requirements of content. Screen size was an important issue in engineering subjects because of special needs issues such as data entry, graphical information and spreadsheet requirements, and in some cases it is impossible to use PDA/GSM for this content, especially for performing the tasks, but it might not be so critical in subjects other than engineering.

The teaching/learning process is a complex one that needs to be reflected in the assessment of learning. As has been noted in the literature about other technology interventions, it is very difficult to isolate reliably specific cause and effect relationships. Technology as an intervention is also multi-faceted, as demonstrated by the nuances in responses to satisfaction with the PDA, the wireless networks, and “the course overall.”

Both groups of students self-report that the task performance method with a high level of learner-content interactivity were the most used and were perceived as most helpful to learning.

Attempting to test all possible types of content on the device may not be the best strategy for future development. Designing more narrowly targeted interactive content that is ideal for small screen size in an environment where the network is reliable may have different results.

ANNEX 1

QUESTIONNAIRE ON MOBILE LEARNING

Section 1. Personal background

1. What is your occupation?

- ☐ Manager
- ☐ Technical
- ☐ Teacher or trainer
- ☐ Student
- ☐ Unemployed

2. What is your age grouping?

- ☐ 24 or younger
- ☐ 25-29
- ☐ 30-40
- ☐ 41-50
- ☐ over 50

3. Gender?

- ☐ Male
- ☐ Female

4. What is your level of education?

- ☐ High school matriculation
- ☐ One to three years of post-secondary education
- ☐ Four or more years of post-secondary education

5. Mobile device ownership

- ☐ Do you own a mobile phone?
- ☐ Do you own a PDA (personal digital assistant), pocket PC or palmtop?
- ☐ Do you own both a mobile phone and a PDA?

Section 2. Student userfriendliness

6. It was easy to study this mobile learning course

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

7. This mobile learning experience was fun

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

8. According to my experience I would take another mobile learning course if relevant to my learning needs

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

9. I would recommend mobile learning as a method of study to others

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

10. Where did you study the mobile learning course?

- ☐ At home
- ☐ At the office or work
- ☐ While travelling
- ☐ Other

Section 3. Didactic efficiency

11. Mobile learning increases the quality of e-learning

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

12. Course learning objectives can be met by mobile learning

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

13. Accessing course content was easy

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

14. Communication with and feedback from the tutor in this course was easy

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

15. Mobile learning is convenient for communication with other course students

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

Section 4. Technical feasibility

16. Navigation through the mobile learning course was easy

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

17. For mobile learning to be effective it is necessary to use graphics and illustrations

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

18. Evaluation and questioning in the mobile learning course was effective

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

Comments:

Comments on equipment functionality and user-friendliness:

