Mobile School Service (MSS)

Zoran Vucetic[1], Borislav Odadzic[2]
[1] Gymnasium Ivanjica, Ivanjica, Serbia
University of Novi Sad, Zrenjanin, Serbia

Abstract—**The appliance most commonly used by the majority of young people is the mobile phone. Research at our school, for example, shows that over 99% of our students presently use mobile devices. Educational institutions should take advantage of the almost universal use of mobiles as a potential educational opportunity. The aim of our research is to improve the educational success of students in Serbian classrooms using mobile services, which will be described in this work.**

Index Terms—**mobile learning, education, mobile phone.**

I. INTRODUCTION

Today, we can safely say that the Internet has become an everyday instrument. However, while some users learn how to use the internet, wireless technology appears on the scene in other scenarios. In contrast to classical access to Internet from desktops, the internet gives the users the possibility to have information no matter where they are. WAP (Wireless Application Protocol) connects the mobile world and the Internet wirelessly, from palm instead of from desktop, making anytime-anywhere communication possible.

It is certain that wireless communications will not be only a miniature variety of WWW world. Wireless access to the Internet presents the next wave of Internet development.

II. LEARNING BY MOBILE TELEPHONE

The idea of education by mobile telephone often makes us think how the forms of mobile technology influence communicational models in education.

Today, one learns a lot out of classroom. Large amounts of information are transformed by Internet, the press, TV, etc., far more exceeds the amount of information which is related by school texts. This challenge has ruined the book monopoly as the sole means for learning and knocking down classrooms walls. Many think that traditional educational institutions are in some way endangered.

The main mobile learning benefit is the possibility of increasing productivity so that learning can be accessible anywhere and anytime. Mobile machines have the power of making learning accessible and that is why they are a natural extension of e-learning. Imagine the power of learning which is truly "just in time", where persons can train in any place and at any time, whenever it is needed. If mobile technology is still in development, then mobile learning is at an embryonic stage.

However, we support the idea that these technologies can have fantastic results in combination with traditional ways of learning.

Our project "Mobile school service" (MSS) tries to define a new environment for "mobile school service" which is showed in the Figure 1.
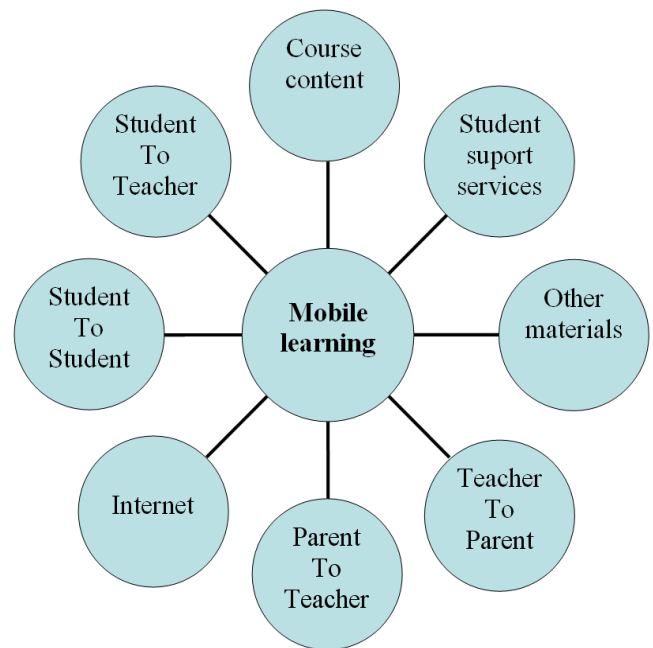

Figure 1.   New environment for mobile learning

How can mobile technology be used to improve learning? Our project includes the following:

- Schools can prepare teaching subjects which students will receive (obtain) by mobile phones. Teaching subjects can contain pictures, sound, animations and other content which will be adapted to the mobile machine.

- The effect of learning will be much greater if teaching subjects are supported by corresponding tests for confirming knowledge, which is the priority of the first phase.

- Some companies have started to publish electronic books which are adapted to mobile machines. This idea should be use by schools, also.

- Students should be gathered (assembled) on "mobile forums" and chat rooms where they will exchange their experiences in resolving certain tasks (issues).

- Besides teaching subjects, it is necessary for a mobile portal to be the bulletin board where students can obtain information at every moment. One of said modules is "Mobile class register" for informing the parents about student success.

During the process of education through the mobile telephone, it is necessary to establish suitable communication and incorporation between the participants in the educational process.

UML (Unified Modeling Language) is used in the projecting of the application for mobile learning. Figure 2 shows UML diagram of the process of learning.
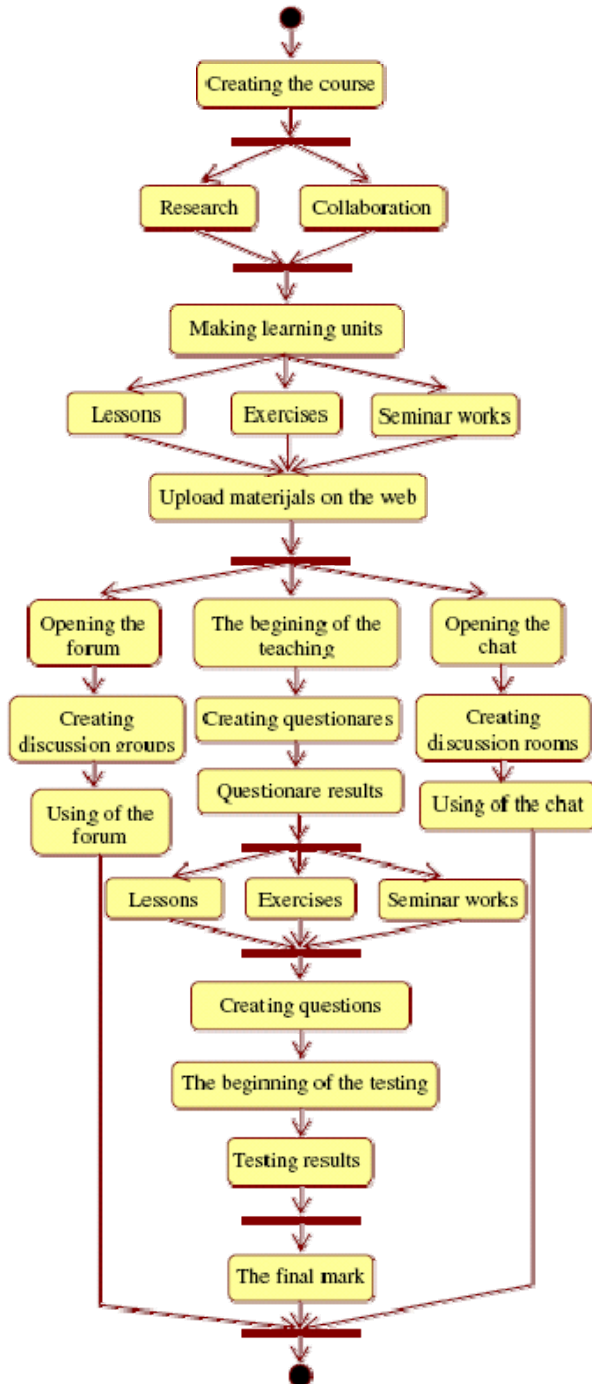

Figure 2.   The process of learning

The clear target is to make learning more flexible and accessible to everybody.

Our idea is that mobile learning should not replace normal education, but should provide additional help during learning and make those who give up learning

become interested; help them realize that this kind of learning is fun and helpful.

III. PROBLEM DESCRIPTION

The goal of this project is to develop services that will provide information and texts for learning, using inexpensive and widely affordable devices.

Taking into account that only a small number of people use the Internet on a daily basis in our environment, we have developed a service to help students learn that uses mobile telephony as a communication media.

The realization of such a project requires the preparation of adequate teaching content (texts) that is accessible via cellular phone, a software application that provides for student knowledge testing and immediate test result delivery over the phone.

Our content comprises not only texts, but also photos, animations, sounds, etc.

The software application had to provide a simple user interface, despite the following restrictions that apply to cellular phones:

- The small size of the display,
- Limited data entry capabilities,
- Low CPU performance,
- Low memory capacity.

IV. SERVICE DESCRIPTION

During the development of the applications, a special effort was made to make the system user friendly and easy to use.

A.   Modules that are available to students

In this work we will describe only the modules that are used the most frequently.

Mobile School Service (MSS) is different to similar systems in mobile learning modules: Mobile class register and Mobile books.

Mobile books – Mobile Offline Learning Objects

One of the most powerful features of the Mobile school service (MSS) client is the possibility of having offline content that is stored locally on the user's mobile device. Mobile books can vary from simple offline resources like texts to interactive elements like quizzes, tests or vocabulary trainers. These objects are bundled in single files and can contain integrated images, audio or even videos.

Users only need to download *.jar file and install it on their mobile phone. We used Java ME to create the *.jar files. Additionally, Java Platform, Micro Edition (Java ME) provides a robust, flexible environment for applications running on mobile and other embedded devices - mobile phones, personal digital assistants (PDAs), TV set-top boxes, and printers. Java ME includes flexible user interfaces, robust security, built-in network protocols, and support for networked and offline applications that can be downloaded dynamically. Applications based on Java ME are portable across many devices, yet leverage each device's native capabilities.

M-learning

Users can select the lessons they want to learn, and the lesson is displayed on the screen (see Figure 3).

Figure 3.   Display with the lesson

Next, users can assess their knowledge through tests with multiple questions. The students have an option to start the tests directly by skipping the lesson.

This way the students are tested, and they get their marks according to the number of points they earn.

The workflow is described below: Just before testing, each student selects the test. The next step is personal data entry, followed by the test. Another alternative is to test without personal data entry, for training purposes only.

The tests can be time limited, or not. The assessment format is a combination of multiple choice and free response questions and free responses are limited to a couple of words per answer. Another type of questions allows true or false answers only. Figure 4 shows a phone display with one question. After the test, a student receives his/her performance report with the corresponding percentage of correct answers, followed by a display of the complete test with both correct and incorrect answers. In case of incorrect answers, the correct answer is also provided.
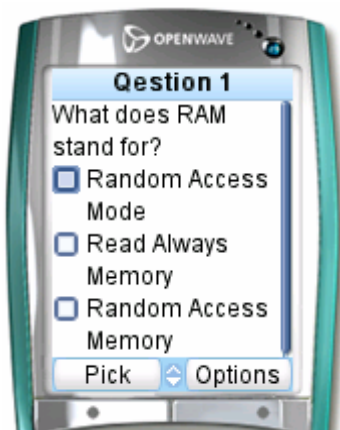

Figure 4.   Test

The number of correct answers is presented as percentage points, and may be used by the teacher to assess students.

This method allows users to learn and test the acquired knowledge anytime and anywhere.

Mobile class register

This module is different than module that monitors the progress and success of student during the MSS course.

As such, it is primarily intended for parents, because it presents an online view of student marks. It contains marks from all subjects that the student is enrolled in during the school year. Also, it contains the total average per course the student takes.

Before the user starts using the service, it is necessary for him/her to know his/her user name and the password to be used.

On the introductory screen the user first views the logon page. After entering the information and checking it, users can go to the page that contains the actual records (Figure 5).

Figure 5.   The view of the marks

It is possible for the user to change his/her password if he/she wants to.

Thanks MySQL, besides the described view that provides the grades, people in charge of the school can follow the rest of the statistics, including: averages, absences, degree of success in different classes as measured by grades including the number students receiving excellent, very good, good, sufficient and insufficient evaluations.

B.   Another modules that are available to students

Bulletin board - informs the visitors about the newest courses, but can also contain important information about school life and work of the school.

Forums allow communication related to courses to be accessed by all users, teacher and students. One can locate forums by the context, through the sender, date of the sending of the message, etc.

E-mail enables direct communication between applicants in the course. Here, it is also possible to search through the theme, the sender and the date of the message was sent.

Chat makes it possible to communicate in real time. Conversations are grouped by courses, but it is possible for everyone who has access to any course as well.

References - During the creation of course references, literature, texts or URLs for the course can be included.

Search - Users can search through available contexts by employing key words.

C. The process of preparation and the development of the material

The process of the preparation and the development material for mobile learning consists of the program, development and validity (Figure 6).
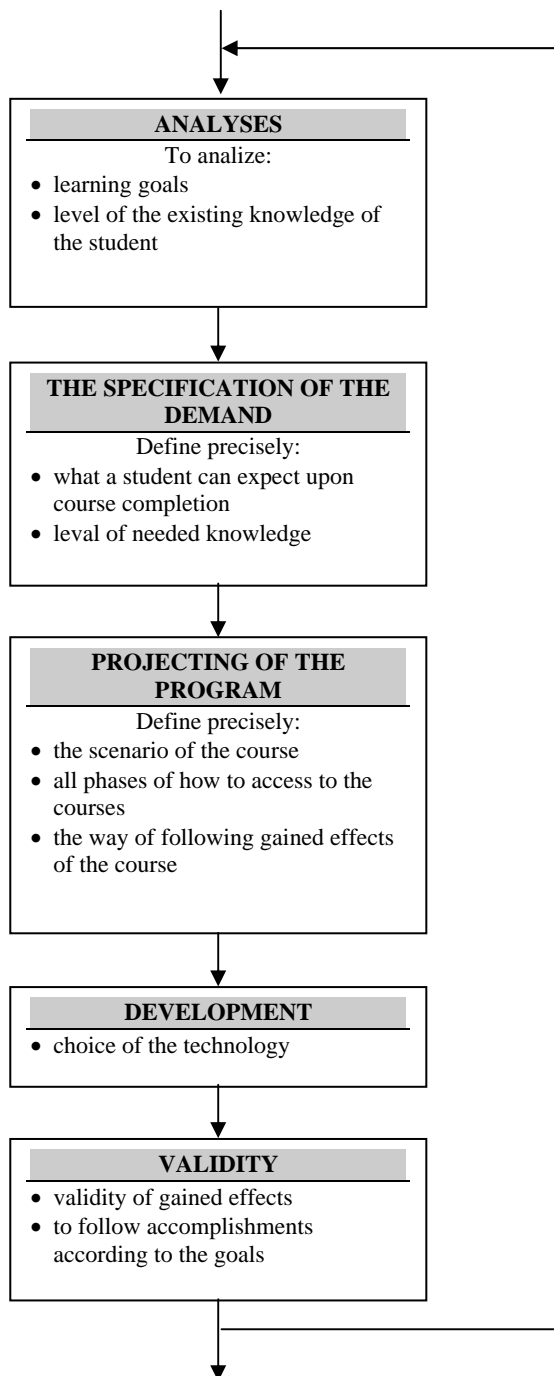
```
          ┌──────────────────────────────┐
          │          ANALYSES            │
          │        To analize:           │
          │  • learning goals            │
          │  • level of the existing     │
          │    knowledge of the student  │
          └──────────────────────────────┘
                       │
          ┌──────────────────────────────┐
          │  THE SPECIFICATION OF THE     │
          │           DEMAND              │
          │     Define precisely:         │
          │  • what a student can expect  │
          │    upon course completion     │
          │  • leval of needed knowledge  │
          └──────────────────────────────┘
                       │
          ┌──────────────────────────────┐
          │   PROJECTING OF THE          │
          │       PROGRAM                 │
          │     Define precisely:         │
          │  • the scenario of the course │
          │  • all phases of how to       │
          │    access to the courses      │
          │  • the way of following       │
          │    gained effects of the      │
          │    course                     │
          └──────────────────────────────┘
                       │
          ┌──────────────────────────────┐
          │        DEVELOPMENT           │
          │  • choice of the technology   │
          └──────────────────────────────┘
                       │
          ┌──────────────────────────────┐
          │          VALIDITY            │
          │  • validity of gained effects │
          │  • to follow accomplishments  │
          │    according to the goals     │
          └──────────────────────────────┘
```

Figure 6.   The process of preparation and the development of the material for mobile learning

V.   RESEARCH RESULTS

We carried out the research which concerns curriculum in information technology (programming in Pascal). Before beginning our research, we divided students into two groups. One group consisted of students who studied in a traditional way. (1. Group). The second group was comprised of students who received traditional instruction plus our mobile learning system (2. Group). Before the beginning of the experiment, a test was given to ensure both groups had the same level of knowledge (Figure 7, Test 1).
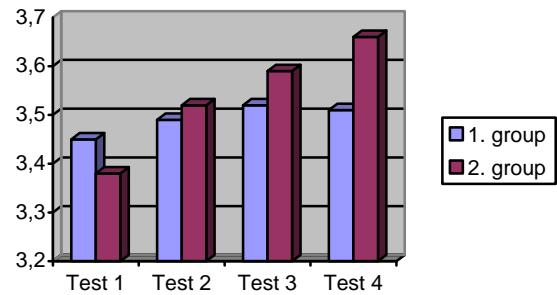

Figure 7.   Chart of average marks

After ending each learning unit, both groups had to take the same test students were graded on a scale that ranged from 1 to 5 (Figure 7).

After the knowledge test, students graded usability and user interface design of "Mobile school service on a four-point scale (4-Strongly agree, 3-Agree, 2-Disagree, 1-Strongly disagree). Beside marks, they could provide their own opinions, comments, suggestions etc.
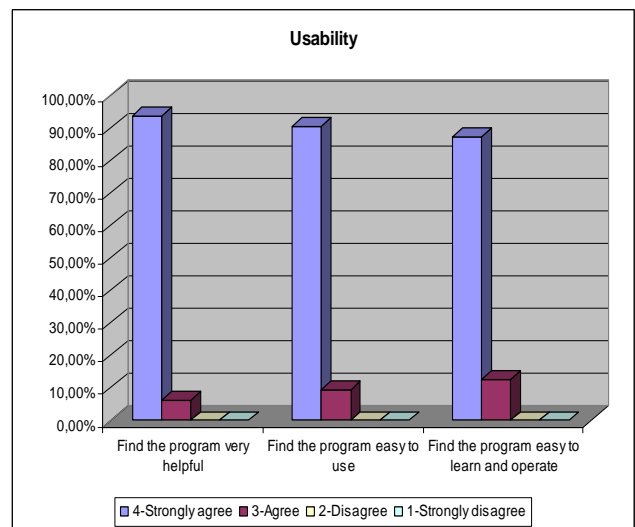

Figure 8.   Chart arrangement of answers for usability

TABLE I.   AVERAGE MARK OF USABILITY

Question	Average
Find the program very helpful	3,94
Find the program easy to use	3,91
Find the program easy to learn and operate	3,88

In both cases we received a very high average of marks and none of the students have given marks of 1 and 2, which can be seen in Table I and in the chart in Figure 8 and for the user interface design in Table II and the chart on Figure 9.
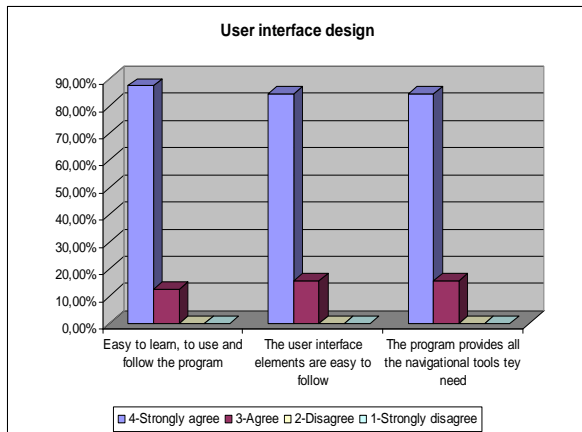
Figure 9.   Chart arrangement of answers for user interface design

TABLE II.   AVERAGE MARK OF USER INTERFACE DESIGN

Question	Average
Easy to learn, to use and follow the program	3,88
The user interface elements are easy to follow	3,84
The program provides all the navigational tools they need	3,84

This research has shown that the following positive effects are achieved:

- Attracting student attention,
- Obtaining higher interest levels, motivation and satisfaction of the students,
- Greater understanding of the context and easier access to new information,
- Better memorizing of the context and the possibility to apply this knowledge in new situations.

Furthermore, this research has shown that the average mark can be improved. If the chosen material hadn't been the hardest, students would have got better average marks.

VI. CONCLUSION

The goal of this work is to point out the possibility of using mobile telephones in the education. In the future, telephones will not be just a means of communication. Mobile technology in the hands of young people, now and in the near future, may be used as a formidable learning tool.

Our practical experience indicates that students using mobile testing have a higher degree of satisfaction and have fewer complaints on objectivity of assessment, and average higher marks than when tested using classical methods. Based on tests, we also conclude that students learn in more detail than their counterparts exposed to only traditional teaching and testing methods.

Certain circumstances are the reason why m-learning is not popular at all either in Serbia or in the world. The first cause of such a situation is the lack of content which would enable wider use and confirmation of the potential of m-learning as a principle. The same as with e-learning; the production of m-learning relies not only on pedagogy and the specific topic, but also on programming skills.

That's why we need to adopt existing and new contents to mobile devices. Some forms of e-learning contents which do function on standard computers hardly function at all on mobile device technology, mainly because of the different ways in which data are being entered. We estimate that in the future, a new field of pedagogy will develop: "Pedagogy of online learning".

The contribution of this work is our definition of a mobile environment which is necessary for m-learning, we also defined the process of preparing and developing materials for mobile learning. As a result students achieved positive effects in the process of learning and mobile technologies have been promoted. Our school was the first school in Serbia where this experimental type of m-learning was tried to be put to work in the processes of teaching and learning.

Further research will be related to the improvement of the service, which is described in this work. Its expansion will mainly focus on SMS with a larger number of students participating in the research. We are planning to expand research with a higher number of students so that to better confirm our claim that whether mobile learning is feasible or not is not a topic of debate any more. The real question is how it can fit into any educational program efficiently and that is what this work focused on. No matter whether the topic is technology or methodology, mobile learning is in any case a challenge and an opportunity.

Finally, this work shows that the concept of applying mobile phones with wireless communication technology is a "new cognitive learning tool" to personally access, analyze, interpret, and organize an individual's personal knowledge anytime and anywhere.

REFERENCES

[1] Zoran Vucetuc, Dragan Vidakovic, Golub Labudovic, "Intranet in high schools", Collection of works, The Third International Conference on INFORMATICS, EDUCATIONAL, TECHNOLOGY AND NEW MEDIA IN EDUCATION, Sombor, Serbia, April 2006.

[2] Sariola, J. (2001). What Are the Limits of Academic Teaching? In Search of the Opportunities of Mobile Learning. Telelearning, Vancouver, Canada.

[3] Yuh-Shyan Chen, Tai-Chien Kao, Jang-Ping Sheu, "Realizing outdoor independent learning with a butterfly-watching mobile learning system".

[4] Masayasu Morita, "The Mobile-based Learning (MBL) in Japan", Proceedings of the First Conference on Creating, Connecting and Collaborating through Computing (C5'03).

AUTHORS

mr sci. Zoran Vucetic, Gymnasium Ivanjica, special High school Department for computers, Serbia (e-mail: microzof@gmail.com).

dr sci. Borislav Odadzic, University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia (e-mail: borislav.odadzic@gmail.com).