

MOBILE LEARNING TO THE E-LEARNING ENVIRONMENT PEU 2.0

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Abstract. Passing from electronical learning (e-learning) to mobile learning (m-learning) is the newest tendency in the world educational practice. Review of mobile technologies and devices is made in the work. Created m-learning means to the e-learning environment PeU 2.0 are presented: authorized access, SMS communication, WAP text interface integrated with different medias, WAP calendar, WAP news, WAP report of student marks, WAP presentation of the PeU 2.0 opportunities, WAP report of proposed programs and courses in PeU 2.0 and WAP report of students and teachers from the user group. The created WAP interface is an alternative approach for access to means and information proposed from PeU 2.0 as it gives a part of opportunities of the e-learning environment.

Key words: mobile learning, e-learning, e-learning environments

Introduction

Passing from electronical learning (e-learning) to mobile learning (m-learning) is the newest tendency in the world educational practice. The first attempts in using the newest mobile communications in education have begun not long after.

Definitely this domain feels deficit from science researches, as well as software means. In Bulgaria, because of the nature of the task and because of the expensive and not such an extent spreaded mobile technical means, similar attempts are not made.

About mobile learning

The concept ‘mobile learning’ (m-learning) is referring to the using of mobile and portable IT devices in teaching and learning [1]. Other definition for m-learning is: an e-learning through mobile communication devices [4]. The wireless technologies allow to be created networks where teachers wish to teach and students wish to learn.

The main advantage of m-learning is its potential for increasing the use through learning everywhere and at anytime [9].

With transformation of computers and Internet into important educational instruments, technologies become more and more portable, easy accessible, effective and easy to use. This gives a lot of opportunities to increase the access and extend the participation of information technologies (IT), in particular Internet. More and more mobile devices, as phones and personal digital assistants, are with more reasonable price than personal computers. By reason of this they represent a cheaper method for Internet access (in spite of that the price of the connection itself can be higher), and the improvements of tablet PCs allow mobile Internet access with equivalent functionality to the personal computers.

About mobile technologies

Nowadays the mobile operators in Europe do not propose enough types of services which could be a part of m-learning – for example videoconfereces in real time and transfer of high quality graphical applications. The development of m-learning entirely depends on the success of the new generation mobile networks and devices which will be established at the market in the future.

The progress of the mobile technologies is based on the development of series of protocols which standardilizing proposed mobile services as *Global System for Mobile Communications (GSM)*, *Universal Mobile Telecommunication System (UMTS)*, *General Package Radio Services (GPRS)*, *High Speed Circuit Switched Data (HSCSD)*, *Circuit Switch Data (CSD)*, *Enhanced Data rates for GSM Evolution (EDGE)*, *Short Message System (SMS)*, *Multimedia Message System(MMS)*, *High-Speed Downlink Packet Access (HSDPA)*, *Wireless Application Protocol (WAP)*, e.t. [2, 3].

The wireless application protocol (WAP) is the first common standard for Internet services in the mobile networks. The protocol standardilizes the design of wireless internet infrastructure, which helps wireless devices to communicate one by one. WAP make it possible the “mini web sites” to be shown, which looks simpler in accordance to normal web sites in Internet. That is why the WAP protocol is ideal to create application for mobile networks with restrictions into user interface. The language, used by wireless devices for com-

munication one by one, is Wireless Markup Language (WML).

About mobile devices

Under ‘mobile devices’ is understood devices like: mobile phones, hybrid phones, smart phones, personal digital assistants (PDA, Palms) or pocket PCs, laptops, notebooks, and tablet PCs.

The trend nowadays is orientated to provision of quicker and more reliable **wireless networks**. This would have a great influence into the nature of the courses, which were spreaded to the mobile learners. It will help also much more sessions student-student or student-teacher in real time to be carried out.

The new and unique global technology **Bluetooth** brings revolutionary changes in the wireless links in the world measure. Bluetooth allows economically profitably, continuously transferring the voice and information over the wireless way in the short radio waveband, which gives users the opportunity for easy and quick connection of the large number of devices without the necessity of the cabel network. It also expands the communication opportunities of laptops, mobile phones, etc.

The mobile technologies grow very quickly and the next generation devices will be with high rezolution colours, showing films, having microphones and playing music. The third generation mobile phones could carry out video conversations, show news and sport clips, could download and save multimedia content. The phones of forth generation will give the opportunity for development of three dimensional virtual communication and interaction wih the surrounding environment. Fot the mobile students this will mean better audiovisual perception of the learning information.

The main opportunities of PeU 2.0

PeU 2.0 (Plovdiv Electronic University) [5, 6] is a contemporary platform of design, development and support of virtual learning environments. The elements of PeU are:

- ◇ **Subjects** – students, teachers, authors, visitors, administrators;
- ◇ **Objects** – learning programs, learning courses, learning materials and test assignments, learning and library resources, e-mails, e-messages, etc.;
- ◇ **Processes** – choice of learning program and course, enrolling, learning, teaching, consulting, monitoring, assessment, selflearning, selfassessment, communication, using library, making reports, administration, creation, edition and publishing of learning materials, etc.

PeU gives opportunities not just for distance creation of learning courses and carrying out the virtual learning, but also for experimenting the new learning methods – in different subject domains and for different categories of users. The virtual platform PeU is the first attempt for creation of the environment for e-learning, in the base of which is not the lecture (theme), developed from one author, but is a set of independent information and controlling units, located in the data base (DB) [7, 8]. The system maintains five access levels for every subject. Five subsystems are realized – information, test, authoring, communication and administrative.

The **communication** subsystem proposes information and means for supporting different types of relationship among users:

- ◇ **Asynchronous** (e-mail, forum, calendar, reminder, shared files, personal web pages, SMS, information about traditional post address and fax number);
- ◇ **Synchronous** (chat, audio conference, video conference, telephone conversation, face to face meeting).

The platform is comparable to the best European samples – it not just satisfies almost all of the 108 criteria for assessment and comparison of the virtual learning environments, but it also possesses a number of unique functional characteristics:

- ◇ Modeling **the course for learning** the given **subject domain** as oriented graph with nodes containing learning materials (lectures and assignments, groups of them) or controlling ones, linked with relations from type predecessor – successor;
- ◇ Grouping materials into learning course nodes with logical relations from type *SubGroup*, *AND Group*, *OR Group*, *MORE Group*, *Join_Split*, *Repeat* and *Check_Point* (in the last case **check points** are created, in which the assessment of the learners progress is generated automatically and the feedback with the respective teacher is realized) and the learning is automatically orientated according to the student's progress;
- ◇ Description of **learning materials** through lists of concepts, levels and used resources;
- ◇ Creation and edition of the **learning courses** – on the base of logical grouping of the learning materials (created from different authors), setting the check points and relationships in the learning course;

- ◇ **Automatic generation of dynamic learning courses** and adaptation to particular learners;
- ◇ Carrying out **learning with resource restrictions**;
- ◇ Supporting of an **integrated DB** including the subjects of learning, subject domains, learning materials, learning courses, educational plans, etc.;
- ◇ Automatic construction, editing, visualization and assessment of a **large variety of test assignments** (24 types), including compound ones and adaptive, nonadaptive, random generated and time tests;
- ◇ **Friendly adaptive interface** with elements of visual programming;
- ◇ Using all kinds of **asynchronous and synchronous communication** between users;
- ◇ Using **free products** as Apache Web server with installed PHP module and DBMS MySQL.

Mobile learning means to PeU 2.0

This work presents the attempt for creation of m-learning in Bulgaria.

The m-learning to the e-learning environment PeU 2.0 is connected to the means proposed from the environment for the link with mobile devices and WAP interface for mobile phones and Pocket PCs.

The creation of PeU 2.0 WAP interface is an alternative approach for access to the e-learning environment. The WAP interface gives a part of opportunities of the e-learning environment.

The **main opportunities** which PeU 2.0 affords for m-learning are: authorized access, SMS communication, WAP text interface integrated with different medias, WAP calendar, WAP news, WAP report of student marks, WAP presentation of the PeU 2.0 opportunities, WAP report of proposed programs and courses in PeU 2.0 and WAP report of students and teachers from the user group.

The users of Internet environment as well as of WAP opportunities have received **authorized access** to the proposed means in accordance of their concrete current role (student, teacher, author, administrator or guest). The role is determined in the e-learning environment PeU 2.0 by the system administrator. The user can have several roles as in the certain moment he/she logs on in the e-learning or WAP environment with one of them (current role).



Figure 1. WAP interface of PeU 2.0

Communication by SMS is proposed in PeU 2.0, as the SMS messages are sending by Internet from the e-learning environment to the mobile phones of the environment users (for example from teacher/student to particular learner, several learners or whole learning group). This opportunity can be used for example for noticing students about determination of expected assessment and receiving the mark and feedback, carrying out the unnoticed discussion in the chat rooms or the forum, e.t.

The developed alternative **WAP interface** is mostly **textual** for faster access, but with the opportunity for **integration of different media** – images, audio or video clips and animated graphical elements.

A part of the PeU 2.0 opportunities are realized as a WAP – calendar, news and different reports. The information received by Internet or WAP environment is the same, because of using one integrated DB – the DB of PeU 2.0.

The **WAP calendar** gives the opportunity messages to be placed and read in/from PeU 2.0. Each user independently from his/her role has the right to use the opportunities proposed by the calendar. The messages are divided into two categories: personal and general. The general messages can be read by all users of PeU 2.0, while only owners have access to the personal messages. The list with messages, which is visualized to the user, is filtered to show all placed messages from current day and further (old messages are not shown).

Except the message at addition of a new message in the calendar, the user have to compulsory determine message category, time and date, as the environment automatically adds the name of the user-sender. The messages are saving/reading in/from DB of PeU 2.0.

The **WAP news** gives access to the topical news connected to PeU 2.0. Users read the news (content and date of publishing) by mobile phone from the environment DB. The list with news, which is visualized to the user, is filtered, as only news from current date and further are shown. The news is freely accessed for all user of PeU 2.0 independently from his/her role. The new news are added only by Internet environment.

The **opportunities of PeU 2.0** are presented in the WAP environment without restriction of the users access. The information in the mobile environment is about – proposed means and opportunities from PeU 2.0, its prehistory, available subsystems (information, author, test, communication and administration) and their functionality, e.t.

All users of mobile devices can receive **WAP report about proposed learning programs and courses in PeU 2.0**. For each learning program the list with included learning courses is given, and for learning courses – short information what is studying inside them.

The most useful proposed **WAP report is for the marks of a particular student**. Only students and teachers have the access to this opportunity. The report for the student represents information about received marks for the course, which he/she learns. In such reports the teacher can learn the data from marks of particular course of one student or group(s) of students which the user teaches. In the report date of placing the mark and its type (current or final) are given.

The **WAP report for students and teachers from the users group** is forbidden for access to the rest environment users. Through this report each student can inform himself/herself about the teacher('s) names of the learning courses in which is enrolled, as well as to receive additional information about their personal e-mail address, phone number and mobile phone number. The student can receive similar information about all his/her fellow-students from the learning groups in which is included. Each user of PeU 2.0 with teacher role can receive WAP report for learning groups, which he/she teaches, together with data for each his/her student (names, e-mail addresses and phone numbers). The mobile environment gives something more from information about users' phone numbers – it gives the facility for direct calling of the given phone numbers.

Realization of the WAP interface

The WAP cite of PeU 2.0 is located on the address: wap.peu.pu.acad.bg. Each user having mobile phone or pocket PC, using only one action – to trace

proposed hyperlinks between respective screens (pages) of the mobile device, can use the WAP site.

The WAP interface proposes different opportunities for different categories of users shown in Table 1.

Opportunities means	Role				
	visitor	student	teacher	author	admini- strator
Information about PeU	✓	✓	✓	✓	✓
Learning programs	✓	✓	✓	✓	✓
Learning courses	✓	✓	✓	✓	✓
News	✓	✓	✓	✓	✓
Authorized login		✓	✓	✓	✓
Calendar		✓	✓	✓	✓
Courses		✓	✓		
Marks		✓	✓		

Table 1

The users, which are not registrated in PeU 2.0 receive the most limited access. They have the opportunity to receive information about the e-learning environment PeU 2.0, the news in PeU 2.0, proposed learning programs and learning courses.

For access to the other opportunities of the WAP interface the user before that is necessary to be registrated in PeU 2.0 with respective user name, role (student, teacher, author or administrator) and password. In accordance to the role each user receives authorized access to the e-learning environment, as well as to the part of the Internet opportunities in the WAP site.

The user with “**student**” role has access to two opportunities: *Calendar* and *Courses*. Only courses are vizualized to the student, in which he/she is enrolled to learn in the system PeU 2.0.

In the *Courses* user has to choose particular course from the list and can receive additional information about his/her teacher, other student or check his/her mark.

Proposed opportunities for **the teacher** in the WAP interface are: work with the *Calendar* and reports about courses. To the teacher is given access only to the learning courses, which he/she teaches.

Proposed means in the WAP interface for users with roles **administra-
tor** and **author** (except freely accessed) till now are limited to the only one opportunity of working with *Calendar* of the environment.

Software realization

The mobile application, presented in this work, is realized with MS .NET STUDIO (for the visual components is using HTML, and for the programming logic – C#). The application is realized for MS Windows operating system using Web server IIS and data base management system of PeU 2.0 – MySQL. The WAP interface of PeU 2.0 is accessed through CSD protocol, as well as GPRS protocol.

Conclusion and perspectives

Creation and integration of the m-learning means in the virtual learning environment gives them new characteristics and intellectual opportunities. In our opinion, this is the most topical direction in the development of e-learning environments. As natural continuation of the work, the following opportunities for PeU 2.0 can be realized: WAP carrying out test examination through questions and assignments from DB of PeU 2.0 with saving information about student results and WAP learning over the course (indexed) on the base of main concepts in the learning course.

Undoubtedly, the communication in the contemporary information society will be on the base of mobile communications. That is why, the methods and means for m-communication and m-learning, created in the work can be multiplied and used also in many other systems requiring integration of similar technologies. For example, the received results can be used for providing of different WAP reports for candidates to learn at the University of Plovdiv about the time of the student candidate campaign.

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МОБИЛНО ОБУЧЕНИЕ КЪМ СРЕДАТА ЗА ЕЛЕКТРОННО ОБУЧЕНИЕ PeU 2.0

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Резюме. Най-новата тенденция в световната образователна практика е преминаването на електронното обучение (е-обучение) към мобилно обучение (м-обучение). В работата се прави преглед на мобилните технологии и устройства. Представят се създадените средства за мобилно обучение към средата за електронно обучение PeU 2.0: оторизиран достъп, комуникация чрез SMS, WAP текстов интерфейс интегриран с различни медии, WAP календар, WAP новини, WAP справка за оценките на конкретен студент, WAP представяне на възможностите на PeU 2.0, WAP справка за предлаганите програми и курсове в PeU 2.0 и WAP справка за студентите и преподавателите от групата на потребителя. Създаденият WAP интерфейс представлява алтернативен поход за достъп до средствата и информацията, предлагани от PeU 2.0 като предоставя част от възможностите на електронната среда.