

BUILDING AN E-LEARNING SYSTEM IN TECHNICAL UNIVERSITY OF GABROVO, BULGARIA

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Abstract

In Technical University in Gabrovo, Bulgaria we started a project for building an e-learning system. Our platform is based on Moodle 2.3 and it has some interesting extensions. The aim of this paper is to share our experience, starting from defining the initial need from e-learning system, to describe some technical details, encountered difficulties and the way we overcome it and the overall effect from implementation of the system.

Keywords: e-learning, system, Moodle, virtual library.

1 INTRODUCTION

Technical University in Gabrovo, Bulgaria is celebrating 50 years anniversary in July 2014. It is an academic and research organization, which provides high-quality education in conformity with the labour market needs for modern broad-profile Bachelor degrees, as well as modern Master and Doctor Degrees in the field of engineering and technologies, business and social sciences. A guarantee for this is the institutional accreditation of the university and the programme accreditation of the degree courses in the professional trends for Bachelor and Master and the research programmes for Ph.D. degree, granted by the National Evaluation and Accreditation Agency. The quality management system implemented for the training, research and academic staff of the university has been certified according to ISO 9001:2000 and ISO 9001:2008 by DQS GmbH and IQNet. Technical University of Gabrovo has been accredited by the European Society for Engineering Education IGIP and by the European Federation of National Engineering Associations FEANI.

The university has three faculties - Faculty of Electrical Engineering and Electronics, Faculty of Mechanical and Precision Engineering and Faculty of Economics. Until now we had only in-presence learning form.

Before starting the project for building and using an e-learning platform, we were experiencing the following challenges:

- The in-presence learning form restricts the count of our students, because most of them are living in different parts of the country and some of them are working in parallel with learning;
- The students must learn in time-fixed semesters and they have no possibility to use flexible their free time;
- The students starting their education in the university have different levels of knowledge and it is difficult to be educated together;
- When a student starts its education in one specialty, it has no possibility to take any course from another specialty;
- We rather had curriculums developed from business organizations and aligned with their requirements for student's knowledge and experience;
- We educate only students; graduated people cannot use the university's resources to improve their knowledge during their whole life.

The project BG051PO001 – 4.3.04 – 0051 "Development and implementation of virtual technologies for sustainably development of distance learning in Technical University of Gabrovo" is financed from Human Resources Development Operation Program of the Ministry of Labor and Social policy of Republic of Bulgaria. It started in October 2012 and will finish in October 2014.

The e-learning platform is online now and it already contains 22 modules from Bachelor's degree programs, 3 master degree programs with 32 modules, six modules for alignment of new student's

knowledge and also three modules developed from business companies. The plans are to implement more than 100 courses and to offer distance learning in at least three Bachelor and three Master programs at the end of this year.

2 E-LEARNING PLATFORM CONTENT

After conducting a comprehensive study of the existing e-learning platforms, our team selected Moodle [1]. We consider many features and specifics of the platforms, but the main reasons for choosing Moodle are that it is free and open source, and it is wide spread in Bulgaria as an e-learning platform. The version used is 2.3, which was the last stable in the end of year 2012. This summer we plan to upgrade to a most recent version. It is running on a Windows 2008 R2 Server with Apache web server, MySQL database and PHP. The e-learning system can be reached at address <http://dmoodle.tugab.bg>. Its main screen is shown at Fig. 1.

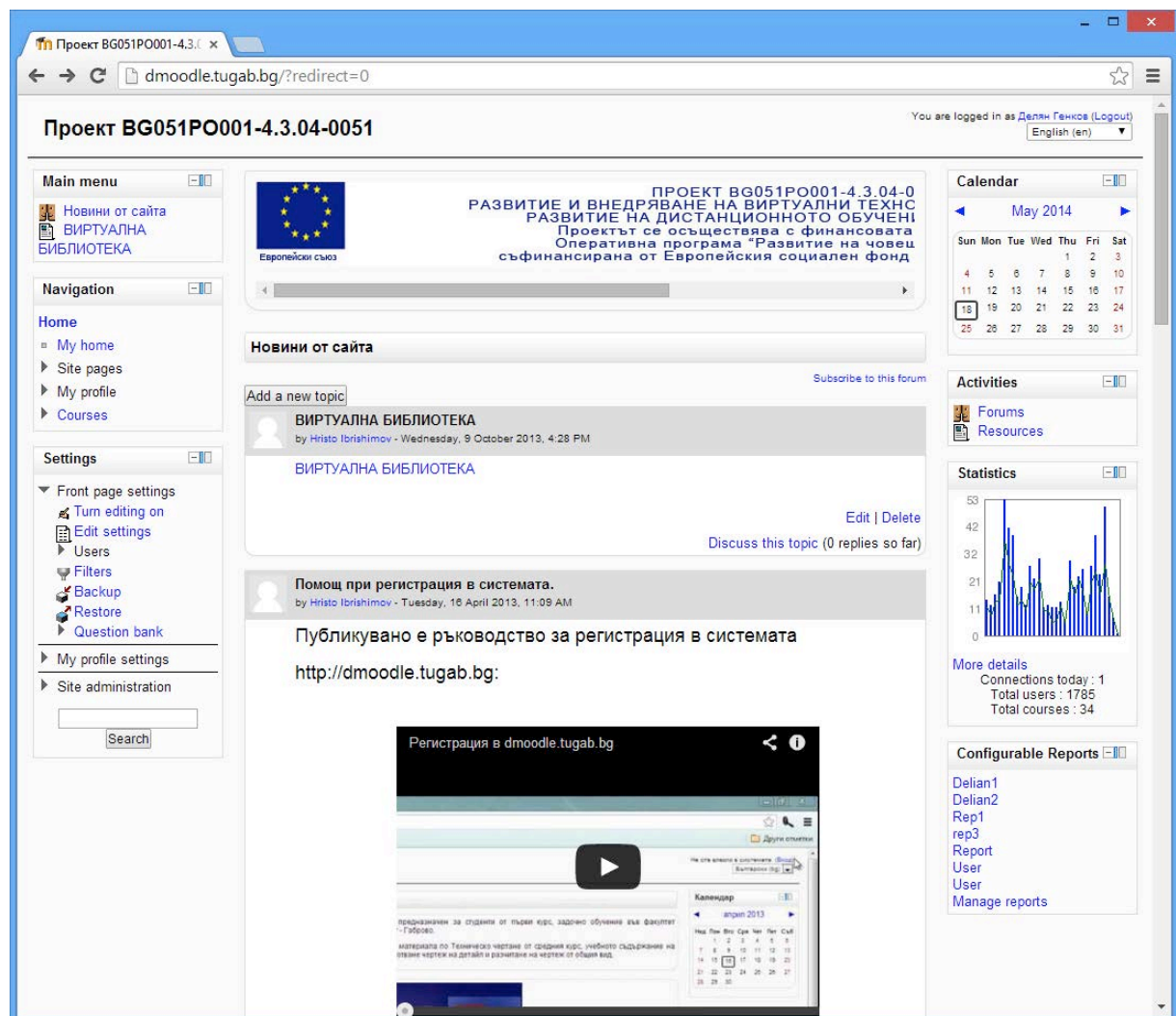


Fig. 1. E-learning system main screen

The courses implemented are divided into nine main categories. The first category is intended to provide alignment of the new students' knowledge, to the necessary level for starting their university education. It consists of five different courses – Informatics, Mathematics, Theory of Electrical Engineering, Physics and Chemistry. These are the main disciplines in which the first grade students must start their education. Because the goal is to equalize the starting knowledge of all the students and to have a stable foundation to start their training, every course begins with a pre-test, the result from which is an indicator whether this student must take the corresponding course and to improve their knowledge prior to start the actual university course in this discipline, or their preliminary knowledge is good enough to start without taking this course. Of course if the result of the pretest is

good enough, but the student is interested in the course content, it still may take the course and improve their knowledge.

The second category is Language courses. At this stage only three modules in English are prepared – Business English, Technical English and English for Academy Purposes, but similar modules are intended in German and French. These modules are supposed for all the students and graduates for improving their language skills.

Next two categories contain selected disciplines from existing bachelor education in our three faculties – “Electrical Engineering and Electronics”, “Mechanical and Precision Engineering” and “Faculty of Economics”. Because these faculties contain 22 bachelor degree courses, and every course contains about 42 different disciplines, it is difficult to create all of them as part of this project. That’s why we selected to implement fourteen disciplines from the first faculty’s specialties, nine disciplines from the second and twelve disciplines from the third faculty’s programs. These modules are intended for the regular students, educating in these courses, as well as for the students from other specialties, who are interested in these disciplines, but they are not included in their learning plan, and for graduates and other non-student learners. For learners who haven’t these disciplines in their learning plan, they are taken as complementary learning, regardless of their regular learning plan. For regular students that must study these disciplines we intend to provide a choice – they may take the e-learning course apart of their in-presence study as a complementary learning material, or they may take the online course and exam only, without taking the in-presence course and their result to be accounted into their learning plan. For achieve this, we developed a special connection between the e-learning platform and the existing learning management system in the Technical University of Gabrovo for exchange of student information and exam results. This connection is described later in the “Connections with external systems” section. In this courses the problem with students identity exists – how to ensure that the person taking the exam is the actual student. In this moment we allow the student to take the whole course remotely, but the final exam must be in-presence. In the future we are considering implementing some form of electronic identification, which will allow remote form of examination.

Next two categories implement the whole course of two master degree courses – Project management and Automotive Electronics. The first one contains nine, and the second one – ten disciplines. These courses are intended to form distant-learning master programs, but some of the disciplines may be taken as an alternative for the students, which are educating in the in-presence form of these courses as an alternative to their in-presence learning.

The last category contains courses, developed from or in cooperation with business organizations or companies working in the field where our students are educated. This helps to ensure that the students’ knowledge is aligned with industry requirements and also provides a way for the external organizations to perform their educational courses without need to have educational resources like classrooms, laboratories, teachers and e-learning systems. For now this category contains only three courses – Laser technologies in machine building, Applications of industrial controllers and Modern technologies in mechatronics, but our intends are to work closer with the industry and to develop more and more of such courses. These courses may be taken from regular students as a form of complementary education or from external learners – business companies’ servants or candidates, as preliminary preparation or qualification improvement.

All the courses, except the language courses are in Bulgarian at this stage, because most of our students are Bulgarian, but in the future we plan to implement most of the programs in English and to offer distance learning education to non-Bulgarian students. At this stage we have some students from Turkey, Greece, Macedonia and Ukraine. We believe that implementation of distance learning education in English will help to expand our popularity and coverage in other countries.

All of the programs are subject to accreditation process, exactly like the in-presence programs, and they are also aligned according to our Quality management system to ensure the quality of education.

3 EXTENSIONS

During the implementation process we met some difficulties and complementary needs, which imposed implementation of different modules and extensions to the traditional Moodle platform. In this paper we will discuss the statistics module, the virtual library and the configurable reports module.

3.1 Statistics module

This module become necessary, because we needed to find a way to prove to the ministry the actual count of students taken some courses, the actual time every student is spent on a course and the results achieved. For this we are using the standard Moodle plugin – Graph Stats (block_graph_stats)[2]. This module can be downloaded from the Moodle plugins directory and must be installed in the standard way for installation of plugins in Moodle. It displays a little graph with visitors' statistics, as shown at Fig. 2.

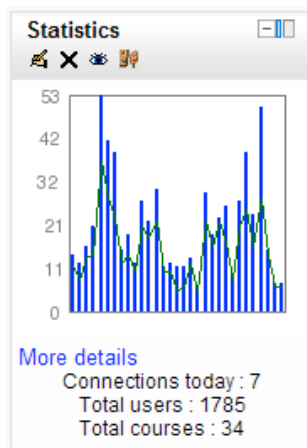


Fig. 2. Visitors' statistics.

Parameters like size, colors, style, number of days to shown and engine used (moodle /google) are configurable. When clicked the “More details” link, a detailed statistics can be requested, as shown on Fig. 3.

Проект BG051PO001-4.3.04-0051: All participants, Sunday, 18 May 2014 (Server's local time)

Проект BG051PO001-4.3.04-0051 (Site) | All participants | Today, 18 May 2014 | All activities | All actions | Display on page | Get these logs

Displaying 384 records

Page: 1 2 3 4 (Next)

Course	Time	IP address	User full name	Action	Information
BG051PO001-4.3.04-0051	Sun 18 May 2014, 5:13 PM	89.106.109.143	Делян Генков	course report log	Проект BG051PO001-4.3.04-0051
Химия - ИО	Sun 18 May 2014, 5:13 PM	77.76.179.110	Цветан Тодоров,ЕСЕО, 1 курс, редовно, 2013	lesson view	Същност на окислително-редукционните процеси
BG051PO001-4.3.04-0051	Sun 18 May 2014, 5:13 PM	89.106.109.143	Делян Генков	course view	Проект BG051PO001-4.3.04-0051
Химия - ИО	Sun 18 May 2014, 5:13 PM	77.76.179.110	Цветан Тодоров,ЕСЕО, 1 курс, редовно, 2013	lesson view	Степен на окисление
Химия - ИО	Sun 18 May 2014, 5:13 PM	77.76.179.110	Цветан Тодоров,ЕСЕО, 1 курс, редовно, 2013	lesson start	Урок 2.2. Окислително-редукционни процеси. Приложение.
Химия - ИО	Sun 18	77.76.179.110	Цветан	lesson view	Класификация на химичните процеси

Fig. 3. Detailed statistics.

The statistics can be filtered by course, student, activity, action and day, and can be displayed on a page or exported in a file.

This module didn't achieve our goal to show the overall time that every student is spent on every course, but it writes the necessary data in the database, so we needed to combine this functionality another module – configurable reports.

3.2 Configurable reports

Configurable Reports is another standard Moodle plugin, which can be downloaded the Moodle plugins directory [3]. By default it can create the following reports:

- Courses reports, with information regarding courses.
- Categories reports, with information regarding categories. A courses report can be embedded in this type of report.
- Users reports, with information regarding users and their activity in a course.
- Timeline reports, this is a special type of report that displays a timeline. A course or user report can be embedded in this timeline showing data depending on the start and end time of the current row.
- Custom SQL Reports.

Actually neither of the built-in reports achieved our goal, so we made some research to the database and created some SQL queries used with custom SQL reports. As a result we can now make detailed reports for example how many students are enrolled and graduated in every course, how many hours are spend on every course, which user is spend how much time on every course, as shown for example on Fig. 4 and many others.

Time	CourseID	Course Name	News (Новини от сайта)	user
3 days 7 hours	3	Математика - изравнително обучение за студенти в първи курс	0	pavlina
2 days 4 hours	4	Теоретична електротехника - изравнително обучение за студенти от първи курс	0	g_velev
12 hours 23 mins	4	Теоретична електротехника - изравнително обучение за студенти от първи курс	0	krmri
8 days 16 hours	3	Математика - изравнително обучение за студенти в първи курс	1	rdaskalov

Fig. 4. Custom reports.

3.3 Virtual library

This module is intended to allow the students to read study materials without being enrolled in the course and to provide them access to complementary materials and books for their learning. To achieve this we created a Moodle Database activity [4]. The database activity module allows the teacher and/or students to build, display and search a bank of record entries about any conceivable topic. The format and structure of these entries can be almost unlimited, including images, files, URLs, numbers and text amongst other things.

For the virtual library we created the following fields: Book_Title, Book_Author, Book_Cover, Book_Review, Rating, Genre and Book, the last one contains the PDF file with the book contents. The Book_Cover field contains a JPEG image with the cover, the other ones are text fields, containing the title, author, review and genre.

The database structure for storing the virtual library data consists of three tables - mdl_data_fields, containing defined fields above; mdl_data_records, containing data about books created in the library; and mdl_data_content, containing the actual books, stored in the virtual library. Their structure and connections are shown at Fig. 5.

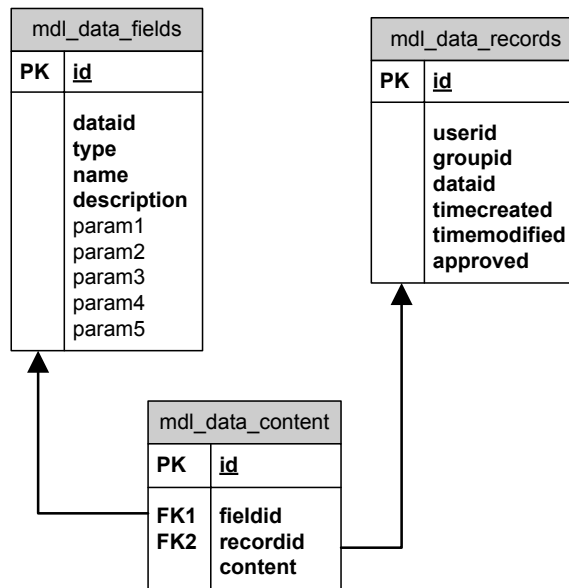


Fig. 5. Virtual library database structure.

There are also some templates created for viewing the virtual library – template for list of books, template for single book, search template and template for adding of a book. The list template is shown at Fig. 6.

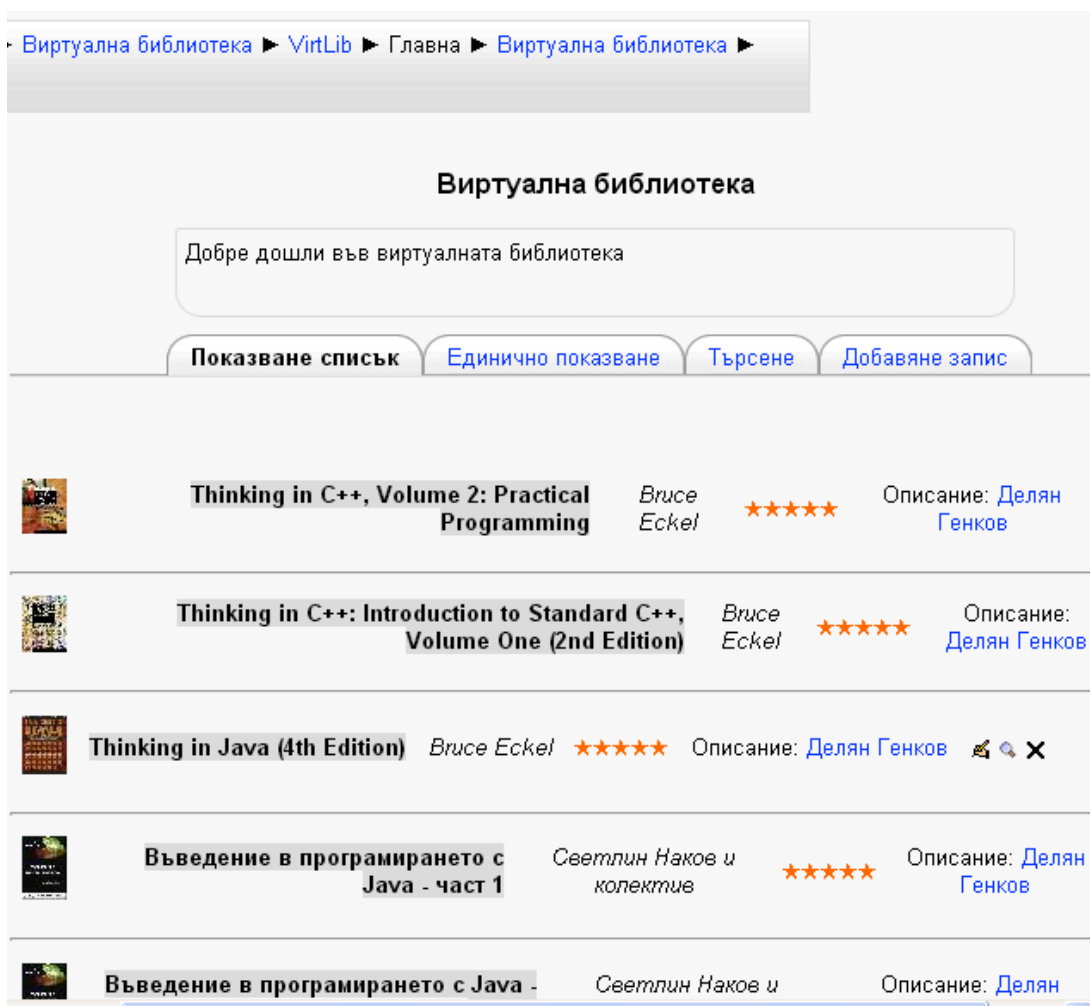


Fig. 6. Virtual library list view.

4 CONNECTIONS WITH EXTERNAL SYSTEMS

As already stated, we planned to give our students some stage of freedom to decide whether they take some course in-presence or take it online, and to account their result from distance learning platform into their university learning plan. For this feature we needed to create a connection between our e-learning system and existing university management system (stated as UMS later). Because of administrative restrictions we have no direct access to the database of the university management system, that's why the data exchange is done manually. At first we extract a comma-separated value text file from the UMS, containing their data, and import it manual in the e-learning system. Thus the student has a single username and password in both systems. We created some specific fields in Moodle to store the data needed for UMS. Then we created some PHP pages to extract the students' data and to make some reports. A sample report is shown at Fig. 7.

ID	First Name	Last Name	Kurs	Fak No:
78	Бетина	Николова	3	31113106
1294	Недялко	Стоянов	3	21111420
1340	Test	Testov	3	123456
1341	СИНАН	МУСТАФА	3	9109222462
1342	АХМЕД	ХАСАН	3	11016114
1343	НИКОЛАЙ	НАНКОВ	3	11024418
1344	МИРОСЛАВ	ПЕТРОВ	3	11031408
1345	МАРТИН	ВЛАДИМИРОВ	3	11101101
1346	ЙОРДАН	КРЪСТЕВ	3	11101102
1347	ДЕМИСЛАВ	ПАУНОВ	3	11101104

Fig. 7. A sample report.

With one of this reports we can create an examination protocol – a paper document, needed for hand-writing of the students grades, according to our university rules. This protocol contains the grades achieved from taking the online course, and every teacher can decide whether to take this grade as a final grade for this subject for the student, or to use it with partial weight along with the in-presence exam.

5 RESULTS AND CONCLUSIONS

This paper describes the initial challenges, building process and content, some technical details, and some practical extensions of the e-learning system functioning in the Technical university of Gabrovo. Introduction and implementation of e-distance learning as a new form of teaching and learning improves the quality of education and lays the foundation for long-term and sustainable development in accordance with the new requirements of the labor market. By improving the quality of training, the students well for their future implementation is increasing too. It must therefore be concluded that the commercial firms directly related to the Technical University of Gabrovo improve the quality of their products and services. Expansion of educational opportunities like implementation of distance e-learning entails the need of educational infrastructure development. The based virtual library, providing a broad and easy access to information and educational resources, as well as the expanded and adapted learning and information system and quality management are adequate and innovation-open response to new educational needs of students. The wide applicability of the established practices of e-distance learning in the various disciplines of the pilot as well as the development of activities planned for a long period after the project lead to the conclusion that the nature of the training form is highly adaptable and implemented in time. Expansion of educational services in different directions gives a significant impact on the development of university social capital. Knowledge and skills may be reproduced and distributed only. Implementation of sustainable development policies for electronic distance learning will lead to sustained improvement in the quality of education in general.

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