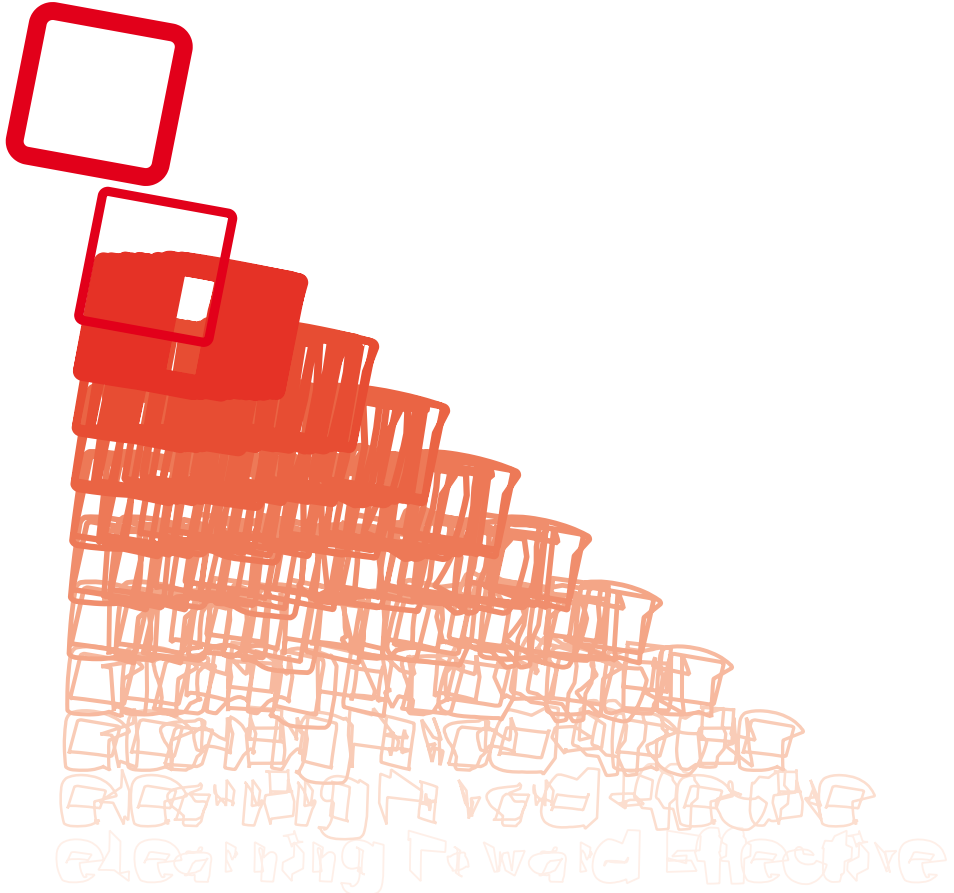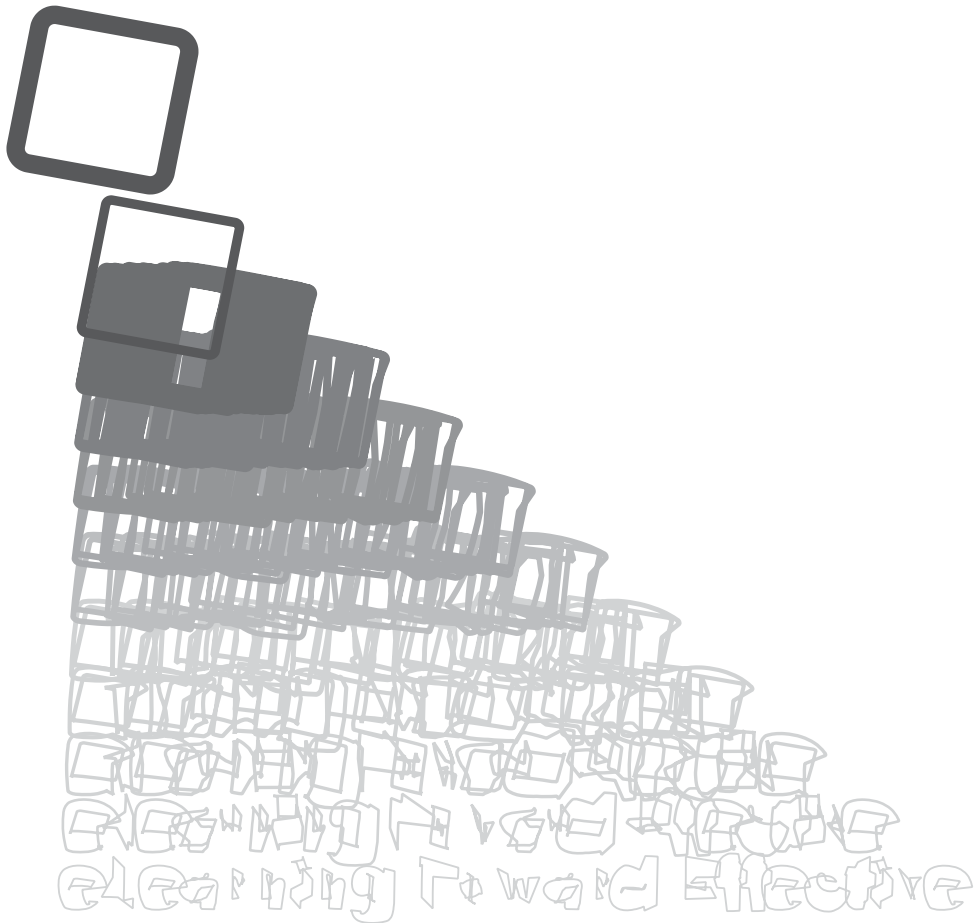# eLearning Toward Effective
Education and Training in the Information Society

Proceedings of the eLearning Conference

**July 2007,
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eLearning Toward Effective
Education and Training in the Information Society

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Foreword

In emerging complex societies, there is a clear need for sound education systems equipped with effective means to create and distribute knowledge. Therefore, in most developed countries, issues related to education and training are getting more attention and are often placed on top of the policy maker's agendas.

In transition countries such as Republic of Serbia and Republic of Montenegro, education still doesn't have full attention, usually being overshadowed by other burning issues related to stability, democracy, economy, etc. Nevertheless education community uses its creativity and strength to come out with various education development programs although relaying on scattered initiatives and enthusiastic leaderships. A great part of those efforts wouldn't be possible without donor support present in the region for almost a decade and intensified since 2001.

One of such programs is eLearning Program implemented from 2005 to 2007 by WUS Austria and financed by Austrian Development Agency.

eLearning Program aimed at widening access to educational resources and improvement of education services. It was designed to contribute to the development of eLearning in the area of Higher Education.

Program had four main components:

1. Support to eLearning Task Force - counselling activities, knowledge transfer and support to eLearning policy development at the national level.

2. Support to eLearning Centres - support to institution development at the university level.

3. Grants for eLearning Projects - grants for projects developed at the faculty/university level.

4. eLearning Conference - meetings, seminars and final conference organized by WUS Austria aiming at information sharing, dissemination of knowledge, capacity building, etc.

More than 150 university teachers and experts were involved in the eLearning Program that contributed to strengthening of role of open and distance learning, diversification of educational delivery systems and technology use in teaching and learning process.

This book contains the Proceedings of the eLearning Conference organized by WUS Austria, in Bijela, Montenegro, from 30th June to 1st July 2007. The conference served as platform for:

- presenting overall achievements of the eLearning Program and activities of university eLearning centres,

- presenting achievements of the eLearning Project Groups that have implemented eLearning Projects at the university/faculty level,

- information exchange and discussions coming after expert inputs (presentations),

- development of recomendation papers at the workshops held during afternoon sessions.

Also, presentations and discussions at the eLearning Conference served as milestone for evaluation of achievements and setting up directions for further activities in this area.

WUS Austria would like to express its sincere thanks and gratitude to all experts, moderators, representatives of university managements and participants of the eLearning Conference, particularly to coordinators of eLearning Centres coming from Universities of Belgrade, Kragujevac, Nis, Novi Sad and Podgorica.

WUS Austria

Executive Summary

In line with its mission to promote human right to education on the basis of academic freedom and university autonomy World University Service (WUS) Austria has implemented eLearning Program and organized eLearning Conference aiming at capacity building and international co-operation in the use of information and communication technologies (ICTs) and distance education in Higher Education.

The eLearning conference was designed to provide an opportunity for higher education policy makers, experts and university teachers to analyze ongoing trends in the region, and exchange experience and good practice on the impact of new technologies on their teaching profession. During afternoon sessions participants were engaged in the development of recommendations regarding choice of Learning Management Software and improvements of the national standards for quality assurance in distance education.

Each representative of the eLearning Project Group presented their experience related to the application and integration of ICTs and distance education into study programmes.

The Conference was opened on 30th June 2007 in Bijela, Montenegro with four welcoming speeches. The first speech was delivered by Mr. Goran Ostojic, Regional Manager for Serbia and Montenegro, who greeted the participants on behalf of the organizer followed by speeches of university representatives Mr. Zoran Ponjavic, University of Kragujevac, Ms. Biljana Predic, University of Nis and Mr. Bozidar Stanic, State University Novi Pazar.

According to the Agenda (see Annex 1), Ms. Danijela Scepanovic, opened the plenary session using time to reflect on eLearning Programme results, developments in the area of eLearning in our region and proposals for some future activities. Overview included presentations of coordinators of the university eLearning centres: Mr. Bozo Krstajic (Podgorica), Mr. Nenad Grujovic (Kragujevac), Mr. Ratimir Drakulic and Mr. Milos Bajcetic (Belgrade) and Mr. Dragan Jankovic (Nis).

The plenary session continued with the presentation of two keynote speakers Mr. Franz Niederl and Mr. Johannes Feiner aiming at brining closer experiences on introducing eLearning at FH JOANNEUM with a very specific outlook for the organizations who decide to engage in similar adventure. First Panel discussions gathered the group of three eLearning Project Presentations followed with the another group of two eLearning Project Presentations. Afternoon session was

reserved for two parallel workshops. First workshop: eLearning as an eLearner was moderated by Mr. Franz Niederl and Mr. Johannes Feiner and second: Standards for Quality assurance of Distance Education by Mr. Dejan Stankovic and Ms. Danijela Scepanovic. As a result of this workshop the following documents were prepared: *Conclusions on Quality assurance discussion based on two specific topics, Recommendation paper for distance education standards improvement and Proposal of standards for quality assurance of distance higher education*. Both, recommendation and proposal were submitted to the Committee for Quality Assurance in Higher Education of Republic of Serbia.

Second day of the conferences started with two keynote speaker Ms. Jasna Tingle who shared her experiences on tutoring as a part of support in an online course and Mr. Kristijan Zimmer who presented the Integrated IT infrastructure for successful eLearning.

Second Panel discussion included the new group of three eLearning Project Presentations followed with the repetition of the first workshop and continuation of the second, this time with the new topic: Learning Management Systems, moderated by Mr. Milos Bajcetic.

Third and final day of the conference, was entirely devoted to the remaining eLearning Project Presentations including the group of nine presenters followed by closing remarks and evaluation of the conference (see Annex 2).

As a result of this workshop the following documents were prepared: Conclusions on Quality assurance discussion based on two specific topics, Recommendation paper for distance education standards improvement and Proposal of standards for quality assurance of distance higher education.

Both, recommendation and proposal were submitted to the Committee for Quality Assurance in Higher Education of the Republic of Serbia (see Annex 3).

Documents are prepared as resource documents available for further discussions with the aim of achieving better quality of the education services practiced trough eLearning and Distance Education. Therefore they were published on the eLearning Network website (www.eln-online.org) along with the forum open for the inputs of the wider education community.

Danijela Scepanovic

E-Organization - The Outback Becomes Standard "eLearning at the Organizational Level"

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Internet Technology - Software Design - Advanced Security Engineering

Abstract

After single experiences of especially enthusiastic and engaged teachers, the time has come for whole organizations to incorporate the eLearning paradigm in daily business. The necessary steps from unrelated online lectures to consistent eLearning for e.g. an educational ecosystem like an university have to be planned, executed and evaluated adequately. This paper notes some concepts made and some pitfalls experienced at the FH JOANNEUM. At last a very specific outlook for the organizations on the long path to eLearning is presented.
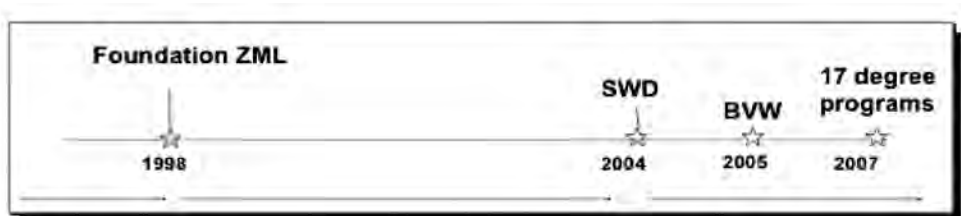
Figure 1: eLearning development timeline of the FH JOANNEUM

eLearning Steps at FH JOANNEUM

The first steps in eLearning have been in the middle of the nineties at the FH JOANNEUM (figure 1). In 1998 this single efforts of some lectures got support by the foundation of the Center for Multimedia supported Learning (CML). This center was on the one hand responsible for some research projects in the field of E-Education and on the other hand they provided WebCT[1] as a common eLearning platform for all lectures. The installation of the part time degree program Software Design with a rate of 50% to 50% between face to face and online teaching made it necessary to introduce synchronous eLearning methods like audio conferences and desktop sharing. Therefore the eLearning platform eNcephalon[2], which is based on the content management system Plone[3], was initated. Today we have 17 degree programs using eLearning methods in different ways.

The teachers of Internet Technology have gathered many - but often different - experiences with eLearning. Some are using the platform for file upload only to provide easy, 24h access to their learning material. Others do a kind of blended learning, which means they split the courses into online and offline parts. The Online parts are not additional too but instead of face to face lecture-hours. The institute provides a dedicated eLearning room (figure 2[4]) in a quiet part of the building for lecturers.

Figure 2: eLearning room equipped with standard PCs and tablet for input

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1   eLearning Platform WebCT http://www.webct.com
2   eLearning Framework eNcephalon https://eLearning.fh-joanneum.at
3   Content Management System Plone http://plone.org
4   eLearning room equipped with standard PCs and tablet for input

Equipped with two standard personal computers this room is suitable for holding an online course on one PC and at the same time get the student's view on the other on (for improved feedback). Some further, often unrelated, single efforts have been undertaken in different directions. On the didactical aspect with the Future Learning Environment (FLE) 3 by Teemu Leinonen from Finland, who inspired teachers with the ideas of knowledge-building, progressive inquiry and creative, collaborative problem solving called jamming. On the technical point a prototype of an eLearning framework (figure 3[5]) was set up to replace the expensive WebCT courses available before. Furthermore software-development by students for missing tools on the platform like rich clients and feedback-tools have been or are still in development.
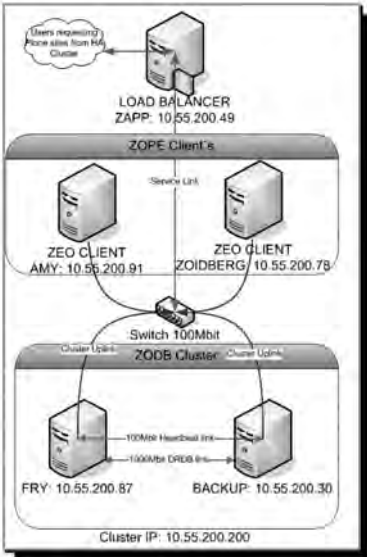
Figure 3: The cluster architecture of the eLearning framework

The E-Organization

Different divisions (figure 4[6]) are involved in an E-Organizations. For example the "actors" include students, lecturers and administrative staff. The main task of the institution is to set up an eLearning strategy to setup, a framework and to promote the eLearning methods and tools to all the degree programs. A common strategy is important to stress the organization's eLearning commitment. And also for assigning the responsibilities among the divisions. The more flexible working

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5   The cluster architecture of the eLearning framework
6   Divisions involved

environment with changed working hours and working locations brings up the need for a proper institutional framework. This framework has to cope for example with the challenges of teacher education (training online teaching methodologies) and modified working labor agreements (evening and weekend work).

When engaging new eLearning tools and methodologies, one has to cope with diversified resistance from different sides. On the one hand staff might be skeptical about changes - especially changes concerning their courses (Are the courses not good enough any longer? Why should i switch to another platform?). On the other hand students or even the management might be prejudiced against eLearning efforts. Students will miss the face to face learning environment and feel lost in cyberspace. The management - here of course especially the finance department might realize increased costs and might block online teaching experiments. The shift from normal Monday to Friday lectures to lectures in the evening and on Saturday is expensive, because that means extra work hours for the staff and the service personnel.

Figure 4: Divisions involved

At FH JOANNEUM the Center for Multimedia Learning (CML) set up the so called "virtual campus". It holds training for administrators, lecturers and students and organizes workshops to exchange experiences. Online and offline documentation is created and distributed in different ways. The development of a quality assurance manual for degree programs guarantees a quality level comparable to traditional learning methods. One aspect of this manual is the periodical evaluation of the platform and of single courses which delivers feedback for further developments.

Figure 5: The Creative Commons License. Screenshot June 2007

When inspecting the current platform, it might look quite perfect at first sight. Nevertheless usability engineering (e.g. by getting user feedback by means of interviewing students and lecturers) brought up the desire for improvements. Simple aspects, like different "file-and directory structure" within similar courses require users to remember different navigation paths. E.g. to find specific data like schedules or homework. Simple problems might be solved by simple solutions. We suggest using predefined folder names where uploads or time-tables are located. In general setting up a global naming convention might be a good idea. Designing and distributing eLearning material has turned out to be more time consuming than supposed. Reuse (for one teacher every year, and between teachers) has to be improved in the future. The course content should also be enhanced (for searching and auto-categorizing) by input of metadata. The system encephalon supports intentionally few metadata like title, description, time-stamp and author. Unfortunately important keywords for further categorizing are missing (labels for "networking", "databases" and so forth would be helpful). For licensing the online learning material, we suggest employing the creative commons license (figure 5[7]) which allows easy country specific types of license, allowing to specify different sorts of reuse for others.

Regular evaluation is done by means of interviews with students and teachers. It has proved valuable to perform this feedback circles during and at the end of each semester. Engaging external, not prejudiced persons provides more objective results.

Course evaluation delivered some very interesting findings. Students in general are to overloaded by huge workload when doing homework (especially

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7   The Creative Commons License. Screenshot June 2007

team projects). Students long for very detailed task-descriptions and individual feedback. The first is for doing homework efficiently - the second for compensating face to face feedback. The evaluation results concerning lecturers brought up that they feel fresh impulses for their course design and like the idea of new didactical aspects. On the downside we learned about the increased time needed for intense preparations for single lessons.

The infrastructure consists of two main parts, the facility management and the IT department. Teachers need additional, special equipped rooms for online sessions. The technical infrastructure must be improved for high network load for asynchronous (parallel download of huge files) and synchronous (audio conferences, desktop sharing) online sessions. For adequate single-sign-on environments the user administration of already existing systems should become one with the eLearning tools.
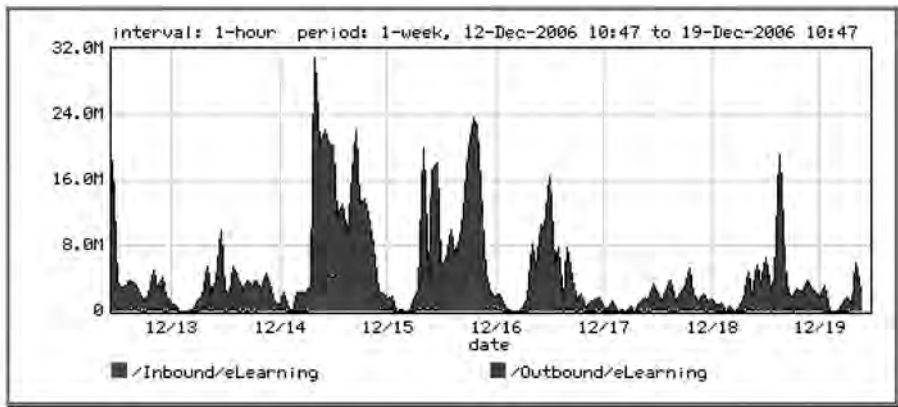
Figure 6: Network load. ZIT 2006

The central IT department told about some bandwidth troubles (network peaks, see figure 6[8]) when several live online lessons are hold in parallel. Other things one must take in mind are software licenses, which have to be installed on online learners private notebooks - no longer in central labs within the university. Students get more and more mobile. They are used to instant access everywhere. So the ZIT of an organization is forced to set up wireless network on the campus, has to permit virtual private network (VPN) access into the intranet and has to secure all the applications properly.

The IT department supports the students and the lecturers with a qualified help-desk for problems when taking part in online sessions. E.g. they provide

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8   Network load. ZIT 2006

password resetting for locked out students (and sometimes they restart crashed server processes of online tools). The service is extended to weekend and evening hours. An online help-desk system called "HelpCenter" (figure 7[9]) with Faqs and tutorial videos might solve reoccurring questions of students.
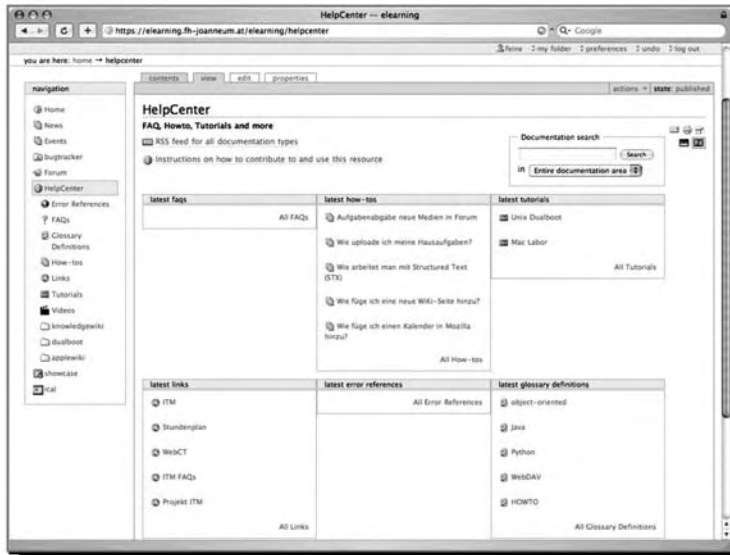
Figure 7: The eNcephalon "Helpcenter". Screenshot 2007

Some anecdotes can be told from the first years of eLearning in a "medium-prepared" E-Organization. One external lecturer had bad luck when trying to enter the buildings of the university at the weekend. No member of the facility management had been available and keys for external lecturers had not been intended. Hence simple troubles like a failing beamer or server, an expired password or a failing network connection might completely collapse a lesson.

Panta Rhei

The overall final conclusion for an organization which is on the path to incorporate eLearning is following: Live the changes! Everything is in transition: The infrastructure one is working with (allow mobile access everywhere and every time), the behavior of the actors (put everything online, detailed preparations for the courses), changes in work-time (flexible work-time, work on weekends) and last, but not least the minds (share course material, communicate everywhere).

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9   The eNcephalon "Helpcenter". Screenshot 2007

Future Prospects

As an outlook into the future of the E-Organization we definitely will need more and intense training. Training for teachers and for students are the same. Cooperation and collaboration between lecturers is more important than it has been before. Content hopefully will become more re-useable by "better", more suitable online material, but also by open minds of lecturers themselves. Mobile access to information might become "must-have", and will no longer be a special feature for tech freaks. To support every kind of transition and change it is necessary to do reflection and discussion. The organization should therefore provide specialized supervision teams to ensure best quality.

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Web-Ressources

- Content Management System Plone http://plone.org
- Creative Commons License: http://creativecommons.org/
- eLearning Platform WebCT http://www.webct.com
- eLearning Framework eNcephalon https://eLearning.fh-joanneum.at
- FLE3: http://fle3.uiah.fi/

eLearning of Engineering Graphics

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Abstract: eLearning is an all-encompassing term generally referred to computer enhanced learning. The paper deals with the methods of eLearning beeing applied in the field of Engineering Graphics. These methods have been developed in the frame of the project "eLearning of Engineering Graphics", supported by WUS Austria. The main objective of the performed project was to help the students studying the first year at the Faculty of Mechanical Engineering in Nis to learn the topics in a comfortable way, as well as to improve Engineering Graphics teaching method.

Key words: eLearning, engineering graphics, mechanical engineering.

1. Introduction

eLearning is an all-encompassing term generally referred to computer enhanced learning. It includes the use of web-based teaching materials and hypermedia in general, multimedia CD-ROMs or web sites, discussion boards, collaborative software, e-mail or blog communication, computer aided assessment, animations and simulations and more, with the possibility of a combination of different methods. These implemented in higher education have placed new demands and big challenges both on lecturers and students through the use of new technology in traditional classroom environments, implementing hybrid courses that include on-line components, or assisting in the delivery of on-line distanceLearning courses. In that way introduced eLearning in higher education delivers more training to more students in a flexible, fast, and very convenient way. It saves time, money, and resources and it delivers measurable, tangible results.

Today's world is driven by access, information, and speed. The key to success is moving knowledge from the people who have it to the people who need it. eLearning gives the power to do exactly that. Virtually anyone can sharpen their skills or develop new ones, pick up quick tips or launch a whole new career, earn an IT certification or enhance business skills through eLearning.

2. eLearning of Engineering Graphics

When we found the proposals for applying for the projects financed by the World University Service (WUS) - Austrian Committee for introducing eLearning process into curricula on faculties in Serbia and Montenegro, we have decided to take advantages of the mentioned possibilities of eLearning. We gathered a team of lecturers from the Department of Mechatronics and Control of the Faculty of Mechanical Engineering in Nis, Serbia that used to teach Engineering Graphics in the conventional way and applied for the project "eLearning of Engineering Graphics". The main objective of the project was to help students to learn the topics of Engineering Graphics and pass the exam in a comfortable way. Engineering Graphics is one of the main subjects at the first year of studying at the Faculty of Mechanical Engineering in Nis. There, the students have been teaching of regulations and standards of Engineering Graphics and training for using CAD software Solid Works 2001+ for solving different tasks of engineering problems. Among many software packages being suitable for design purposes we chose the Solid Works 2001+ as the most suitable. As a mechanical design automation software, it takes advantage of the familiar Microsoft Windows graphical user interface. It enables the students easy sketching of individual entities, experimenting with different features and dimensions and producing three-dimensional models and detailed drawings of complex mechanical parts and assemblies. The lectures took place at computer classrooms. Since there were not enough working places in the existing computer classrooms in the building of the Faculty of Mechanical Engineering, our intention was to establish a new computer classroom with more personal computers. Moreover, the existing classrooms were open only during working hours of the Faculty so we decided to launch a server in order to enable our students and other concerned having Internet connections at their homes to download teaching material whenever they like, over the whole day and weekends. In this way, students and mechanical engineers working in industry enterprises would be enabled to learn and improve the knowledge of Engineering Graphics throughout continual on-line approach to the source of necessary information, regulations and standards being collected at the unique location.

The application was successful and we obtained the WUS eLearning Project No. 011/06. The teaching process according to this project started at the summer semester of this academic year for the first time (2006/07). In the frame of this project the new computer classroom was established. It consists of six PC units (monitor 17", CPU AMD Sempron 2800+, memory capacity 256 MBytes, disk space 80GB) and one PC as a web server (monitor 17", CPU AMD Sempron 2800+, memory capacity 512 MBytes, disk space 160GB, DVD RW optical device). All of these computers have been equipped with a software package being suitable for eLearning of Engineering Graphics.

Fig. 1. The new equipped computer classroom for eLearning of Engineering Graphics

For the purpose of the effective eLearning teaching process we have chosen NetOp School 5.0 as a powerful software package that connects a lecturer's computer with the computers of the students creating an interactive classroom on the local network. In that way a number of effective teaching tools, such as the ability to show the lecturer's screen as well as monitor classroom screens to the entire class, creating and executing tests and other tools to help in supervising and staying in control of the classroom, are obtained. Furthermore, for lecturers, as well as for the students, it is very important that the audience, students or any other interested in Engineering Graphics, do not have to be physically present in the classroom. They could be in other computer classrooms in the building of the Faculty, as well as out of the building, at their homes or any other place with good Internet connection.
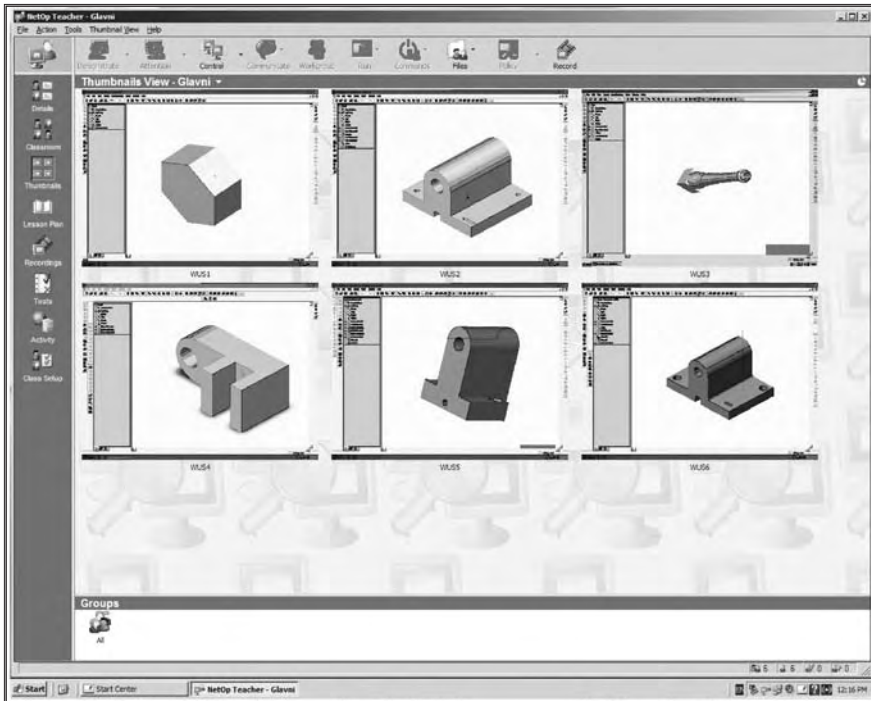
Fig. 2. NetOp School layout of teacher's desktop connected with students' computers

Consequently, the students are able to use the new equipped computer classroom for practicing Solid Works 2001+ not only during the timetable exercises, but also in extra terms after their regular classes. However, for reviewing the teaching and instruction material of Engineering Graphics topics the students are not forced to be present at the Faculty. We have also established a server for file transfer protocol in the computer classroom. The address is ftp://160.99.22.207. It contains the teaching material and web presentations for eLearning lectures and exercises of the Engineering Graphics for the following topics: Lines, Scales, Formats, Tables, Headings, Standard Numbers, Technical Letters, Axonometrical Views, Projections, Sectional Views, Dimensioning, Tolerances, Assemblies and Subassemblies. The resources are specially prepared and designed for eLearning purposes with plenty of video materials in the form of animations of successive steps for better understanding of the topics. Therefore, the ones having Internet connection at their homes are able to contact the server whenever they like, over the whole day, including weekends. Beside the students, graduated students and mechanical engineers employed in industry enterprises are also the target group of this project. Due to the web server, they are also able to use in their offices

the published material in order to perform a project task demanding knowledge of Engineering Graphics throughout continual on-line approach to the source of necessary information, regulations and standards collected at the unique location.
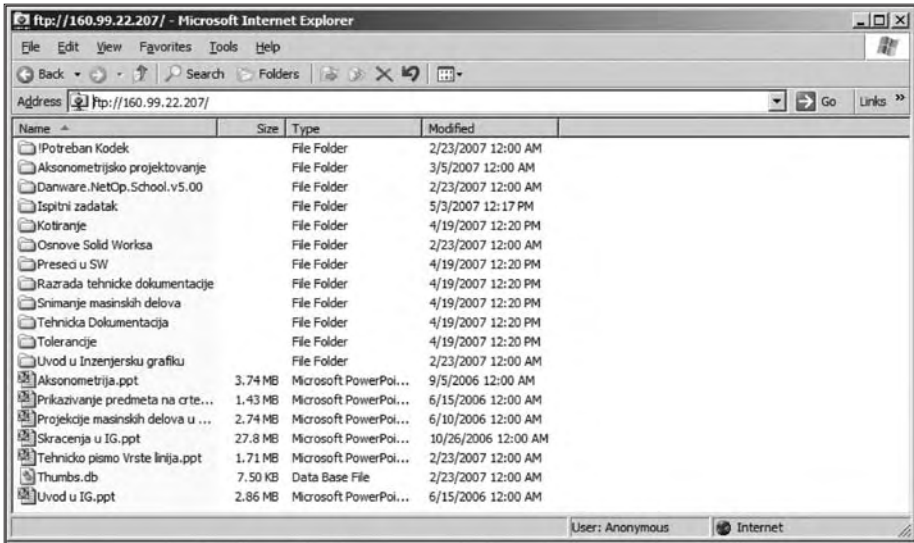
Fig. 3. Files on the ftp server ready for reviewing and downloading

Fig. 4. The cover of the printed material for Engineering Graphics

Further, as additional outcome of the project, we have prepared printed instruction material for the subject of Engineering Graphics considering the topics: Introduction in Engineering Graphics, Technical Drawing and Line Types, Projections, Sectional Views, Dimensioning, Tolerances, Assemblies and Subassemblies and Making Technical documentation. This printed instruction material has been handed over to the library of the Faculty of Mechanical Engineering in Nis, so it is at disposal for students.

With all the activities being performed during the period of implementation of the project we have also been:

- improving the Engineering Graphics curriculum according to e-Europe Strategy, eLearning Action Plan and Bologna's process,

- developing and gaining skills, expertise and experience of our teaching staff in educational processes based on eLearning,

- encouraging our students and teaching staff for eLearning through effective usage of information and communication technologies,

- establishing more accessible, faster and cheaper distribution of educational services in the field of Engineering Graphics.

We also expect in the following period, after the first year of implementation of the project, achieving the other accompanying effects that will manifest in a longer period. We expect improving students knowledge, their greater average marks of the subject Engineering Graphics, as well as of the following subjects that need capabilities in Engineering Graphics. We expect also strengthening cooperation between enterprises and the Faculty throughout exchanging of information and knowledge in the field of Engineering Graphics, and, the last but not the least, arousing the interest of young people, especially secondary school pupils, for technical sciences which will result in increasing the number of enrolling students at the Faculty of Mechanical Engineering in Nis.

3. Conclusion

According to our up-to-date experience we are very impressed by eLearning that gives students a chance to speed up or slow down their educational process as necessary, or to choose content and tools appropriate to their different interests, needs and skill levels. It eliminates geographical and time barriers opening up broader education options by on-demand access as a mean for learning that happens at the time when or where someone want or need it. For many students this represents a new, exciting, engaging and much more flexible and accessible process of learning, enhancing their computer and Internet skills.

The next main benefit from our point of view is performing eLearning as a social activity experiencing not just through subject contents, but through the use of on-line communications and networks. Therefore, learners have to work on developing and gaining of skills, expertise and experience of information and communication technologies encouraged communicating, collaborating and sharing knowledge with their students through mutual reflections and discussions. In that way the educational practice on the Faculty of Mechanical Engineering in Nis is moved from the classroom onto the desktops of personal computers

networked in the global world network.

We intend to aim our future educational work in direction to eLearning, because we have found it very useful in educational process. We shall use experience gained throughout the implementation of this project to apply eLearning as a teaching method to other subject at the Faculty, especially on the ones in the field of Mechatronics. Therefore we shall apply for further similar projects supported by WUS Austria.

Acknowledgement

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Development of Metal Forming Electronic Instructional Resources

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1. Introduction

Internet-based, interactive, multimedia technology for eLearning offers additional efficient improvements of the teaching process in area of metal forming, especially if possibilities are considered for playing video material of real industrial processes, simulations or else, to be available to each student. Process modelling, where metal forming operation is simulated by FE/FV numerical methods is powerful technique that also can be used for interactive distance learning. Generally, application of virtual engineering technologies enable obtaining of the electronic model of product, simulation of related production processes, monitoring of influences of relevance parameters for production and product quality. Considering the fact that the whole process is done in computer environment, it is ideal tool for creation of electronic educational material for students. If that electronic material is adequately designed and available at www environment, students and engineers are offered possibility to gain persistent knowledge and skills in these innovative technologies, as well as to improve their traditional knowledge on technological processes, gained in previous education process.

This paper deals with design and development of electronic instructional material in area of metal forming. That material comprises computer-based learning activities designed to teach engineering concepts. It presents experiences gained through implementation process of project titled "Development of Metal Forming Electronic Instructional Resources" supported in scope of eLearning Programme WUS Austria.

2. Project objectives

This project, as a component of eLearning programme, has anticipated the development of electronic material for Modelling and Simulation in Metal Forming course that was developed in scope of the CDP+ 009/2004 project of WUS Austria, in order to stimulate students' independent work, in-depth knowledge and increased motivation, therefore enabling easer achievement of planned study outcomes.

Traditional engineering education methods often result in competency gaps between the theoretical and the practical issues. As a result, traditionally educated engineers may have difficulty translating their classroom education into effective manufacturing practice. These competency gaps can be addressed by introducing electronic instructional material in area of metal forming processes.

Overall project objectives are established as follows:

1. Project should contribute to development of competences and skills of teachers at Serbian universities, in using of ICT technologies in production and presenting of electronic instructional material in education process, in areas of higher and long-life education.

2. To contribute to development of qualitative e-content and services for students and mechanical engineers, in the area of material processing, and its virtual simulations.

3. To show ways and methods in curriculum design and instructional resources production.

4. To enhance collaboration and information exchange between Universities in Serbia and Montenegro (University of Kragujevac, University of Novi Sad and University of Podgorica), through exchange of knowledge and good practices in area of Metal Forming.

5. To contribute to strengthening of role of eLearning as a new and engaged learning environment for students and engineers.

Specific project objective is development of e-content and instructional material production for Modelling and Simulation in Metal Forming course at Mechanical Engineering Faculty in Kragujevac, and dissemination of new educational materials to Mechanical Engineering Faculty in Podgorica and Faculty of Technical Sciences in Novi Sad, in order to:

• effectively gain the new knowledge and skills in application of new educational delivery technology in area of Metal Forming and FE simulations

• enhance the quality of education in accordance with identification of faculties needs

• improve the communication and dissemination of good practice in higher and long-life education between educational institutions, by using new teleconferencing equipment installed at universities of Serbia and Montenegro.

• better understanding metal forming processes and key principles for product and tool design.

3. Project implementation

Regarding existing human and material resources and demands of mechanical engineering faculties' to innovate the educational process, realized activities contributed to achievement of objectives above listed, from general ones that refer to eLearning program up to specific ones, as well. Through forming of electronic educational content in accordance with pedagogic principles, through transformation of existing traditional teaching material into e-Material and through making of multimedia contents the quality of teaching and students' and engineers' training will be significantly improved. That will result in increase of competencies for course trainees in area of Metal Forming, as well as Modelling of processes using FE/FV simulation. The use of available DEMO and VIDEO material from the most famous EU academic and industrial centers will improve students' practical knowledge and skills through examples of the best EU practice. The largest part of e-Material was developed at Mechanical Engineering Faculty Kragujevac, but members of the project team from Universities in Novi Sad and in Podgorica, with aim to disseminate good practice and students and engineers training in those regions in area of VIRTUAL MANUFACTURING in Metal Forming processes, also presented the new material and were trained for independent work at development of instructional resources for eLearning.

Results obtained through implementation of this project were as follows:

1. Available knowledge, recommendations and legislatives for regular development of instructional resources for eLearning are collected and systematized.

2. Specialized Software for Virtual Manufacturing MSC.SuperForm and MSC.SuperForge are purchased

3. Training for use of MSC.SuperForm and MSC.SuperForge software is realized

4. Redesign of educational content for Modelling and Simulation in Metal Forming course

5. Conventional educational material transformed into e-Material (PDF, HTML)

6. Produced multimedia content (animation, simulation, video material, etc.)

7. Collected DEMO, CD and VIDEO material from leading EU academic, research and industrial centers in area of Metal Forming and FE simulations

8. Completed instructional material for eLearning

9. Dissemination of project results, that is, of completed e-Material

10. Virtual workshop realized (during one day) titled "Modelling and Simulation in Metal Forming", through teleconferencing equipment, for students, engineers and teachers simultaneously at Universities of Kragujevac and Podgorica

3.1 Recommendations and legislatives for regular development of instructional resources

At the beginning, activities at collecting electronic material with good practice examples in development of e-material for eLearning were done. Developed eLearning systems at leading EU universities, have been analyzed, using published papers which were available at Internet. In this sense, collected material were systematized, after analyses, and prepared at CDs, for further application and distribution to all potential lecturers who wish to join at development and application of eLearning at Mechanical Engineering Faculty in Kragujevac. According to recommendations from eLearning Task Force Serbia

and Montenegro [1], prepared on 02. 05. 2005. at Cetinje, as well as from Task Force BIH [2], special attention is given to the following recommendations:

1. eContent

2. Video content

3. Videoconferencing

For Videoconferencing recommendations, there is a material in Serbian language, developed at Mechanical Engineering Faculty in Kragujevac, in scope of eLearning center and it is available in printed form. Material at Serbian language for eLearning tool MOODLE, considering the fact that it is applied as LMS at Mechanical Engineering Faculty in Kragujevac, as well as a document about standardisation that, in brief, describes SCORM standard are prepared and available on CD.

1.1.1 Standardization in area of eLearning - SCORM standard

Complexity of standardization issues in area of eLearning is easily recognized if numerous IT solutions and operative systems are considered. The mostly applied standard in this area is SCORM standard (Shareable Content Reference Model), developed by ADL (Advanced Distributed Learning) USA government organization [3]. SCORM library of standards was made with one objective - to enable interoperability, availability and repeatability of educational content, based on web technologies. Primary function of SCORM standard is to enable efficient communication between existing LMS (Learning Management System) systems.

SCORM standards describe technical demands necessary for educational material created this way, to be repeatable (repeatability characteristic). However, it does not standardize the design itself of the educational material, because SCORM is made in such a way to be suitable for large spectra of educational situations and at the same time to allow application of particular specific models of design. Standard is in a process of continual improvement through regular periodical meetings of the members of ADL community.

Application of SCORM standards in one organization that plans introduction of eLearning systems is a very complex issue, regarding the fact that it has long lasting consequences. Detailed description of SCORM standards cannot be done here, due to a scope of this paper. Institution has to adopt and implement eLearning at their system in such a way that it is SCORM compatible, but at the

same time to suggest and develop its own design for eLearning courses in such way that users are not in contact with rater complex technical specifications of these standards. It is not as simple as it might seem at the first look.

3.1.2 eLearning Tools - Moodle Learning Management System

Learning Management System (LMS) represents software or web based technology for planning, implementation and evaluation of specific learning process. It is used to organize and provide access to online educational resources for students, teachers and administrators. It is usual that LMS offer instructions for work for different groups of users. It can encompass various interactive characteristics, such as discussion groups, video conferences or discussion forums. Typical characteristics of one LMS include services for student management, student authentication, content input, content management, content delivery and other.

Free LMS platform highly applied is Moodle [4]. Very good characteristic of this LMS is excellent web based manuals. It can be discussed from three points of views: students', teachers' and administrators' point of view. Moodle software is applied as LMS for eLearning at Mechanical Engineering Faculty Kragujevac.

After collecting electronic material with good practice examples of e-material development for eLearning, material was prepared in Serbian language for eLearning tool - MOODLE. Eleven lessons were prepared for Moodle in accordance with adopted SCORM standard and uploaded into the established web location (http://www.eLearning.kg.ac.yu) (Figure 1.).
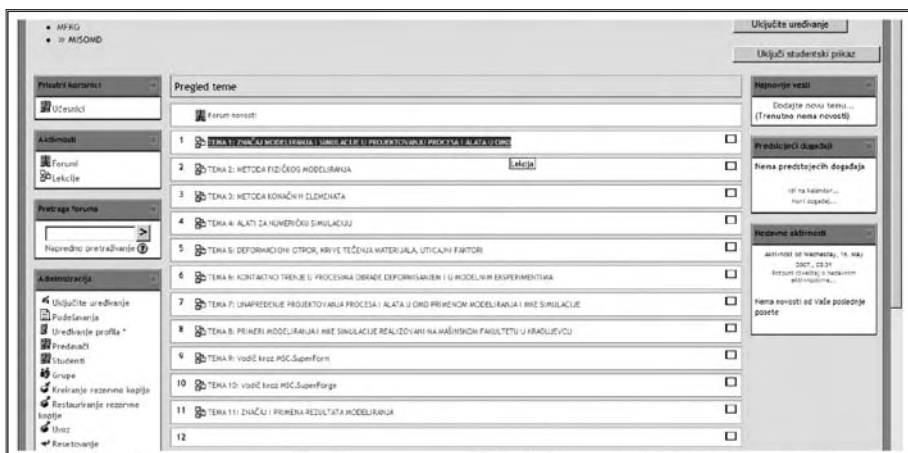
Figure 1. Main selection page of online course "Modelling and Simulation in Metal Forming"

2.2. Redesign of educational content for Modelling and Simulation in Metal Forming course

Teaching material for Modelling and Simulation in Metal Forming course, developed in scope of CDP+ 009/2004 project, has been redesigned and prepared for setting up at MOODLE platform. In that sense, 11 topics were prepared, with distributed content for every page in MOODLE editor, with appropriate navigation. All illustrations and figures were prepared separately, which in developed course existed in scope of particular lessons. The last two topics were additionally prepared, as tutorials for application of MSC.SuperForm and MSC.SuperForge software that students will use for doing exercises and projects in scope of mentioned course. All conventional material for the course were transformed into e-material and set up at MOODLE. Beside e-material for the course that is available to students at MOODLE, additional electronic material is collected on CD and DVD in a way of catalogues, DEMO and VIDEO materials.

2.3. Multimedia content (animation, simulation, video material)

Additional material was made for the course that illustrates metal forming processes as AVI files, with simulation of different modelling processes in MSC.SuperForm and MSC.SuperForge software. Visualization of processes through reviewing AVI files is very useful for students, because it improves their understanding of the physics of process itself, influence of the process parameters at their flow and analysis of output results of simulations. In scope of this project, over 10 FE/FV simulations were realized of metal forming processes: forging, upsetting, cogging, extrusion, net-shape forming, hydroforming, bending etc. Also, eLearning platform was established and video content enabled to all students in order for them to see more explicitly the nature of these processes.

4. Conclusions

Numerous technical analysis confirmed advantages of multimedia educational content over traditional ones like books, scripts, brochures. That is the reason that the multimedia content must be set up at the same level of priorities as one-media material. Within EU this is indicated as a significant mechanism for quality assurance. WUS Austria activities at academic infrastructure development in area of eLearning as well as for development of informative consultative services, helped significantly in achieving objectives of this project.

The application of nowadays current technology in the classroom (computers, internet) has lead to a more hands on experience for today's student.

The online availability of class materials has been a convenience to both student and teacher. It has cut down costs of printing class handouts and distributing them to all students and it has made them accessible to students at all times.

Process modelling and multimedia techniques together delivered via the www, offer a very powerful method for distance learning and advanced education. Modelling of production processes, where a metal forming operation is simulated in the computer environment using FE/FV numerical methods (that is VIRTUAL MANUFACTURING), offers unique opportunities for interactive distance learning for understanding the relationships between the process variables in metal forming operations. Developed e-material for Modelling and Simulation in Metal Forming course is intended for training of students, as well as for training of engineers in industrial companies (at www environment).

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Laboratory Experimental Setups for Measurement and Control via Internet

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1. Introduction

The Internet (Web) has become a widespread tool for teaching and learning. The Web enables more flexible delivery (anytime), distance education (anyplace), new visualization possibilities (interactivity), and cost reduction. In engineering education and control education, the Internet and web technology have increasingly important role, serially in concepts of distant learning. This issue was a topic of a large number of researches and papers Colace F. et. al. (2004), Book W. J. et. al. (2004), Casini M., et. al. (2004), Guran-Postlethwaite Y., et. al. (2005), Yu Q., et. all. (2004).

The web laboratory of University of Kragujevac (WLUK) (http://weblab.kg.ac.yu mirror http://www.cqm.co.yu/weblab) was established at the initiative of group of professors and associates of University of Kragujevac in order to use laboratory resources more effectively and to improve cooperation between departments, faculties and universities. The main goals is a development of a network of laboratory resources for usage of authorized group of users for research, academic and college education, as well as permanent learning.

In this paper, we will present educational advantages and limitations of a web based experimental environment using an example of one web-based experiment that is functioning in WLUK. A web portal for laboratory and directions of further development are also described (development of the integrated eLearning environment, design of access rights and schedule of usage of

laboratory resources, because only one person could control experimental set-up at the same time). The presented experimental setup consists of: a PC computer, A/D and D/A interfaces and laboratory set up (laboratory crane). Finally, we will present some initial educational results in the implementation of a web lab in the educational process at Faculty of Mechanical Engineering, Kragujevac.

2. Pre-requests, architecture and software realization of web based laboratory

Considering other relevant experiences and solutions in development of the web laboratories [Casini M., et. al. (2004), Guran-Postlethwaite Y., et. al. (2005), Forinash K., et. al. (2005), as well as the character of the planned laboratory exercises, the team that started development and implementation of the web laboratory of University of Kragujevac defined following requests for the software infrastructure of WLUK:
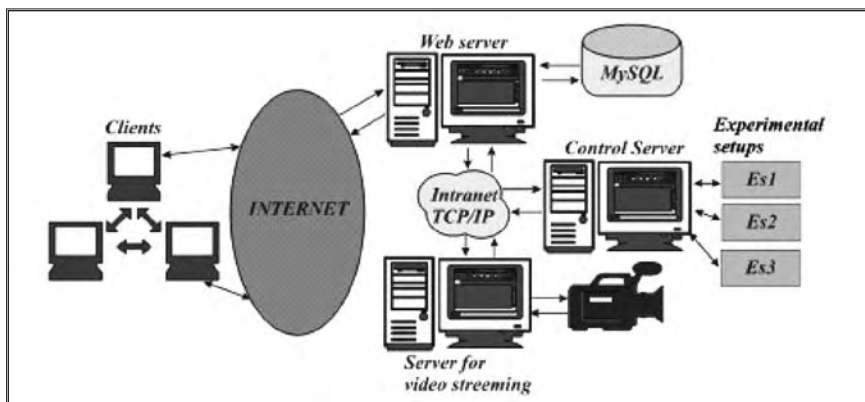
Figure 1 - Architecture of the system

- Easy understanding of educational tasks and user friendly interfaces for laboratory exercises.
- Adjustment of teaching material to the new context.
- On line presentation of an experiment.
- It is necessary to select appropriate software platform and appropriate security police.
- It is necessary that client software operates on all available software and hardware platforms.
- Environment for easy definition of the control algorithms and control signals.
- Laboratory exercises and all results should be stored in a database.
- Download of experimental results.
- Management of changes and distribution of new versions.
- System must posses modular and open structure so new component and laboratory experiments could be added easily.

In order to achieve listed demands, we selected an appropriate software architecture. The software architecture consists of two major parts: the first part that controls physical processes (on the server side server - Control Server) and the

second part that controls user interface and defines user access (also manages with other functions and parts of eLearning environment) oriented towards user service (Web server) (Figure 1).The control server is developed using programming language C#. The software module - the software interface for implementation of the control algorithm and communication with the web server is located on the local control server. The system for data acquisition and D/A converter are connected with this server.

The client side is base don dynamic pages generated from PHP or ASPX (the reason for this duality is the fact that telemetric exercises are hosted on the IIS server using ASPX and laboratory exercises in the field of automatic control are hosted on Apache server using PHP). All information about experiments, user access and other relevant information connected with eLearning environment are stored in MySQL data base.

The last planned server is the video server. The video server supports broad streaming of the video signal. This server has a task to establish a visual „feed back" and to create real impression of an experiment to potential users of the web laboratory.

2. Web laboratory - university of Kragujevac - example of one laboratory set-up

Web laboratory University of Kragujevac has 6 experiments in the filed of telemetry and 3 experiment in the field of automatic control. We will present laboratory exercise of inverted pendulum & crane. User interface and server side of application are presented on the figure 2.

a) Server side of application

The following options are enabled:

1. Selection of sampling period (default value is T=0.05s, but this value could be set differently)

2. Selection of duration of experiment (default value is t=10s, maximally up to 60s)

3. Selection of the option for control variable (in each sampling period voltage is set on D/A converter in the range of 0V-5V, i.e. in the range of -2.5V -2.5V Toward laboratory model, i.e. voltage of -12.5V-12.5V in the winding of the motor. Following options are enabled:

> a. Definition of user-defined control sequence u(kT), k=0,1,2,..., $0{\leq}kT{\leq}t$
>
> b. Definition of control sequence according to P control algorithm. Feed-back is closed by position of wagon *x* for the realization of position servomechanism (the goal of the control: fact and punctual positioning of the system with minimum swinging of the weight). Allowed selections: 1) defined values for position of the wagon (default value is x_z=60cm, but this value could be changed in the range of 0-120cm) . 2) value of *K* (default value is *K*=1 and could be changed).
>
> c. Definition of control sequence according to self-defined control algorithm. It is allowed to upload software routine for realization of any control algorithm.

4. Start and stop of experiment and indication of status of laboratory set up are available. User of the experiment has up to 5 minutes of continual access to experimental aperture. During that 5 minutes user could perform more that one experimental probes. Potential user should be registered in order to use laboratory set-up.
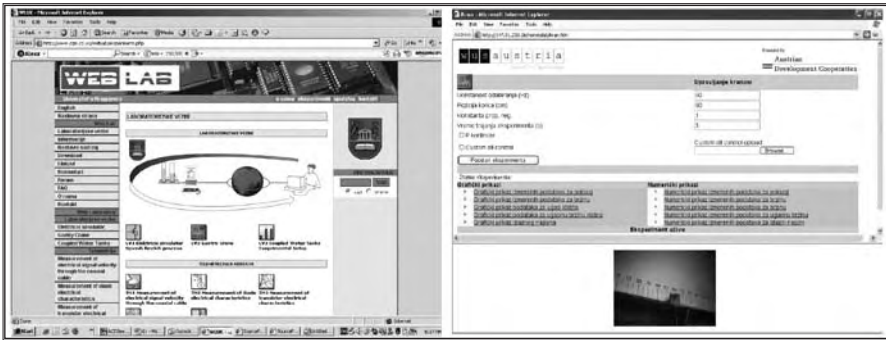
Figure 2 User interface - b) Client side of the application

5. Experiment is monitored by web camera. This service has a task to establish a visual „feed back" and to create real impression of an experiment to potential users of the web laboratory.

6. After performed experiment or after defined time of experiment t, user could observe experimental results in two modes: 1) Diagrams of change of relevant variables during the time and 2) Available file with tables and numerical presentation of results with following variables: time t, current in the motor i, position of the wagon x, the velocity of the wagon, angular position of pendulum φ, angular velocity of pendulum, control variable u (voltage of the motor).

7. End of experiment - it is activated by button „Kraj", or by the end of selected duration of experiment. The end of experiment starts control procedure that turns wagon into initial position x_0=0cm.

4. Initial educational results

The eLearning concept is mentioned as a very important corner stone in education in all important combines and declarations of European Union (Stefanovic M., et. al. (2006). The main recommendation is connection between concepts of eLearning, web laboratories and permanent education and distant learning.

No	Question	Mark				
		1	2	3	4	5
1	Task is clear			17%	26%	57%
2	Educational goal is well presented			27%	25%	48%
3	Exercises are accompanied with appropriate theoretical content			25%	30%	45%
4	System is reliable		16%	18%	32%	34%
5	System is easy to use		5%	15%	28%	52%

Table 1 Students' questionnaire- Character and organization of web laboratory

Effects of implementation of web laboratory	Mark				
	1	2	3	4	5
System provides better training					
Multimedia character of course					
System makes laboratory exercises easier					
Decrease time of preparation for laboratory exercises					
Improves organization of course					
Improves character of lectures					
Stimulation for students					
Gives better information about course					

Table 2 Students' questionnaire - Effects of implementation of web laboratory

Title	Number of access to WLUK	Average mark of users' satisfaction WLUK (1-5)	Average mark of users' satisfaction Austria Niederl F., et.al. (2006)	Electronics Engineering Technology Oregon Institute of Technology (Guran-Postlethwaite Y. et. al. (2005))
Web Laboratory	526	4.13	2.99	3.00
On-line testing	3237	3.71	-	-
On-line material	-	3.40	3.03	-
Virtual seminar	-	-	3.07	-

Table 3 Indicators of usage of integrated environment for eLearning

The presented web laboratory, with other parts of the integrated environment for education, became a part of the education process during the year of 2006 on Faculty of Science and faculty of Mechanical Engineering. The web laboratory is presented to students from departments of Automatic Control and Industrial Engineering form Faculty of Mechanical Engineering. Students used the web laboratory during the educational process and filled on-line questionnaire in order to present their experience and evaluate benefits from the web laboratory, the results are presented in Table 1. The positive response from the student population was undivided; they highly evaluated organization and character of the web laboratory. The students accepted this educational tool and responded with the main answer that the web laboratory fulfilled planned educational goals, and they completely understood laboratory experiments goals and tasks of exercises. The students also pointed that the system is user-friendly, and easy to use.

The students were also encouraged to give their conclusion about the effects of implementation of the web laboratory. The results are gathered, grouped

and presented in Table 2. It is important to emphases that there was no negative reaction, and more important conclusion is that the web experiment contribute to better and more quality understanding of the educational material.

Other similar researches have similar results. For example, Universities Australia concluded: *"Virtual experiences are valued for their flexibility of use, availability for revision and provision of additional information, whereas real experiences are valued for the hands-on, 3D nature but also for their 'reality'* (Franklin S., et. al. (2005))".

This approach to education was accepted and highly evaluated by students, results in Table 3. Comparing Austria University and Oregon Institute of Technology, the students satisfaction is better, but this is a result of higher motivation of the Serbian students because they usually do not work with modern on-line educational resources, so our students highly evaluated the initial steps in that direction.

These results encourage us to continue to develop the web laboratory and to interconnect our lab with similar labs (we plan to increase number of experimental setups and to integrate web laboratory with other eLearning resources.

5. Conclusion

The expansion and development of information technology, enables usage of new, highly-quality education systems much different than the traditional systems. In the concept of eLearning, an virtual laboratories have an important place. These virtual laboratories increase availability of the laboratory equipment to students and decrease maintenance costs.

This paper describes education advantages, organization, realization and educational effects of one laboratory exercise in the web laboratory of University of Kragujevac. It is interesting to mention that the experimental setup is very cheap and based on the legacy equipment, but in the new environment it presents a very useful education tool for training and education in several courses at University of Kragujevac (Modeling and Identification, Control Engineering, Real-Time Programming).

The achieved goals of control education and engineering education using web laboratories are:

1. To provide the basis for lifetime learning so that new control problems can be dealt with.

2. To establish and maintain high standards of excellence for the experience of learning the foundations of control.

The implementation and usage of web laboratory improved education process in many different ways:

• Laboratory is accessible 24/7. A student time is personalizes, e.g. students may freely plan their experiments. The analysis of access information of the web lab shown that we have access to web lab at any time, maximum is between 22.00 - 23.59 - 11.8% so total visits, and minimum is between 06.00-06.59 - 1.6% of total visits to web lab.

• Physical presence of students is not mandatory in the laboratory building. This is very important because enables concept of distant learning and enables permanent education of people who are dislocated from university and educational centers. Almost 1/4 of accesses to the web laboratory were made out of region of Kragujevac, where university is placed.

• Optimal utilization of resources. Increasing of availability of the laboratory equipment and full access to the laboratory no matter of location leads to better utilization of laboratory resources. The analysis of accesses to the web lab shown that 27% of accesses were made from academic network, and 73% of accesses were made from outside access nodes. This rationalization in utilization of laboratory resources leads to lower expanses.

• Better preparation for experiment. The access to the laboratory equipment and theoretical content, as well as the previous experiments, offer better preparation of students for the experiment. Student could individually try and repeat experiment as many times as they need to prepare. According to the analysis of the access information, we determinate that each student perform specific experiment 5.1 times in order to improve his/her knowledge or to check his/her results.

• Web lab is a very important for the concept of permanent education for all employed and unemployed persons. People with special needs could use resources of the web lab and have the same opportunities as all others. Distant learning and the web lab make them equal in the education process.

• Initial results of the implementation and usage of the web laboratories have shown that this education approach has great motivation and education effect, and improve organization and quality of education (table 1-3). The analysis of students' feedback show that students highly evaluate this approach in engineering education. The feedback from users has been quite positive, and the convenience and ease of use of the system have been universally appreciated.

One great advantage of this web lab is fact that this lab is part of an integrated eLearning environment. Students have theoretical content, practical work in the web lab and opportunity for self-evaluation using e-tests. Everything mentioned above emphasize importance of dynamic eLearning environment and high potential of web laboratories.

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Results of Transformation of Traditional "Linear Structural Analysis" Course Into the eLearning Course

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1. Introduction

This paper should be the brief overview of all results achieved within realization of WUS Austria programs last few years. Also, this chance will be specifically used to promote activities performed in the realization of the eLearning program as well as great contribution of WUS support to institutional development of the universities in Serbia and Montenegro. Project teams from Faculty of Mechanical Engineering of Kragujevac generally showed significant interest for WUS Austria programs. Thence, this kind of presentation of achieved results has additional importance to give the impulse to the other universities staff to participate in the calls and programs organized by WUS Austria.

2. Importance of previous cooperation with WUS Austria

Previous cooperation with WUS in the framework of programs Centers of Excellence Projects (CEP), Course Development Program (CDP) and Course Development Plus Program (CDP+) issued the following realized projects: CEP N°088/2003 „Development of the Engineering Software and Improvement of Teaching Process on the Regular and Postgraduate Studies at the Faculty of Mechanical Engineering", May - September 2003 and CDP N°057/2004 „Nonlinear Structural Analysis", October 2004 - September 2005. These projects have supported the course development at the faculty with provision of

equipment foreseen as an accompanying measure. These programs supported the improvement of courses, with the objective to facilitate the transition of higher education in SEE towards European standards. Also, they generally encouraged the faculties to introduce new subjects and to apply innovative approaches - in content and methodology - to already existing courses.

Since the eLearning is considered as area of education with the great potential and interest from university practitioners in Serbia and Montenegro for this topic was shown, WUS Austria decided to start with the eLearning Program, [1]. Due to experience of the Project Group members with actions related to eLearning within realization of the Tempus Joint European Projects UM-JEP-17119 entitled "Educational Network Based on Information Technology" the chance for further courses development within eLearning program was recognized. As the logical next step in the attempt to improve education services, the following project within eLearning program was proposed: Transformation of traditional "Linear Structural Analysis" course into an eLearning course. This project was directly connected as continuance with above mentioned CEP projects N°088/2003. This was also the great oportunity to follow launched reform of higher education in Serbia according to Bologna declaration and ECTS. Using such available information technology eLearning should become the basic prerequisites for modern lifelong learning and continuous education programs, offered by university and consumed by citizens of information society.

3. eLearning Project Results and Findings

As a result of joint efforts of WUS Austria and university representatives, five eLearning Centers at universities of SCG were established and equipped. Project Groups during the project realization cooperated and used resources available at the eLearning Centers. During the project implementation, at the first stage users' needs were collected and clarified. Analysis of the structure and the content of the existing traditional course, its teaching and examining methodology were performed. After that the objectives and strategy of transformation of traditional into the eLearning course were defined. Some necessary experiences were collected through the organized eLearning seminar as well as direct contact with colleagues from other institutions. The project team organized meetings with students as well as associates on the faculty to discuss advantages and disadvantages of proposed course material and its on-line form. Using up-to-date computer techniques (MOODLE software) previously agreed with University

eLearning Centre design of online course started, [2]. The strong experience in IT helped to overcome all requests in the attempt to create the quality interactive on-line course. During the whole project realization significant support by students who recognize importance of the started work as well as chance to do something new in their education was given. Since they can customize the learning material to their own needs, students understood that they will have more control over their learning process and can better understand the offered material.

Using teaching and communication techniques the interactive online environment was created. The learning management system (LMS) for a complete eLearning infrastructure, creating, managing, tracking, delivering, and assessing was provided by the University eLearning Centre at the Faculty of Mechanical Engineering in Kragujevac. Implementation of the project included the appropriate focus on both the technological (e.g. acquiring IT skills needed to use eLearning) and pedagogic (e.g. using eLearning to learn) aspects of staff development to meet organizational, unit and individual needs. The project also was carried out in collaboration with those who have expertise in using eLearning to support teaching. Students as the end users also started to develop their "e-skills" that include Information Literacy Skills, basic computer skills, learning technology skills (the eLearning technology in action), and assistive technology skills (technology used to assist a person with a disability).

Further perspectives of the designed online course will be to increase the knowledge and proficiency in the use of relevant fundamental theoretical background as well as computer implementations of various techniques and modeling strategies within the field of linear structural analysis. On the figure 1 contents of online course is shown. The benefits from set up online course will be to qualify more students to use computational methods in their own fields. The student will develop basic skills for understanding the theories for linear problems as well as methods for computing response, i.e. application of finite element methods. The faculty has a wide range of contacts with the industry in the region as well as country at all. Many big firms in the industry, where civil or mechanical engineers are working, have to deal with linear static problems. So, the course will concentrate on the bridge between theory and practice and will be a good preparation for an engineers' career, too.

The purchased computer equipment donated by WUS within this project is located in the Laboratory for Engineering Software at Faculty of Mechanical Engineering of Kragujevac. The teaching staff and students have access to it and it is used during teaching process, research activities, and further development
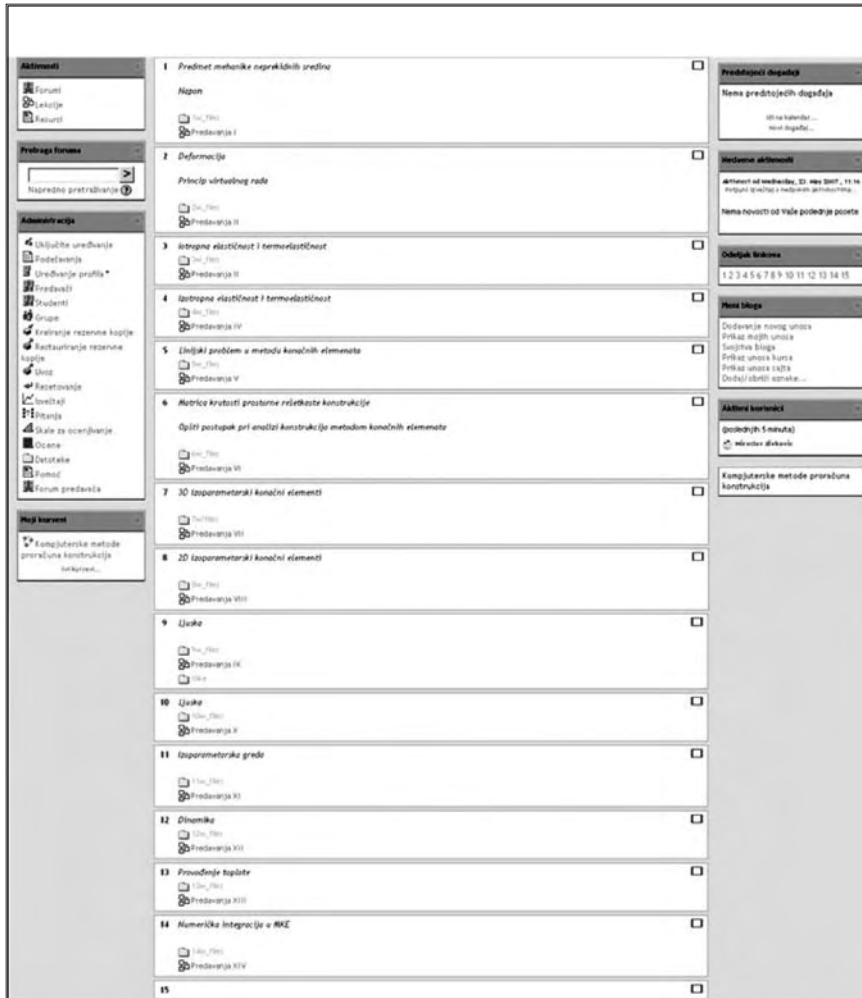
Figure 1. Contents of online course

of the already set online course as well as design of the new ones. Equipment will be in usage for development of domestic software package PAK, too, in the linear calculation both in teaching process and research activities. It will be used for testing and development of online courses in the future.

The evaluation was foreseen as the key element of this project which should help the institution to understand the effects and effectiveness of the approaches adopted within the project to achieve its key objectives. It can be used as a developmental tool, to review practice and inform and guide future policy and practice in eLearning; provide robust quantitative and qualitative

data from staff and student experiences of eLearning. Expertise in evaluating eLearning practices already exists at Faculty of Mechanical Engineering through the previous Tempus Joint European Project "Educational Network Based on Information Technology", group for Informatics in Engineering as well as members of eLearning Centre. Evaluation methods foreseen detailed questionnaire surveys, observations, semi-structured interviews, focus groups, participant observations, empirical usability testing, numbers of staff and students attending development sessions, usage statistics, etc. Detailed internal review of eLearning course in terms of content, teaching and examining methodology after on-line course implementation was performed. Also, evaluation by users (students, employees) through numerous contacts was performed. Presentation of achieved results to Collegial Body of Department and Faculty is foreseen for the future. Modification of all collected weaknesses of the on-line course detecting during course implementation will be performed as well as discussion with other colleagues all detailed of eLearning course. Constant adaptation of course content and methodology according to survey results is foreseen too.

Some of the project activities will be continued after the end of the project. Number of trained students, rearranged course and developed infrastructure for eLearning education will provide great advance in creating leading position for mechanical engineering studies in the region and give them huge chance to success. Presentation of project results to government/ministries/universities will be arranged through the conferences, meetings and workshops in order to establish institutional sustainability. Significant contribution will be realized through the collaboration with companies in order to retrain their full-time employed engineers and to expand their practical knowledge with new solutions. Site maintenance as ongoing process is also foreseen in future for updating information, fixing bugs, moderating discussion forums, updating the calendar of events and adding new materials.

4. Conclusions

The eLearning program gave a great contribution through the financial support on the new courses development as well as modification of existing courses in the terms of content, teaching and examining methodology. This project is just start for our education in reaching EU standards and models in higher education with permanent review for local needs. All performed activities will facilitate the transition of higher education in Serbia towards modern European standards. Produced material for this course will serve as a base for creating new eLearning courses in mechanical engineering within our faculty. Also, we expect that the other Serbian technical faculties will use this project as a good example for introducing new eLearning courses.

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The Introduction Of eLearning In Business Law Course

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> *"If you tell me, I will listen.*
> *If you show me, I will see.*
> *But if you let me experience, I will learn.*

Lao Tse

Lao Tse, Chinese philosopher from the fifth century BC, gave maybe the first contribution to the evolution of education and learning by proposing experiencing, instead of telling and showing. His vision got a credible name today in the computer era after so many centuries - eLearning.

This paper presents the main activities, results and observations which occurred during implementation of project titled "The Introduction of eLearning in Business Law Course" at Faculty of Organizational Sciences, University of Belgrade, financed by WUS Austria. The objective of this project was adoption of eLearning to improve the quality of education of students through better access and delivery of educational content and services, as a support for existing course, and a transformation of a passive role of students into active. It is important to state at the very beginning, that eLearning is a general term covering a wide range of techniques and methods that have in common the use of ICT. The emphasis of this project was on opening possibilities for students through enabling new expressions of education that combine the strengths of face to face form of education with eLearning tools. Some of the different elements that were combined to form an eLearning mixture were: information and communication technologies, interaction, learning resources, collaborative and individual learning, formal and

informal learning, and support.

To facilitate eLearning, eLearning environment had to be created on a LMS platform. Chosen platform was Moodle (at the website www://elab.net/moodle), as it is open source and user-friendly. This environment now contains several elements: courseware with other learning and supporting materials, online support and online assessment.

Learning resources often play a significant role in eLearning. Materials may take variety of forms depending on the course and approach taken. For the purposes of Business Law course following online materials were created:

• Study Guide provides guidance to students about how to obtain most from the course, details of assessment and good practices (course info, contacts, themes for student papers, projects and assignments, grading scale, etc);

• Instructional Material "Guide to eLearning in Business Law" is a practical manual for students in eLearning usage (how to register, read and upload assignments, discuss in forums, etc);

• Resources which are simply available on the world wide web (relevant web pages, downloadable files and databases;

• Traditional learning materials are available online (eContent): eBook, legal documents, lecture notes, handouts, case studies, assignments, workshops);
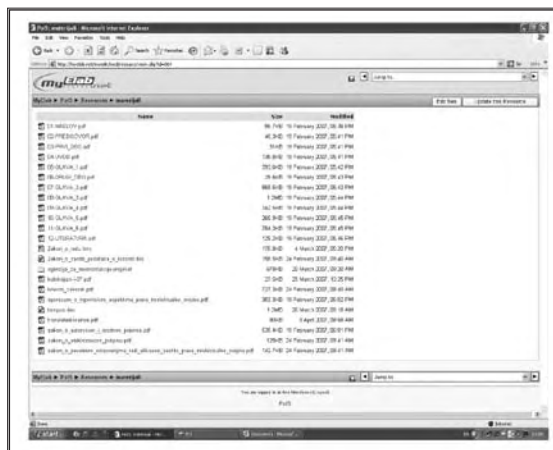
Exhibit 1. eContent

During semester, most activities students had to accomplish were online:

• Case studies/Workshops - in classes students worked in teams in a computer equipped classrooms on a real problem related to weekly topic of the course. Cases were put on web site and students had to upload a solution in the form of a single file;

• Research activities - students investigated a topic by searching the web, eJournals and online databases and judging the quality of web sites;

• Quizzes - students had the opportunity to take quizzes in class or from home and asses their gained knowledge;

• Glossary - each student was obliged to define two terms related to the course during semester.
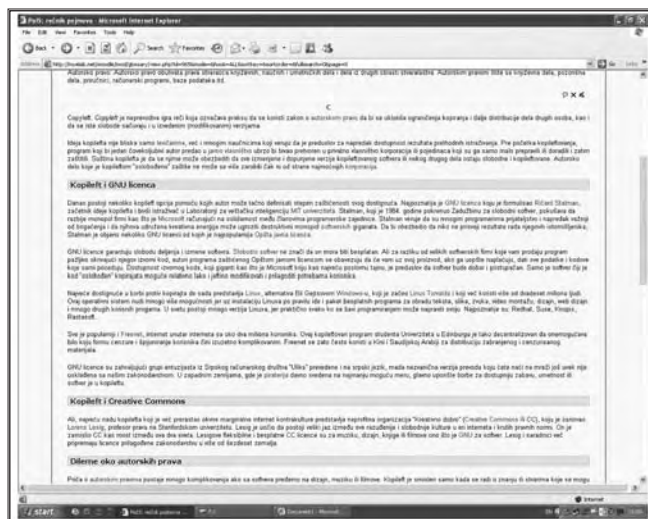
Exhibit 2. Glossary

Online support is organized through e-mail, news and forum.

• Each student got a new username (in the form SurnameName06@myelab.net) and a password for course registration. This made communication between students and with lecturers much easier and just-in time;

• News section has all relevant information regarding course events: deadlines for assignment submission, weekly and monthly activities, guest lecturers timetable and partial/final exam dates;

• Forum section is for student discussions: searching for team members, discussing current lectures, literature, giving opinions about the course, etc.
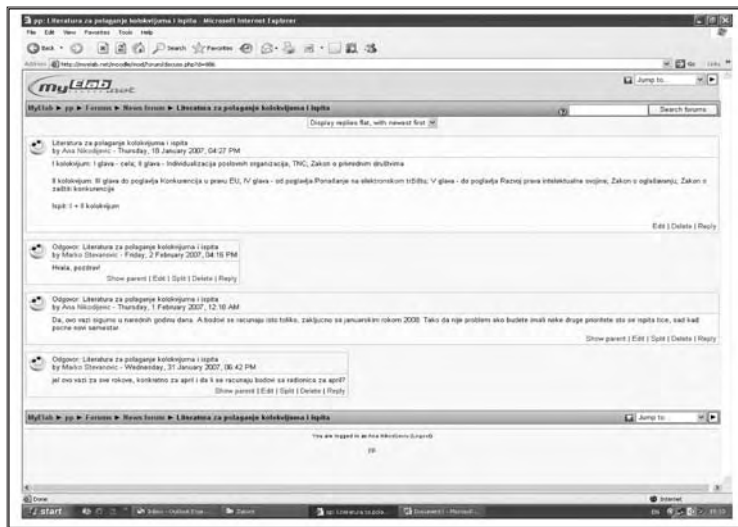
Exhibit 3. Forum section

Grading of students and assessing their level of knowledge during semester is mostly realized online. Only partial and final exam papers are still in paper form and are being graded traditionally. Assessment and evaluation of eLearning activities was mainly focused on students (i.e. did they learn what they were supposed to, did they like the course) and on the quality of the course itself. Students filled in the questionnaire regarding their opinions on classes, eLearning process and gained knowledge during classes. They had to give their answer with grading scale from 1 to 5. As questionnaire was on voluntary basis, only 67 students answered it.

Some of additional written comments regarding eLearning implementation were:

• "Original, brave and for compliments all the way!"

• "Best words for the site and forum (it remains to wait and see how students will accept the new working methodology).

• "Business Law classes are a true adventure."

The most interesting questions regarding eLearning were:

• Please grade entire teaching process on the Business law course (Average grade: 4.43);
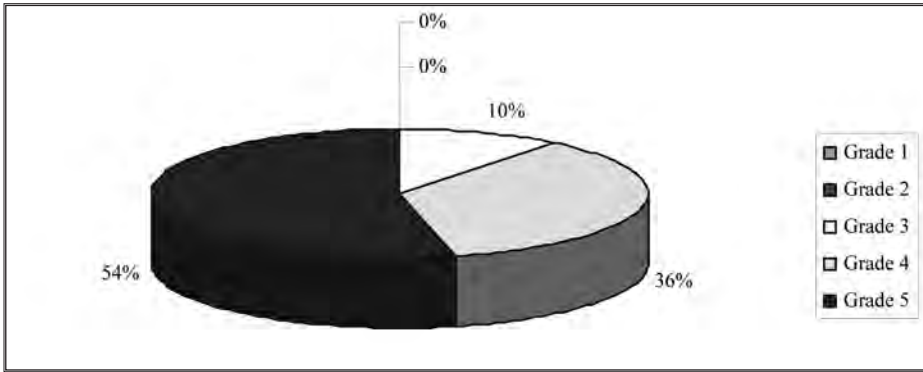
Exhibit 4. Teaching process grading

- Please grade eLearning with Moodle
(Average grade: 4.25);
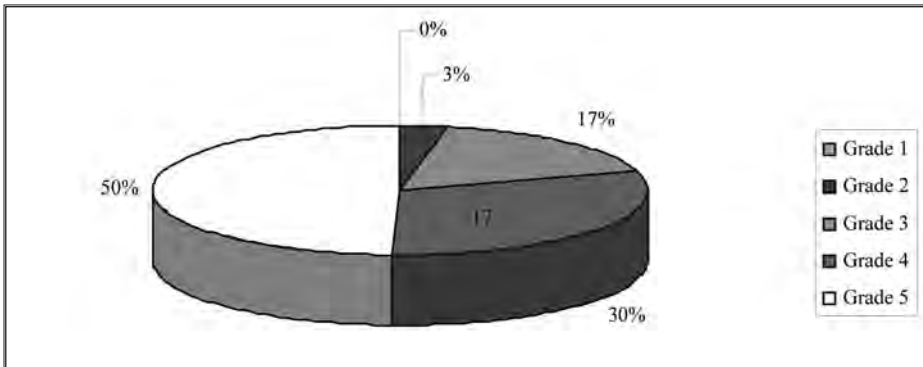
Exhibit 5. eLearning grading

- Would you prefer to have more eLearning opportunities in the future?
(Average: 80%);
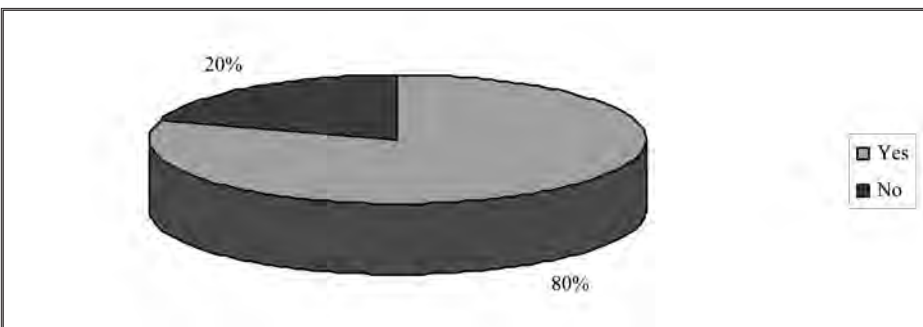
Exhibit 6. eLearning opportunities grading

Learning results were outstanding and most important are:

• Increased interest in the course content (small number of absentees, more questions to lecturers);

• Developed computer skills (Internet, e-mail, document management);

• Fostered collaborative learning (group assignments, teamwork);

• Improved quality of learning (high grades during semester and on final exam - out of 140 students who were engaged in eLearning process, 132 passed the exam at the end of semester).

There are many other forms of eLearning activities that will be engaged for Business Law course in the future, as it is preparation of new learning materials (videos of student presentations and lectures, examples of projects, interactive learning materials, articles, newspaper cuttings, multimedia components, simulations, etc). Likewise, eLibrary will be formed containing eBooks in Business Law and national and international legal acts. Increasing the number eLearning activities that future generations of students will have to complete is planned with eWorkshops, eDebates, more formative and summative tests, quizzes, revision notes, exercises, individual and teamwork assignments. Set of frequently asked questions will be also prepared. Managing of eLearning environment is a never-ending process and the ending of this project is only a beginning.

Purchase of equipment and scientific literature was a prerequisite for realization of all project activities. Without financial help and constant support from WUS Austria and its staff, it would never come to life. Thanks to them eLearning in Business Law course on Faculty of Organizational Sciences is a highly productive and sustainable method of learning that will only grow in eQuality, variety of eActivities and number of eStudents involved, as years go by. There will be no turning back to old teaching and learning methods. Now, at the very end, I can look to the future and say with great confidence that eLearning encourages a journey into less familiar territories for people seeking ways to develop themselves and others, and I am proud to be among those people. As Max De Pree said:

"We can not become what we need to be by remaining what we are".

Experiences and Achievements

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Abstract

We give an overview of experiences and achievements obtained during the eLearning project eLP001/2006. Special attention is paid to the activities geared toward better student engagement in learning.

1. Introduction

The present project was envisaged to create online teaching content and a more traditional textbook for a set of courses in Discrete Mathematics, using an open source software package *Moodle,* including the existing freely available examples and implementing new interactive examples. All these results are now available at our site http://eLearning.pmf.ni.ac.yu.

One of our main goals was the free use of implemented content regardless of the faculty. On one hand, project members do come and teach Discrete Mathematics at three different institutions. On the other hand, it is our opinion that this would raise interest among other computer science faculties to use this material and, as a consequence, help to establish the leadership of Faculty of Science and Mathematics (FSM) in this field.

The above eLearning site contains the teaching content that group members already had available, thus multiplying its usability. While any specific teacher may opt for a particular choice of topics in her course, interested students may further benefit from the option of having additional topics at the same site. Moreover, for the sake of completeness, we have decided to put and revise all this material in the more traditional format of paper textbooks.

During the course of preparing the above site, we were also exposed to new teaching methodologies, in particular to the concept of *engaged learning,* which helped to enrich our teaching. In the rest of the article, we will describe our experiences in the aspect of applying activities geared toward better student engagement. In Section 2 we describe a possible way of creating the learning community, and then in Section 3 we describe the activities that we tried in teaching a discrete mathematics course at the Faculty of Science and Mathematics in Nis in the academic 2006/7 year.

2. Creating the learning community

Chamberlain and Vrasidas said in [1, p.79] that: "*Learning is interactive when learners are actively engaged in a variety of activities, and along their peers and teacher, they are co-constructors of knowledge. The learning environment provides a sense of a learning community within which participants collaborate with others to negotiate and share meanings*".

In order to establish the above goals, we have adopted an innovative framework establishing engaged learning through the Phases of Engagement which helps learners become more involved as knowledge generators and cofacillitators of a course.

Engaged learning already appears in the contexts of active learning, social cognition, constructivism and problem-based learning. It emphasizes student-focused learning within an instructor-facilitated environment.

Collison, Elbaum, Haavind and Tinker said in [2] that: "There is a strong evidence to suggest that learners learn best when constructing their own knowledge. However, there is also a right time to clearly guide learners or simply give them a critical piece of information to help them move forward"

In this respect, the most important role of the instructor in (online) classes is to ensure a high degree of interactivity and participation. This means designing and conducting learning activities that result in engagement with the subject matter and with fellow students, as mentioned by Kearsley [4]. In thiis situation, students become active knowledge-generators who assume responsibility for constructing

and managing their own learning experience.

2.1. Guiding learners to engage

Conrad and Donaldson [3] suggested the following **Phases of Engagement** concept (see Fig. 1), in which learners and instructor pass through different phases until they establish a form of a learning community.

In the phase of **Newcomer**, the instructor sets up the stage. The course begins in a more traditional manner, and the instructor includes activities which are interactive and help learners get to know one another. For example, the instructor may provide variours icebreakers or suggest students to prepare short individual introductions. In this way, the learners build trust and gain more confidence in their peers.

In the second, **Cooperator** phase the instructor becomes a structural engineer: he forms dyads of learners and engage them in activities that require critical thinking, reflection and sharing of ideas. For example, as part of an activity students may be given to review and critique the work of their peers.

In the third, **Collaborator** phase, the peer partners are combined into teams, in which members support one another and are responsible for one another's learning. Teams are then engaged in activities that require their members to collaborate, solve problems, reflect on experiences. For example, they may be subjected to content discussions, role playing, debates...

Learner role:	Instructor role:
Newcomer	Social negotiator
Cooperator	Structural engineer
Collaborator	Facilitator
Initiator/partner	Community member

Fig. 1. Phases of Engagement.

At the last, **Initiator/partner** phase, activities are learner-designed or learner-led. Discussions begin to go not only where the instructor intends but also where the learners direct them to go. Thus, the learners themselves become knowledge generators, and the instructor becomes just another member of a learning community. The instructor encourages the move to this phase by introducing opportunities for individuals and teams to lead activities, for example through group presentations and projects, or through learner-facilitated discussions.

3. Testing the Phases of Engagement concept in a classroom

Some of the activities proposed in [3] are designed specifically for *distance learning*, while others are suited to both *classroom* and *online use*. Let us first describe the teaching environment in which selected activities have been tested:

- lectures are held in a traditional manner, in an ordinary classroom

- student group is small (<20)

- students already know each other (as this course on the second year)

- I haven't meet them before

A half of them have web access at the faculty only

It must be mentioned that the setting for the discrete mathematics course will be quite different from the next year, due to changes in our teaching programme. Namely, discrete mathematics is transferred from the second into the first year, which directly affects the second and the third point above — it is expected that the group will at least double with 30-40 students, and while some of the students will come from the same highschool, it is expect that most of them will not know each other at the beginning of the course.

3.1. Selected activities

For each of the phases of engagement we have selected appropriate activities from those proposed in [3]. Our choices are given in the following table:

Newcomer:	Name that movie!
Cooperator:	Jilligan's Island
Collaborator:	Team Problem Solving
Partner:	Group presentation
And at the end:	Bumper Sticker

Among these, team problem solving and group presentation are oriented towards academic exchanges, while the first two activities are meant to introduce the students and see how well they can work in a team.

3.2. Newcomer: Name that movie!

Here is the description of the activity:

Day 1:

If you were to write the score for the movie of your life, which two songs - one representing your whole life and one that gives a more recent picture - would you choose and why?

Day 2:

Based on the song choices, suggest the movie title for each student and give a short explanation.

Day 3:

Among all suggested titles for your movie, select the one title that suits you best.

Among all student answers, we selected the following illustrative example:

Jovana suggested songs:

> **Let love be your energy**
>
> **Poješću sve kolačiće**

She received title suggestions:

> **Eh, da imam to što nemam**
>
> **Kolače woman**
>
> **Ljubavni kolačić**
>
> **Grlom u jagode**

Jovana's choice:

> **Kolače woman**

Slavko suggested songs:

> **Don't worry, be happy**
>
> **Dum dum**

He received title suggestions:

Lezi, lebu, da te jedem

Sreća, sreća, radost

Cool

Kad porastem, biću kengur

Slavko's choice:

Sreća, sreća, radost

As we can see from the above, this activity may be used in a classroom — actually, my students preferred to take this activity in the classroom than online. Its main feature is that it describes student's life in an innovative way. The instructor and other learners may find out about a particular student more than he would be willing to say otherwise, and thus more easily remove the isolation barriers among them.

3.3. Cooperator: Jilligan's Island

This activity is meant for teams of six persons as follows:

We are all on a sinking boat, about to be stranded on a deserted island in South Pacific. The lifeboat we have has limited space. We can each bring one personal item with us (completely up to each individual what that is). The lifeboat will hold the six of us, our one personal item each, and a total of eight other items.

Step 1:

Each of us must select his/her personal item and suggest five other items we feel will be necessary for our team survival, and give an explanation.

Step 2:

We must collectively make a decision on the eight items that will come with us on our rescue boat.

Within five days (our boat has a very slow leak), we will have to reach a consensus; otherwise, it will be too late, and we'll perish on the sinking ship.

A particular example of team answers are given in Fig. 2. We can observe here that the personal items may reveal further details about student personal life: while nothing new is learned about girls, among boys one can tell immediately tell who's in love and who's an easy going guy. Moreover, the common item list reveals a practical mind:

- 5 out of 8 items are related to food, while

- 2 of them are meant for escape.

3.4. Collaborator: Team Problem Solving

This was a repetitive activity, where the student were asked to solve problems in three rounds. Students were divided into teams of four, and each team was assigned a different problem to solve. Each round lasted for two weeks, but it then turned out that the selected problems were easy for the teams, with each team fully solving the given problem in due time.

Personal items		Common items	
Name	Item	Item	Purpose
Ivana	Toothbrush	knife	to cut fruits, to clean fish
Daliborka	Sunglasses	axe	to cut trees
Ivan	Girlfriend photo	fishing net	to catch plenty of fish
Dragoljub	Fishing pole	saucepan	to cook food
Slavko	Ball	rope	for a float
Dalibor	Safety pin	zippo lighter	to make fire
		tent	as a temporary shelter
		playing cards	for fun

Fig. 2. Team answers to Jilligan's Island acitivity.

Student grades were then based on my evaluation of the solution and the team participation rubric. In this rubric, team members were asked to score themselves and each of the remaining team members on the following criteria:

- Cooperation

- Contribution

- Participation

Scores are 0, 2, 3 and 4 points worth. This way, the instructor may emphasize the importance of collaboration. Large discrepancies in team members' assessments are a signal for the instructor. Open discussion with students may shed new light on the team functioning and improve student conflict resolution skills.

3.5. Partner: Group presentations

As an opportunity to engage in learner-designed and learner-led activities, during the course of the study, groups of 2-4 students were asked to prepare the presentations on:

- the life of **Euler**

- the life of **Gaus**

- the **Fibonacci** numbers

Each of the presentations was indeed a success that led to constructive critics and discussions among students. I have to admit that I have also learned many new things during these presentations.

3.6. At the end: Bumper Sticker

This activity served to close the course and give the instructor much necessary feedback, but in a very creative form.

Reflect on your experience as a member of this class. If you had to sum up your thoughts on the experience or the knowledge you have gained, how would they be stated on a bumper sticker?

Student answers are shown in Fig. 3.

4. Conclusion

Our experiences show that the *Moodle* system is well suited to implement learner-engaging activities, like those shown in Section 3, and easily create a collection of online resources, including the traditional-style textbooks in PDF format. *Moodle* facilitates activity grading as well, although we must confess that this part of the system is not enough teacher-friendly at present.

Selected engagement activities from [3] were tested in practice in a small group of students. They turned out to be an effective way of raising student awareness of the importance of being a part of the learning community.

The eLearning server available at **http://eLearning.pmf.ni.ac.yu** welcomes other teachers at PMF Nis from the next academic year. It is our intention to use the experience gained through the eLP001/2006 project to provide a good practice route for the rest of the teachers to move their courses online as well. As one of the activities, we are preparing an introductory crash course on how to use *Moodle* to achieve that goal.

Ivana:	Per aspera ad astra
Daliborka:	newGRAPH - training of nerves
Dalibor:	Is there any life beyond Discrete Math?
Jovana:	Discrete, I love you discretely.

Fig. 3. Bumper Sticker summaries.

At the end, we have already invited other discrete math teachers in Serbia and neighboring countries to share our experiences and achievements.

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Web-based Course-supporting and eLearning System for Courses in Informatics

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Abstract

This paper discuses attempt to create eLearning course support for undergraduate and graduate courses in the field of informatics in our department. The goal should be obtained by using a web-based eLearning system accessible through Internet.

1. Introduction

The aim of the project was to create eLearning course support for at least two undergraduate courses and one graduate course in the field of informatics.

We have created complete eLearning course support for two undergraduate courses "Operating systems" and "Software Engineering" by using and customizing Moodle [1], an Open Source CMS (Course Management System), according to our needs.

Besides full support for two mentioned courses this tool has been employed for several other undergraduate courses like: "Ethical Aspects of Informatics" [4], "Introduction to e-Business", "Object-oriented Programming", "Data Structures and Algorithms", "Software Project Management".

At master studies, we have also created complete eLearning environment for the advanced version of "Software Engineering" course. Similar blended

learning concept is being applied to a whole set of other master courses, for instance: "Privacy, ethics, and Social Responsibilities", "Software Engineering for Critical Systems", "Formal Method Engineering", and "Component Based Development".

2. System structure

Our eLearning system consists of several parts:

1. eContent (repository of teaching materials),

2. quizzes and testing facilities,

3. live chats between students and teachers,

4. specialized forums for students to exchange ideas, additional sources of information and ways to solve assignments,

5. statistics on earned points and progress reports for teachers and students,

6. eLessons (specialized electronic lessons for independent study and checking the progress)

7. facilities to submit solutions to assignments with prevention of cheating,

8. automatic checks of certain aspects of solutions to assignments (when solutions are computer programs).

Our eLearning system recognizes two different forms of eContent:

- most of the material is given in a form of "electronic lessons", created by students as a part of elective course "eLearning", and used as self-learning material.

- all of the content is given as a repository of teaching material, usually as PDF versions of presentations given to students.

Most of the courses have testing facilities in a twofold form. First, each eLesson is from time to time interrupted with questions, for keeping students "awake" and concentrated. Additionally, final quizzes are created within each section of eCourses. We decided to use these quizzes only as unofficial, self-testing facility for students. Besides this, we use Moodle's quiz module for creating repositories of questions and generating official tests.

Live chats between students and teacher (Zoran Budimac) were regularly available for courses "Software Engineering" and "Operating Systems". Students

used this facility, and were satisfied with it. And all of the mentioned courses had forums for exchange of ideas and additional material, and for discussions about problems and solutions of assignments. Those forums were controlled by teachers, so that there is no "too much" help, or "cheating" involved.

All enrolled students, and only the enrolled students, had information about points gained at each of the tests/assignments.

Students of "Software Engineering" studied 2 electronic lessons by themselves, and were satisfied with those. In order to test self-learning, we gave a test for those 2 self-studied lessons, with very good results. Namely, on a short test of 4 questions, students gained 3.4 (85%) points (average).

Our application called "Svetovid" developed in order to prevent cheating and help in submission of solved assignments (used in several courses: "Object-oriented Programming", "Data Structures and Algorithms", "Operating Systems", "Compiler Construction"…) worked very well. The quality of original solutions received from students increased dramatically. Svetovid also has a possibility to help in solution submission, in a sense that it automatically checks certain simpler aspects of students' solutions - syntax, technical aspects, or easy-to-notice logical errors. Considering the relatively large number of students, this application proved to be of a great help to assistants in the process of checking assignments.

3. Customizations of Moodle

Our web-based eLearning course support software employs Open Source Course Management System Moodle [1] with customizations made by our project members according to our needs [3].

eCourses developed at the Department required more adaptivity concerning navigation through eLessons. For example: the course creators wanted more flexibility in their students' eLearning experience, in a way that they can explicitly choose different paths through lessons or can be directed to different parts depending on their answers.

Therefore, several navigational extensions of Moodle have been developed and most of them have already been put into practice.

Firstly, direct referencing (jumps) from eContents to other parts of eContents is a useful ability to reference parts of other eLessons within the course from any point of the current eLesson. There are at least two good purposes for such an extension:

1. Redirection of learners to other parts of eContents, for instance after giving the wrong answer to a question concerning already read material in the current lesson, or facts from previous lessons, it could be useful to go back to the explanations of that particular topic and go through, for example several pages dealing with the problematic issue.

2. Simple reminders - apart from complete redirection of learners to another page, there is a possibility to just remind them of certain pages, without disturbing their learning path.

These features have been fully integrated into existing structure of HTML editor used while creating eContents, not only of eLessons, but of other course resources and activities.

This means that main eContents (represented in eLessons) is accessible from any part of the eCourse (quizzes, assignments etc.), or actually every textual part of eContents created by Moodle's HTML editor.

Secondly, extended jumps represent a possibility to move from one page in eLesson to the other, even from other eLessons providing direct reuse of the existing material without duplicating it, depending on student's current activity (answers to the questions asked within the current page).

Thirdly, conditional jumps allow tracing where users came from when entering the current page and directing them further through the eContents in the most appropriate way, therefore designing more meaningful eContents, leading to greater success with students. This feature is in testing phase and will be used in the following semester within the existing and newly developed eCourses.

Moodle's standard capabilities of integrating some of its features with other software have been used with much success. They have turned out to be complex enough for the tasks we had to perform while developing our eCourses. Nevertheless, the development of additional possibilities for calling external programs has been started. These will be implemented in several iterations, as a set of features, following the new integration needs as they emerge in our work.

4. Svetovid submission system

Submission system called Svetovid is cross-platform software that helps instructors leverage the effort of practical exercises and exams. The system was created with the idea of close integration with the rest of our systems, but along the way we concluded that it is better to keep it as a separate facility. The idea is

to later integrate the information collected about student work and not the whole system.

The goals for the Svetovid submission environment were as follows:

1. Allow students to comfortably develop their programs.

2. Allow students to test their programs before submission.

3. Keep a log of student efforts.

4. Be flexible enough and usable for different courses including wide range of programming languages and project stage: coding, typing, program documentation...

5. Disallow students to share programs and solutions, intentionally or unintentionally.

6. Help instructors with marking student solution (i.e. program code).

The first goal was achieved by designing and implementing easy-to-use client program for program development, by incorporating most common IDE ideas.

Some sample input and output data, prepared by instructor, for preliminary program test, are available in advance. Students can test their programs by running them against one data set on which they will eventually be tested, and under precisely the same conditions.

This ensures that the program will work the way student expects and that it satisfies some basic requirements, so the second goal was achieved.

The third goal was achieved by integrating an extensive logging mechanism to the system. Separate log files are kept for each day, and each course. By reviewing log files instructors can find: exact time and computer ID from where student saved/loaded a file; number and successfulness of compilations and program runs, with exact time and computer used for each action. Thus, using this information, instructor can monitor student progress, or find potentially suspicious students (the ones who did nothing, while his submitted program compiles and works flawlessly).

The fourth goal is achieved by means of command scripts: by placing all necessary tasks, like compile, run, test, etc., in batch scripts provided by the instructor. By writing an appropriate command sequence in the batch script, the instructor can accommodate any programming language. We are using the system

to automate compiling and running of Modula 2, Java, and Scheme programs; for courses in "Operating systems", "Object-oriented programming", "Programming languages", "Computer graphics", "Compiler Construction" and "Data Structures and Algorithms". Moreover, commands can test any aspect of files submitted by student. For example: programming style, line indentation, commenting, frequency of words, existence (or inexistence) of certain key words. With provided generality even assignments that are not programs can be tested. The system can be used for assessing quiz answers, checking program documentation, etc.

The fifth goal is achieved by means of password protected virtual directories placed on another (or the same) computer, and accessible to students only from the Svetovid client, but not via the standard file system.

The final goal is gained by the same command scripts for compilations and testing available to students. While command scripts provide automation of evaluation process, the concept of virtual directories provides security for instructor's data.

5. Results

The system is used on undergraduate and graduate courses in Software Engineering, developed within international (EU sponsored) projects and compatible with several other courses in the region and similar course at the Humboldt University in Berlin. Thus, the system is successfully used in international environment to exchange ideas and knowledge, especially via live chats and student forums.

Furthermore, electronic support is offered for many other courses currently taught at the Department.

The Svetovid system is used in undergraduate course in Operating Systems, Compiler Construction, Object Oriented Programming, and many other, where prevention of cheating and automatic checks is essential.

Two manuals have been created for easier usage of Moodle CMS. The first one is designed to be used by students, and concerns the usage of the system from the student perspective. The other one is designed to be used by lecturers, so it covers some other points of interest of a person who wants to create a eLessons, or even whole eCourses, even if that person is not originally a professional in computer science.

Mentioned two manuals will have additional value, since it has been

decided that the system will be recommended to ALL of the lecturers at the Faculty of Science in Novi Sad. Members of this project will offer their services as consultants, administrators, or even material developers, while manuals will be used as a useful first introduction to the system.

Apart from that, Zivana Komlenov performed the complete translation of Moodle interface, in both Latin and Cyrillic versions. This translation was accepted by Moodle consortium as official Serbian language pack(s). Translation of documentation and help files is in progress. All the results of this additional task will also be of great importance for faster involvement of other colleagues to eLearning concepts and usage of this well proven tool.

Results of this project were presented at several different meetings, conferences, congresses and workshops (most of them are listed among references). On "6th Workshop on Software Engineering Education and Reverse Engineering" in Ravda, Bulgaria, in September 2006, following presentations about our project were held:

- "A Course Support on the Web for JCSE",

- "Seminar and Project in eLearning",

- "Project management course: experience from the first year and second version",

- "Principles on creating eLessons - case study in 'Software metrics' (Section 'eLearning')".

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Creation of eLearning Content for Rapid Prototyping Course

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1. Introduction

This paper presents results achieved within realization of WUS Austria eLearning programme project entitled "Creation of eLearning content for Rapid prototyping course". At the beginning of the project, an analysis of existing teaching methodology was carried out with eLearning and LMS use in mind. The results of the analysis were new course features identified as suitable for use with LMS (multimedia presentation, forums, self-evaluation, and electronic test). According to these results, the creation of eLearning content was initiated. The material was created within planned activities, and was made available to students attending the course in winter semester of school year 2006/07.

2. Connection with previous activities

The development of Rapid Prototyping course, which preceded this project, was also in cooperation with WUS - Austrian Committee. The project was in framework of Course Development Plus Program (CDP+) No. 141/2004 by the title "Rapid Prototyping". At closing ceremony of CDP+ 2004/2005 programme, World University Service - Austrian Committee issued a document in recognition of the efforts made by Prof. Nenad Grujovic, of The Faculty of Mechanical

Engineering, Kragujevac, to produce the best course "Rapid Prototyping" within the CDP+ 2004/05 for the universities in Serbia.

From year 2002 - 2005 Prof. Nenad Grujovic successfully coordinated Tempus Joint European Projects UM-JEP-17119 entitled "Educational Network Based on Information Technology" which was aimed at establishing distance learning facilities (teleconferencing rooms) and introduction of eLearning with development of web course management system. In accordance with this project, eLearning Centre at University of Kragujevac was founded with help of WUS Austria eLearning grant.

This eLearning project may be recognized as continuation of above mentioned CDP+ project N°141/2004 and Tempus UM-JEP-17119.

3. Rapid Prototyping eLearning Project

Rapid Prototyping is the automatic construction of physical objects using solid freeform fabrication. The first techniques for rapid prototyping became available in the 1980s and were used to produce models and prototype parts. Today, they are used for a much wider range of applications and are even used to manufacture production quality parts in relatively small numbers. Also, some sculptors use the technology to produce complex shapes for fine art exhibitions.

These methods are developing quickly and steadily and have progressed from being tools for fast product development to becoming tools for fast product formation. The entire product formation process comprising product development, development of production facilities and production it self is therefore considered here. Nevertheless, the early stages of product development have special significance for success of a product in the market.

Rapid prototyping takes virtual designs from computer aided design (CAD) or animation modeling software, transforms them into cross sections, still virtual, and then creates each cross section in physical space, one after the next until the model is finished. It is a process where the virtual model and the physical model correspond almost identically.

In additive fabrication, the machine reads in data from a CAD drawing and lays down successive layers of, in our case, powdered material, and in this way builds up the model from a series of cross sections. These layers, which correspond to the virtual cross section from the CAD model, are glued together or fused (often using a laser) automatically to create the final shape. The primary advantage to additive construction is its ability to create almost any geometry

(excluding trapped negative volumes).

The standard interface between CAD software and rapid prototyping machines is the STL file format.

The word "rapid" is relative: construction of a model with contemporary machines typically takes 3 to 72 hours, depending on machine type and model size. Used in micro technologies "rapid" is correct, the products made are ready very fast and the machines can build the parts in parallel.

The eLearning content for Rapid Prototyping course is created within Moodle LMS. The course duration is 15 weeks, so the material is divided in 15 topics. Each topic is subdivided to pages suitable for reading using branch table system, and between pages students are presented with question related to previously shown page. Depending on answer given by student, either next page will be displayed (correct answer), or student will be instructed to reread the same page (minor misunderstanding of the matter) or even the whole topic (major misunderstanding of the matter). This way the student is provided with methods for self-evaluation, and the teacher can monitor students' activities within a topic.
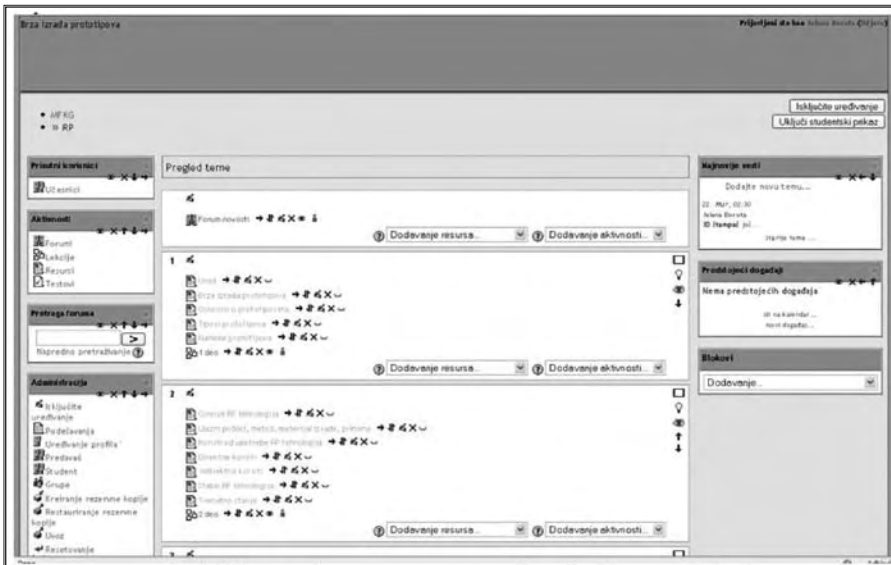
Rapid Prototyping course on www.eLearning.kg.ac.yu/mfkg/

Total number of created pages is 76, there are also several short videos, and SMIL multimedia content. Within SMIL content students can watch video demonstration of basic operations on 3D printer, along with narration and slide presentation. The streaming content is synchronized and bookmarked, so the

students can easily navigate through it. The only requirement is RealPlayer, which can be downloaded for free from the Internet. This SMIL content provides students almost full experience of laboratory practice.

Outlook of final test

A discussion board is set up for students to consult each other and teachers on certain topics. The earlier discussions are archived, and can be read at any time.

Rapid Prototyping - Question categories

Students have to take two control tests throughout the duration of the course, and there is also a final exam, all of which are taken in electronic form through Moodle LMS. The scores from the tests make 50% of the final grade.

Through connection of Centre for Information Technologies at Faculty of Mechanical Engineering (which is the coordinator of eLearning projects at University level) with EAR project Virtual Manufacturing Support for Enterprises in Serbia, 04-SER01/10/016, a possibility is provided for industrial experts to learn about most recent technologies in rapid prototyping (wwwcevip.kg.ac.yu). Demo version of Rapid Prototyping course is set up on Moodle LMS for this purpose.

4. Conclusions

Centre for information technologies at Faculty of Mechanical Engineering is coordinator of eLearning projects at University of Kragujevac. The centre is constantly encouraging eLearning activities at the University level. Considering the reform in higher education, eLearning is going to have a very important relevancy, especially for remote and disabled students. With help of Centre for Information Technology, further improvement is expected in eLearning and blended learning methodology in this and other courses.

In general, impressions about eLearning Program are very positive. The collaboration with eLearning centre at University of Kragujevac was intense and productive, and communication with experts through seminars and Internet was more than useful. Through realization of this project it has been noticed that increased communication with students in order to learn about their needs and experiences from first-hand may help in development and implementation of successful eLearning course.

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Introducing eLearning Concept at the Faculty of Transport and Traffic Engineering, Belgrade University - Small Steps Towards Big Achievements

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Abstract

This paper deals with experiences in the first step of implementing eLearning concept at the Faculty of Transport and Traffic Engineering, Belgrade University. Since our project "Introducing eLearning concept at the Faculty of Transport and Traffic Engineering, Belgrade University" has been accepted by WUS, we set the main goal of our activities - to determine the level of interest among students and teachers, and create an environment that supports eLearning.

Introduction

Faculty of Transport and Traffic Engineering has educated students since 1950, in all aspects of transport, traffic, communications and logistics. Currently there are about 2000 students and 146 teachers at the faculty divided into nine departments. Since the area of education is dynamic and each year a great number of candidates show a lively interest to study at our faculty, advanced teaching methods are indispensable

Before we started eLearning initiative at the Faculty, we had already been familiar with the fact that ICT usage within education process was poor

and unsatisfying. Only few courses have some of the "e" aspects. Mainly, they are oriented to/towards using the official faculty web page for distributing learning content and e-mail communication to students. Others rely on the so called "students disk", with a popular name, Gonzo. It represents a section of the faculty's server computer where teachers create folders and thus distribute different learning materials (mostly Power Point presentations, pdf and word documents. Students access Gonzo from the faculty's computer centre, and they can also create their own folders, where they store their materials. On the other hand Gonzo has many disadvantages:

- Lack of space - since students' and teachers' materials stay on disk after finishing the course and, in the case of students, for many years after they graduate

- Low security level - every student and teacher can change or even delete anybody else's documents

- Students need to come to the faculty (computer centre) in order to take over the materials. Teachers too, can only access Gonzo through faculty LAN.

Since, our facultiy, like others in Serbian Universities is going through rapid changes of the educational process (Bologna initiative), improvements in teaching methods are becoming the key factor of successful education process. In the very beginning we were aware that despite the need, there was not enough willingness or motivation among the teachers for implementing new teaching methods especially those relying on ICT. Many changes that were obligatory through legislation created an environment of specific saturation. That is why we have decided to make our approach slow and systematic in order to avoid resistance and the possibility that eLearning becomes just another idea formally presented, but devoid of the true effectiveness.

Towards eLearning - activities and results

In order to accomplish efficiency and effectiveness of our work we have defined major fields of research:

I. Learning about eLearning - in order to determine how this concept can be presented and implemented with / respect to faculty characteristics. The main question was: What are the basic elements and principles that need to be analyzed and how to present them in a simple and understandable way? The final goal was to create a guide book to eLearning basic principles. The literature we purchased

thanks to the WUS, was of great help, along with advice on literature titles we got from Franz Niederl. One of the faculty departments (telecommunications traffic) showed interest in eLearning. Two graduating students supported by mentor professors, chose the field of eLearning for their theses.

II Survey among students - At the very beginning of our research we defined the two main targets:

- ICT literacy and the availability of technology

- learning preferences of our students.

Since the faculty offers a satisfactory level of ICT resources (computer centre, broadband Internet access) we agreed that the obstacle coming from the fact that some students don't have ICT elements needed for eLearning, wasn't a threat to successful implementation. Those students are already used to going to the faculty computer centre ("The **Gonzo period"**). That is why we have decided to focus our research on the second target. Based on the opinion of a member of our project team Svetlana Cicevic (PhD in psychology) we agreed to conduct a survey of the learning styles.

Learning style could be defined as adopting a habitual and distinct mode of acquiring knowledge. A student's learning style may be determined by answering to few questions:

What type of information does the student preferentially perceive: **sensory-**sights, sounds, physical sensations, or **intuitive-**ideas, insights? According to these answers several types of learning styles could be established:

Visual type indicates learners who need to see the teacher's body language and facial expression to fully understand the content of a lesson. They tend to prefer sitting at the front of the classroom to avoid visual obstructions. They may think in pictures and learn best from visual displays including: diagrams, illustrated text books, overhead transparencies, videos, flipcharts and hand-outs. During a lecture or classroom discussion, visual learners often prefer to take detailed notes to absorb the information. They prefer using images, pictures, colors, and maps to organize information and communicate with others. They can easily visualize objects, plans and outcomes. They also have a good spatial sense.

Auditory type learn best through verbal lectures, discussions, talking things through and listening to what others have to say. Auditory learners interpret the underlying meanings of speech through listening to tone of voice, pitch, speed and other nuances. Written information may have little meaning until it is heard.

These learners often benefit from reading text aloud and using a voice recorder. They use sound, rhyme, and music when learning and focusing on using aural content in association and visualization.

Tactile/Kinesthetic type learns best through a hands-on approach, actively exploring the physical world around them. They may find it hard to sit still for long periods and may become distracted by their need for activity and exploration. They learn best when there is the opportunity to do "hands-on" experiences with materials. That is, for example, experiments in a laboratory. They use body and sense of touch to learn about the world surrounding them. Pursuits that involve the physical style include general physical work, mechanical, construction and repair work, sports and athletics, drama and dancing. They memorize information well when actively participate in activities, field trips, and role-playing in the classroom.

Group learning style gives favor to group interaction and class work with other students. The stimulation received from group work facilitates learning and understand new information.

Individual learning style indicates that learning gives best results when work alone.

LEARNING STYLE	Major learning style preference	Minor learning style reference	Negligible
VISUAL	37.4 %	59.1 %	3.5 %
TACTILE	46.1 %	47.0 %	6.9 %
AUDITORY	48.7 %	46.0 %	5.3 %
KINESTHETIC	40.8 %	54.8 %	4.4 %
GROUP	20.0 %	55.6 %	24.4 %
INDIVIDUAL	39.9 %	46.1 %	14.0 %

Application of learning styles theories implies knowledge that senses have a major impact on the way we learn, existence of natural preference towards one style but including the ability to learn in other styles, and finally, usage of different management tactics for different styles.

The aim of our experimental study was to determinate learning preferences of our students and to find out how these styles could be accommodated with eLearning elements. The investigation was conducted with 116 students at the Faculty for Traffic and Transport Engineering. The Perceptual Learning-Style

Preference Questionnaire was used in order to identify students' major and minor learning style preferences, and those learning styles that are negligible. Main results are given in following table.

The results show that auditory and tactile learning style preferences are dominant among our subjects. On the other hand, the representatives of minor learning style preferences are visual, group and kinesthetic. In most cases, minor learning styles indicate areas where an individual can function well as a learner. Usually a very successful learner can learn in several different ways. Only 20% of students show group major learning style preference, vs. near 40% who prefer individual work, and 24% with negligible scores indicates that they may have difficulty learning in that way (group). The group which show minor group learning style preference (56% of our sample) is, at the same time, the most interesting. This is the group where appropriate strategies could be applied to improve the skills and to strengthen the learning style in the negligible area. Probably, one possibility is to reduce the number of students per group, in order to gather better learning results.

Our next challenge is to establish continuous monitoring of learning stiles, in order to determine in what way they are affected by eLearning implementation.

III Arousing teachers' interests- In order to create a supportive environment for eLearning implementation we set the goal to find the best way to present this concept. We wanted to be sure that the improvements that eLearning offered would not only be understood but worth implementing as well /. That is why we have established cooperation with the representatives of the faculty computer centre (*special thanks to Slobodan Mitrovic*), who showed great interest in LMS, since they have been experiencing many problems with Gonzo and the faculty web page. Together we chose Moodle and customized it according to the faculty needs. It is currently being tested and can be seen at http//:delix.sf.bg.ac.yu/moodle.The main idea was that presenting the eLearning concept (principles and elements) along with the survey which shows that our students prefer learning methods supported by ICT, and demonstrating its application which makes eLearning "alive" in such an easy way, will ensure a positive feedback.

Before the presentation, we already experienced many questions about the real meaning of eLearning, since it turned out that many teachers defineed it as distance learning and substitution for traditional learning methods. After the presentation (*Get a closer look of presentation we held at the Faculty of Transport and Traffic engineering*) and discussion the teachers showed great

interest in improving their course presentation by using LMS, especially in the fields of distributing "value added" learning content, communication with students, computer testing centre. Together we agreed on: the guide book content, organizing trainings for designing an on line course and LMS usage. We set the goal to start the next semester with many courses improved by eLearning.

Conclusions - a vision of eLearning at The Faculty of Transport and Traffic engineering

Since Introducing eLearning concept at the Faculty of Transport and Traffic Engineering received good feedback we hope and will make every possible effort to make eLearning an element of faculty policy. The next steps are:

- establishing some kind of centre for eLearning development
- cooperation with eLearning centers of other faculties

Our framework is based on continuous activities which will create a supportive environment for successful eLearning implementation.

ELITE - eLearning IT Environment

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Abstract

One year long project entitled "ELITE - eLearning IT environment" supported by WUS Austria has been realized at Faculty of Electronic Engineering, University of Nis during 2006 and 2007 year. Description and results of the project are presented in this paper.

1. Introduction

One of the first steps in organizing development of eLearning activities in Serbia and Montenegro has been made by World University Service, Austria. It kicked off Serbia's eLearning Task force foundation. After that WUS Austria has opened the call for eLearning projects. One of successful project application was application for project "ELITE - eLearning IT environment". Duration of the project was one year (April 2006 till March 2007). Description of the project and the main results are described in this paper.

Usage of computers in teaching process has a long tradition at Faculty of Electronic Engineering [1]. All kinds of computer based learning are applied as using the web sites with static education material like (PPT, PDF, etc.) or web portals (some kind of interactivity with students is supported). Also, there are three elective internet courses offered for students during 9th semester. Courses are: "Advanced techniques in Image processing", "Introduction to Fuzzy logic ", and "Advanced techniques in Logic design".

A number eTools are used for demonstration in teaching process, labs, home works, etc. Some of them are commercial products, open source solutions, etc. A lot of them are our tools developed with the aim to help our students learn. It is important that a number of student projects and graduation papers can be used as teaching tools.

All above is only a part of computer supported education but we can't say that our faculty offers eLearning [2] education. Our goal is development of blended eLearning [3]. On the other side there are a lots of things which should be improved like unbalanced usage of computers in learning process throughout the departments. Naturally, department for Computer Science is leader in computer based teaching process.

One of the common features that was not developed for such a long time was the management of student projects and students' progress tracking. These components could enhance the communication between students and teachers significantly and bring more control to the entire educational process.

Also, currently we have large collection of completed student projects as hard copy and digital version CD. Publishing of this archive on the Web is very helpful for students that have to develop their own projects as a "Examples gallery". This way, students can get sneak preview of the skills of that their colleagues possesses. The other benefit from this archive's publishing is better communication between students and IT companies.

Results planed by project proposal were development and deployment of eLearning Web portal with archive of eLearning teaching materials and collection of successfully finished student projects. This portal will have the following impact:

• Students can be better prepared for exams as they have 24/7 access to teaching materials, whenever they are online;

• Teaching staff can have better overview on earlier prepared material so they can improve it much easier and much effective;

• Teaching staff could have better possibilities for teaching using eLearning materials;

• Communication between teachers and students as well as between students (especially graduated where the most of them are employed) will be improved through different forums;

• Student project will be become public and could help when students

apply for openings in local companies.

The main objective of this project is further development and improvement of the existing collection of eLearning materials and presentation system, as well as educational process improvement. These improvements can be achieved through following activities:

• Making eLearning teaching material more accessible and easy to use;

• Upgrade of existing collection of eLearning materials (both software and hardware);

• Upgrade of existing presentation software;

• Upgrade of Web based software system for more effective maintenance of collected eLearning material;

• Upgrade of course management Web portal;

• Improving students' projects management;

• Publishing students' projects archive on the Web;

• Improving students' progress tracking;

We have used the following indicators for progress evaluation:

• The number of collected teaching eLearning materials available through eLearning IT portal;

• The number of student's projects (consisting of project documentation, software, demo versions) available through eLearning centre;

• The number of registered users (students and teachers) of eLearning centre;

• The number of visitors of eLearning portal;

• The number of student projects demo versions downloads;

• The number of downloads of eLearning materials;

• Evaluation of eLearning portal utility (evaluation will be done by students and teachers through different opinion polls)

Project beneficiaries are:

• under-graduated students of department of computer science

• graduated students of department of computer science

- computer science department teaching staff

- companies with openings in IT area, mainly from the territory of Serbia, Montenegro and neighbouring countries

2. Project results

All planed goals are achived and in some aspects overcome project plan. Web portal named "Students' creative network" is established. Web address is http://sch.elfak.ni.ac.yu

Before of creation of portal we discussed a lot with our students about theirs needs. We made also two questionnaires about eLearning, one of them for students and another one for teaching staff. Results of questionnaires were very useful for us and final concept of our portal. In according to suggestions of our students current version of portal overcomes significantly our starting idea described in project proposal.

Student's opinion is very important for the future form of portal and future features and changes.

The main features of SCN portal are described in next section.

As a side effect we detected growing of interest for development of a new eLearning courses and a new portals with the aim to improve teaching process. Also, students are ready for a new form of teaching and now they are factor which has big influence on teachers to improve their old fashion lessons to a new, computer based, teaching style.

Digital archive of finished students projects and graduation papers growth each day so very soon we will have nice collection of student projects. This is starting point in student portfolio development.

3. SCN portal description

Current content of this web portal overcomes the starting planed content. The following parts are implemented:

1) Collection of successfully finished students' project is made.

About 70 successfully finished students' projects are included. All projects were a part of student exam for subject „Technique and methods of programming". Each item should consists of:

- short project description,

• project development material according to the RUP (Rational Unified Process) methodology (system vision, use case specification, architecture model design, test plan, testing report, user manual, etc.).

• User manual (each project has practical software product).

• Demo version in AVI format.

• PPT presentation of realized project.

• Authors resumes.

As the most of current collected project are uploaded by the "Elite - eLearning IT environment" project authors, the student CVs are omitted. As all future projects will be uploaded by project authors the CVs will be included too.

2) Collection of teaching materials for subjects included in portal.

This part is named "Literatura" (in English "Literature"). Currently 4 undergraduate subjects are complete covered by teaching material (lectures, exercises, tools, demos):

- Algorithms and programming,

- Object oriented programming,

- Object oriented design,

- Technique and methods of programming". The

3) Collection of graduation papers is included in portal.

This part was not included in original project plan. But our students suggested that it could be very useful for them so we generated this possibility, too. Current

collection is not rich with uploaded graduation papers but we plan to include all future graduation papers as well as some very successful previous ones.

Each item in this collection has the same element as item in Students project collection i.e.: CV of the author, text of final diploma work, PPT presentation used by author through diploma work process, demo version of realized software if it is a part of diploma work (exe or as AVI file),

4) Student project selection section named "Berza projekata" (in English "Project bursa").

This part plays a role of "student project subject bursa", and it offers a list of subjects for students' projects. Students apply for subject while final decision about distribution of subjects lies on teaching staff, based on student

application. All communication between students and teachers goes through this portal module. Student application consists of: short student CV, description of proposed project solution and plan for project realization.

5) Forum

The forum part of portals plays standard role in communication of students, teaching staff, and guests. Currently available topics are:

- "eLearning - pro and contra"

- Projects

- Literature

- Project bursa

- General topics

6) News

All news of interest for students (education, study, scholarships, job offers) are included.

7) IT bursa

This part of portal is reserved for IT company job offers for our students and graduates in IT area. Also, our students can ask for job through this site.

8) Interesting links

This section gives a lot of interesting links for our students as for example:

University of Nis web site, Faculty of Electronic Engineering web site, Computer science department web site, web sites of laboratories (GISlab, CIITlab, L3lab, Infosyslab), eLearning network web site, ELN University of Nis web site, Students' clubs - 3DArcheology and GNU club, web sites, Partners in learning web site.

Some of laboratories have eLearning material available for students through Moodle LMS (learning management system). Materials cover various subjects from Computer science area like Computer architecture, Parallel computing, Data Structure, Data bases, Artificial intelligence, etc.

Our Students' creative network web portal include all links related to the eLearning material available at Department of Computer Science. It plays the central role for eLearning at our faculty because all existing eLearning materials are shared through 4 separated LMSs. It is interesting that eLearning course realized through "Partners in learning program" targeted wider population, not only our students. It is offered to professors in primary and secondary education institutions nationwide.

4. Concluding remarks

Developed SCN portal is significant step in improvement of teaching process. Direct benefits are better communication between students and teachers, teaching at examples, central place for all portals and LMS, better prospect of abilities and knowledge of our students, better communication with IT companies. There is a lot of work on SCN portal improvement like: Improvement of search engine, extension of portal to other student divisions at faculty (currently portal is specialized for students at Computer Science department, migration of teaching material from 4 separated LMS into only one central LMS available through our portal.

Also, SCN portal is important because it is starting point for building and establishing a student portfolio.

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Web Point for Teachers

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1. Realized outcomes

Results of the Project, *Web point for Teachers (eLlearning Project No. 017/06)*,, have been realised out of aims and planned activities.

1. We have completed a complex analysis of possibilities of application the Internet and the Web in teaching and learning and defined certain standards. Specimen of documents which was taken for the analysis was deliberately chosen and some criteria were taken such as formal scientific competence, correlativity of contents and availability. Results of this research activity are four papers and monograph, complementary with the project 149050D (The Project is being realised with the financial support of the Ministry of Science and Environment Protection in the period 2006-2010). Scientific papers: 1) Miroslava Ristic, *eLearning - new technologies and foreign language teaching*, in Monography publication Foreign language teaching innovations Teacher Training Faculty, University of Belgrade, 2006.; 2) Sanja Blagdanic, *Methodological-information aspects of the Internet application in realisation of teaching and learning.* This paper has been presented at the Scientific Conference Didactic-methodological aspects of changes in primary school education within thematic area of Information technologies in education, Teacher Training Faculty, University of Belgrade, 2007.; 3) Miroslava Ristic, *Choice of software platform for eLearning*, This paper was presented at the Scientific Conference Didactic-methodological aspects of changes in primary school education within the thematic are of Information technology in education, Teacher Training Faculty, University of Belgrade, Belgrade 2007.; Miroslava Ristic, *Communication in the process of distance learning*, in the annual of

the international Conference Management of quality and reliability DQM 2007, Belgrade, 2007. Monography publication: Danimir Mandic, Miroslava Ristic, *Web portals and distance learning with the function of improving teaching quality*, Mediagraf, Beograd 2006.)

2. Web portal for teachers has been created and installed which initially has two functions: 1) to enable students to get accurate information on tine, and to make learning process more efficient; 2) to encourage teachers to use ICT in their work. Specimen of subjects (Educational Technology, Methodology of pedagogical research and English Language) some static (information on teaching subjects, contact information, useful inks) and dynamic (consultations and forums) blocks of information were installed.

3. Research on the status of digital literacy of students and teachers and analysis of their attitudes on possibilities of the Internet application in teaching and learning, has been completed on the specimen of more than 200 students of Teacher Training Faculty, University of Belgrade. This research was done using the test in accordance with ECDL standards and questionnaire in which we studies attitudes on application of the Internet in teaching.

4. Students of the third and fourth year were trained for advanced use of the Internet in the computer laboratory of the Faculty. According to the results of the questionnaire *Students' reference on pedagogical work of teachers and professors at Teacher Training Faculty in Belgrade, 2006/07*, members of this project team got excellent marks. Miroslava Ristic, according to votes of the third and fourth grade students got an average mark 4,9 (scale was from 1 to 5). Apart from this pedagogical work, an important role for stimulating students if all years for working in collaborative web surrounding also has *The Internet club for students of The Teacher Training Faculty* which was opened on April 2nd 2007.

Picture 1. Student's Internet club at Teacher Training Faculty

2. Importance of purchased equipment and software for realization of project

Purchased equipment has been used in the process of training of students of Teacher Training Faculty, with the two more departments in Vršac and Novi Pazar; for multi medial presentations of teachers and students at the Faculty, for projecting and gathering blocks of information for the web portal and for processing the results of the research.

Picture 2 & Picture 3. - The computer laboratory of the Teacher Training Faculty

3. Further perspectives of the eLearning development at our faculty

The Project Web Point for teachers is going to be continued, because it is complementary to the previously mentioned project 49050D. *Web portal for teachers.* It has been created as the permanent source of information for students, primary school teachers and teachers of higher grades and it is going to be maintained.

4. Conclusion

eLearning has not been developed in the way and intensity as in the other countries. Owing to professional and financial help of Belgrade office WUS in our academic area, within programmes for development of eLearning. For the first time, in a serious way there have been different initiatives supported for application of contemporary educational technologies which leads to the increase of availability, flexibility and quality of studies.

eLearning and Online Course Development - Andragogy of Communication and Media

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Abstract

The article provides an overview of project that refers to the development of an online course as a supporting element of ongoing instructional activities within a major course in Andragogy of Communication and Media. The author tries to emphasize basic issues, activities, results and implications of the online course which was intended to provide a better quality of teaching and learning processes. The discussion also deals with benefits and obstacles for the implementation of Learning Management System (LMS) at university level. The paper summarizes our experiences and achievements during the implementation of the eLearning project and perception of the possibility to incorporate online teaching activities into the existing educational settings.

Introduction

The necessity for improvement and advancement of teaching activities resulted in the project entitled „eLearning and online course development - Andragogy of Communication and Media". Having accepted the idea of permanent development in the domain of teaching, the basic aim of this project was to establish an online course as supporting and integral part of the major course entitled Andragogy of Communication and Media. Activities which were part of the online course were combined with basic teaching activities so as to create a new approach to teaching, which is commonly known as *blended course*. In accordance with this, blended course Andragogy of Communication and Media

includes traditional lectures, online activities, practical work and counseling. The online course is designed for final year students at the Department of Pedagogy and Andragogy at the Faculty of Philosophy, University of Belgrade. Furthermore, this virtual environment learning system is designed for those who will cope with adult education where ICT and LMS have even more important role under constant limitations caused by work and family duties and lack of free time for regular educational engagement.

Having applied modern teaching tools, such as LMS (Moodle), more possibilities for interactive learning have become available to all students who took the above-mentioned course. Above all, online learning gives the long-awaited flexibility in terms of accessibility to education anytime and anywhere. The power of modern education technology has changed not just student's position in educational process but the teacher's position, too. The results of this project clearly indicate those changes.

Fundaments and relevance of the project

Applying LMS in teaching and learning activities is a qualitatively different methodological approach to the process of college education. By doing so, we created a blended course, which was first of that kind ever taught at the Department of Pedagogy and Andragogy. The relevance of applying this new online education technology and acquiring knowledge of how it can be used in educational purposes is even more significant, considering the fact that is intended for the students who might apply it in their future professional engagement.

From the aspect of the current major course in Andragogy of Communication and Media, the relevance and benefits from the implementation of the new learning technologies and online course comprise the development of the following elements: *Education content* (updating existing course content, creating new e-content, using online resources, copyright issues, etc.); *Communication* (provides online counseling and adequate and timely feedback through teacher-student interaction and constructing rich environments for student-to-student interaction); *Teaching/learning activities* (synchronous and asynchronous online learning activities expands the flexibility in teaching and learning process); *Educational resources* (Andragogy of Communication and Media course was enriched with a considerable amount of contemporary scientific literature available on the network. For this purpose an internal electronic education material database was created and is available to students at any time.

- The content of the online course refers to educational issues of information

technology and new media. We emphasized several topics to deal with during the course:

• Theoretical fundaments of media, distance education and new education technology

• Didactic and methodological aspects of eLearning and online education

• Internet and educational multimedia

• Educational aspects of virtual universities, computer labs, educational usage of radio, television and other e-devices in the process of adult education.

Each of these topics comprises one or more sub-topics, i.e. teaching units, which included various online activities. In accordance with this, several sub-topics were covered in full, such as: Introduction to distance education - basic concepts; media and computer literacy; new education technologies - new opportunity for education of adults; eLearning and online education; education tools and activity within LMS (Moodle); interaction and communication in online learning environment; precondition, development and characteristics of internet as an education source/network literacy; virtual universities and computer classroom, radio, TV and other e-devices in educational process, etc.

Taking all key elements listed above into account (relevance from the aspect of the major course entitled Andragogy of Communication and Media, content and topics of online course), general objective of this project was to create a blended course, which also includes eLearning content development in the mutual domain of education and media. Traditional classroom activities were improved by adding eLearning elements and supported by the online course. Thus defined general objective of the project consists of four groups of separate objectives. Each of these groups of objectives include several items:

• *Knowledge objectives* (What should students know? They should learn basic theoretical fundaments, concepts, current trends, and issues associated with eLearning, online education and new educational technology and media.)

• *Skill objectives* (What skills should students acquire? They should acquire competence and skills in developing computer and network literacy. Since many students were not computer-literate, which is the basic prerequisite for participating in online courses, we had to show them how to successfully use a computer and the Internet for educational purposes. Familiarizing students with the ethics of using electronic data from the network was

also necessary. In addition, we were engaged in training students how to use LMS tools within the online course. Finally, we tried to develop online communication skills on student-to-student, as well as student-to-moderator basis.)

• *Attitudes objectives* (Fostering positive attitudes, i.e. cognitive, effective and volitional aspects toward using ICT in education, as well as promoting collaborative learning activities based on the theory of constructivism.)

• *Objectives related to preparing educational materials and resources* (Converting the readings required for this course into PDF files; creating an internal database which is supposed to include educational materials from the field of Andragogy of Communication and Media, e.g. multimedia educational materials, etc.)

Apart from those four groups of objectives which refer to the whole group of students, we had to deal with another goal which was not part of the of the major course, but which was very important for the sustainability of the project result. It was planned that outstanding students learn how to create online courses provided that they have elementary knowledge of working methods in online environment.

Online educational activities

The online course lasted three months and thirty students actively participated in large variety of online activities from the beginning to the end. All students were very interested in this teaching approach and expressed great satisfaction with the learning process. In spite of lack of previous experience in eLearning and online courses, final results indicated that after minor problems in using computers at the beginning, all students managed to use LMS successfully and accomplished the required tasks. Students' learning activities were supported by different LMS tools, which might be divided into two groups: educational activities *(lessons, forums, quizzes, glossaries, chats, assignments, choices, etc.)* and educational resources *(web pages, links to files or web sites, data directories, text pages, etc.).* By combining all these tools the learning process became more interactive and flexible.

From the students' view, the structure of online course consisted of five integrated parts. The first and second parts provided information about the course syllabus and readings, as well as general information about teaching activities of the online course (schedule, assessment criteria, course requirements, etc.) and

about technical support. The third part of the course was what we termed *e-practical workspace*, which was designed to facilitate students' practical work in the field required by the major Andragogy of Communication and Media course. In this *e-practical workspace*, students had opportunities to upload reports on their practical engagement and discuss relevant issues.

In terms of learning/teaching activities, the most important structural part of the course were teaching units. Each of these units could include a large variety of different tools. For this particular course we used just some of them (lessons, forums, etc.) which are essential for carrying out online teaching activities. In addition, we combined them with other supporting elements with the intention of making a more dynamic learning environment. Thus, the structure of teaching units usually involved the following items: handouts, lessons, original articles in PDF, forums, quizzes and external links.

The fifth part included Internet resources (e-catalogue of the Faculty of Philosophy, National and University Libraries, links to relevant education institutions and NGOs dealing with education and media, etc.) and databases (KoBSON, Public Knowledge Project, JSTORE, Wikipedia, etc.). According to the students' claims, this part was very useful for all other activities and they greatly benefited from it.

The structural parts that we have mentioned form a coherent whole, which is the basis for interactive work in online environment. It is important to point out that the activities carried out by students during the education process entail using all elements of the five structural groups. Therefore, omission of certain elements had a negative impact on their overall success.

Observations and results

During and after the project we observed several key issues worth mentioning. At the general level, one of the results was that all students became PC-literate and got acquainted with a new way of education work, i.e. with online education. Since our basic aim was acquiring skills and gaining relevant theoretical knowledge necessary to understand and apply media and modern education technologies, after the completion of online activities the students were able to:

- analyze and discuss basic theoretical concepts, current trends and problems related to the media, new educational technologies, distance education, eLearning and online education;
- successfully apply the basic ICT tools for educational purposes;

- gain knowledge, know-how and habits needed for virtual educational environment, i.e. by using LMS (Moodle);

- efficiently use Internet resources.

Apart from the above-mentioned results, carrying out educational activities through the online course contributed to a higher level of interaction and communication between students and the teacher and among students themselves. Achieving a higher level of individualization of educational activities was significant, too, which was very useful, according to students. The online course produced some extra benefits, such as converting the required readings into PDF files; a considerable amount of articles was collected, as well as syllabi and curricula of other courses dealing with media and education; we have established an internal database with an abundant list of links to other institutions dealing with this matter. Perhaps the most important benefits of this project are the facts that students gained an insight into possibilities of ICT education and that they were an integral part of a virtual learning community. We would also like to add that a few outstanding students are qualified to create online courses by using LMS Moodle.

The problems we encountered during the online course were related to a low level of PC-literacy, limited Internet access and small amount of time allotted to classes in the computer lab.

Finally, we have to say that the support given for this course (equipment and training) not only enabled the development of the course, but also the establishing of three other courses at the Department of Andragogy and Pedagogy.

Thoracic Surgery eLearning Course

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Introduction

Thoracic Surgery encompasses the operative, preoperative, and surgical critical care of patients with acquired and congenital pathologic conditions within the chest. Included is the surgical repair of heart lesions, and congenital and acquired conditions of the coronary arteries, valves, and myocardium. It also includes pathologic conditions of the lung, esophagus and chest wall, abnormalities of the great vessels, tumors of the mediastinum, and diseases of the diaphragm and pericardium. Management of the airway and injuries to the chest are also within the scope of the specialty.

Clinical competence in thoracic surgery requires factual knowledge and technical skills in the preoperative evaluation, operative management, and postoperative care of patients with pathologic conditions involving thoracic structures. Precise definition of the scope of thoracic surgery as well as the current methods used to assess clinical competence has been developed to ensure that an individual who is certified by the ABTS has met certain standards and qualifications.

The scope of thoracic surgery encompasses knowledge of normal and pathologic conditions of both cardiovascular and general thoracic structures. This

includes congenital and acquired lesions (including infections, trauma, tumors, and metabolic disorders) of both the heart and blood vessels in the thorax, as well as diseases involving the lungs, pleura, chest wall, mediastinum, esophagus, and diaphragm. In addition, the ability to establish a precise diagnosis, an essential step toward proper therapy, requires familiarity with diagnostic procedures such as cardiac catheterization, angiography, electrocardiography, imaging techniques, endoscopies, tissue biopsy, and biologic and biochemical tests appropriate to thoracic diseases. It is essential that the thoracic surgeon be knowledgeable and experienced in evolving techniques such as laser therapy, thoracoscopy and thoracoscopic surgery.

eLearning technologies

eLearning is also called Web-based learning, online learning, distributed learning, computer-assisted instruction, or Internet-based learning. Historically, there have been two common eLearning modes: distance learning and computer-assisted instruction. Distance learning uses information technologies to deliver instruction to learners who are at remote locations from a central site. Computer-assisted instruction (also called computer-based learning and computer-based training) uses computers to aid in the delivery of stand-alone multimedia packages for learning and teaching. These two modes are subsumed under eLearning as the Internet becomes the integrating technology. A concept closely related to eLearning but preceding the birth of the Internet is multimedia learning. Multimedia uses two or more media, such as text, graphics, animation, audio, or video, to produce engaging content that learners access via computer. Blended learning, a fairly new term in education but a concept familiar to most educators, is an approach that combines eLearning technology with traditional instructor-led training, where, for example, a lecture or demonstration is supplemented by an online tutorial. Faculty, administrators, and learners find that multimedia eLearning enhances both teaching and learning. These advantages can be categorized as targeting either learning delivery or learning enhancement.

Integrating eLearning into Medical Education

The integration of eLearning into existing medical curricula should be the result of a well-devised plan that begins with a needs assessment and concludes with the decision to use eLearning. In undergraduate medical education, eLearning offers learners materials for self-instruction and collaborative learning. In graduate medical education, the Accreditation Council for Graduate Medical Education has established six core competencies toward which eLearning can

be applied. eLearning materials suited for each of these competencies can be integrated into the education of residents and fellows, replacing lectures and other synchronous methods of instruction. Asynchronous eLearning can be effectively used during demanding clinical care rotations, especially when duty hours are limited yet curriculum requirements remain high. In continuing medical education, physicians with daily clinical obligations can attend medical "e-conferences" using eLearning.

Objective of the ongoing project

New teaching materials and methodologies are in creation as a part of joint efforts of eLearning Centre at University of Kragujevac and academic staff at faculties to introduce eLearning into course programmes.

The wider objective of this project is to make surgery room practical experience and related course material available to greater number of students and medical experts. eLearning content is easy to deliver, and with use of eLearning Centre facilities and dedicated wireless link, even live broadcasts of surgery can be scheduled and held via teleconferencing or Internet. This way the project will contribute to development of new skills of both teachers and students in using ICT technologies in education.

The specific objectives of this project are: Adaptation of existing teaching methodology in order to effectively deliver teaching material and surgery practices by electronic means compatible with university LMS system; Setting up the schedule for live broadcasts of thoracic surgery, and presenting practical aspects of this course; Creation and setup of eLearning content for Thoracic Surgery to be delivered through LMS system; Increasing the number and range of students that can attend this course, especially surgery room practices; Providing possibility for medical experts to learn about most recent techniques in thoracic and plastic surgery.

Within eLearning Programme for Serbia and Montenegro, eLearning Centre is founded at University of Kragujevac to coordinate and promote introduction of eLearning in higher education. The Centre is equipped with help of WUS and it is able to provide necessary technical, training and counseling support.

Only with use of requested equipment together with teleconferencing facilities of eLearning Centre it will be possible to provide more students with chance to attend real-life thoracic surgery and listen to specialist performing the surgery. This is mainly because the surgery room needs to be kept sterile and can

not accommodate such large audience as teleconferencing room can. Thoracic surgery is extremely complex and can last for hours, so students and surgeons will remain physically separated with possibility to communicate throughout the surgery. Also, certain practical aspects of plastic surgery will be presented, since plastic surgery is required after thoracic surgery.

According to recommendations by Serbia eLearning Task Force (eLTF), every course programme that uses information-communication technologies (ICT) in order to improve teaching process is considered as eLearning course. Also, it is recommended that eLearning Centers are established at universities, and that they represent central point for all eLearning activities. Therefore, learning content will be transferred to web-based form compatible with university LMS. Also, with use of teleconferencing it will be possible for students not physically present in surgery room to attend surgery and ask questions. This option can be utilized by students from other medical faculties, as well as clinical experts.

Project is primary aimed to e students of 5th study year at Medical Faculty at University of Kragujevac (more than 100 students). All students at 5th year of studies are already attending this course, but they require more experience in practical surgery. Students from other medical faculties (several hundreds) will be able to attend surgery via teleconferencing at Universities' eLearning Centres. This would be of great benefit, since surgery rooms are not suitable for large audiences.

If requested equipment is provided in full, the mobility feature can be used by other lecturers from any faculty at University of Kragujevac for linking to eLearning Centre's teleconferencing systems. This way it can be possible to provide teleconferencing on-site (e.g. at amphitheatre of Medical Faculty) with link to remote locations (such as surgery room at Clinical Centre of Kragujevac) where actual practical work takes place (see section 2.10.c). Medical Faculty PhD students also attend course in thoracic surgery (approximately 15 students) and they too will benefit from surgery broadcast and live communication with surgeons. Currently, the practices in Thoracic Surgery are held at Clinical Centre of Kragujevac, and the number of students that can attend the practices is limited as well as the scope of practical topics (there are certain restrictions related to complexity of thoracic surgery, so the students can not observer the whole procedure). The other problem is that Medical Faculty does not have teleconferencing equipment, which can be solved by the use of mobile equipment at University of Kragujevac eLearning Centre.

The wireless link is necessary to connect Clinical Centre with Medical Faculty by means of Wireless LAN, since they are about 1 km away from each other. Pan/tilt/zoom camera is needed for capturing video for live broadcast, and audio system is required for capturing and playback of audio. The laptop will be used for converting audio and video signals to a form compatible with teleconferencing system.

Moodle based Thoracic Surgery eLearning course

Moodle is a free software eLearning platform (also known as a Course Management System (CMS), or Learning Management Systems (LMS), or Virtual Learning Environment (VLE)). It has a significant user base with 25,281 registered sites with 10,405,167 users in 1,023,914 courses (as of May 13, 2007).

Moodle is designed to help educators create online courses with opportunities for rich interaction. Its open source license and modular design means that many people can develop additional functionality, and development is undertaken by a globally diffuse network of commercial and non-commercial users, spearheaded by the Moodle company based in Perth, Western Australia.

Moodle has many features expected from an eLearning platform including: Forums, Content managing (resources), Quizzes with different kinds of questions, Blogs, Wikis, Database activities, Surveys, Chat, Glossaries, Peer assessment, Multi-language support (over 60 languages are supported for the interface).
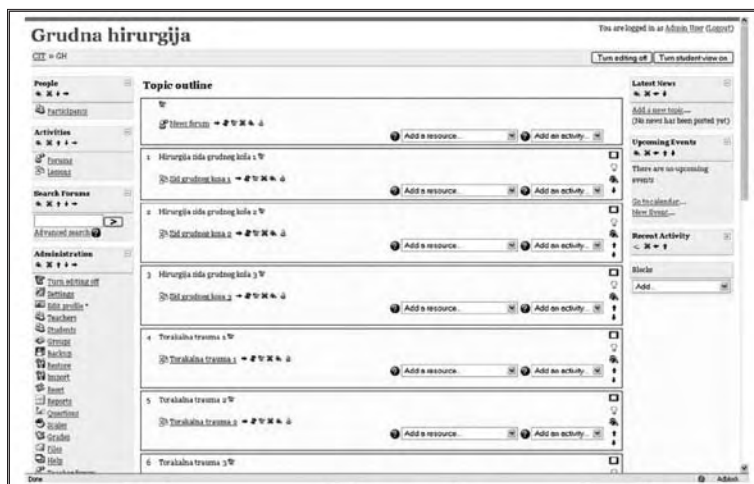
Implementation of Thoracic Surgery in Moodle

Example of Lesson in Moodle

Moodle is modular in construction and can readily be extended by creating plugins for specific new functionality. Moodle's infrastructure supports many types of plugin: Activities, Resource types, Question types, Data field types (for the database activity), Graphical themes, Authentication methods, Enrolment methods, Content Filters

Many third-party Moodle plugins are freely available making use of this infrastructure. PHP can be used to author and contribute new modules. Moodle's development has been assisted by the work of open source programmers. This has contributed towards its rapid development and rapid bug fixes.

Wireless link and teleconferencing link

The equipment will be used for live broadcasts of thoracic surgery from Clinical Centre of Kragujevac to Medical Faculty, and from there to other faculties or interested parties. It will be available for project group members during the realization of the project. After the end of the project, the equipment will be available for other lecturers at University of Kragujevac. Project member Nikola Milivojevic will be responsible for technical issues related to use of equipment, and project members Slobodan Milisavljevic and Dejan Vulovic will perform surgery for broadcast.

Surgery room at Clinical Centre of Kragujevac

eLearning Centre at University of Kragujevac
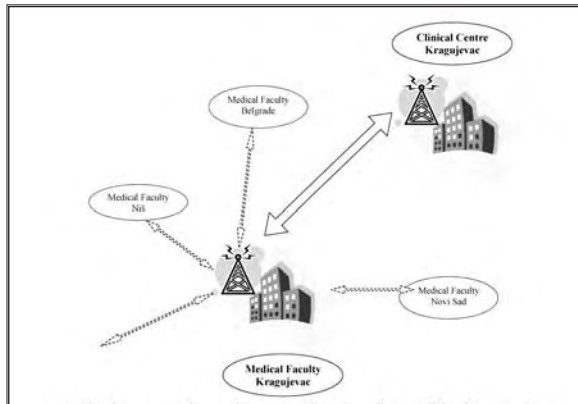
Schematic view of wireless link and teleconferencing link

Results of the project

• eLearning content will be available through University LMS system, where students can check in for scheduled lectures and practices. The tests will be available for evaluation of course progress and results will participate in final mark.

• Practices will be scheduled for teleconferencing at eLearning Centre to be held at the same time the actual surgery takes place at Clinical Centre in Kragujevac.

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Development of University Professors eLearning Skills

Introduction to eLearning and LMS - Blended Course

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Improving education and training for teachers and trainers is the first of thirteen objectives in education and training systems set out for Europe by the European Commission (1).

Raising the high quality of educational systems in Europe is an important objective of the Lisbon strategy, based on the fact that:

The fast development of Information and CommunicationTechnology (ICT) has brought about deep changes in our way of working and living, as the widespread diffusion of ICT is accompanied by organisational, commercial, social and legal innovations.

Our society is now defined as the "Information Society", a society in which low-cost information and ICT are in general use, or as the "Knowledge(-based) Society", to stress the fact that the most valuable asset is investment in intangible, human and social capital and that the

key factors are knowledge and creativity. This new society presents great opportunities: it can mean new employment possibilities, more fulfilling jobs, new tools for education and training, easier access to public services, increased inclusion of disadvantaged people or regions. (2)

Introduction

Quality University professors are the single greatest determinant of student achievement. Their education, ability, and experience account for more variation in student achievement than all other factors. Studies have found that 40 to 90 percent of the difference in student test scores can be attributed to teacher quality. Knowing the subject matter, understanding how students learn, and practicing effective teaching methods translate into greater student achievement.

Therefore, it is vitally important that University professors continue to improve their knowledge and skills throughout their careers. Professor's professional development is absolutely essential if IC technology provided to University courses is to be used effectively.

Simply put, spending scarce resources on informational technology hardware and software without financing professor professional development as well is wasteful. Experience from developing, industrialized, and information-based countries has shown that professor training in the use and application of technology is the key determining factor for improved student performance (in terms of both knowledge acquisition and skills development enabled by technology).

Educational technology is not, and never will be, transformative on its own—it requires professors who can integrate technology into the curriculum and use it to improve student learning. In other words, computers cannot replace professors - professors are the key to whether technology is used appropriately and effectively.

The Project "Reticulum M - Development of University professor's eLearning skills" falls into the area of fostering digital literacy and development of skills, competencies, experiences and attitudes to make effective use of ICT in education process. After University professors and assistants pass this teacher training program they will be enabled to produce quality digital content and services for the students.

Project Objectives

Main objective of the project *Reticulum M* was capacity building of university professors and assistants to use Learning Management System in their teaching process. This was achieved by elaboration and development of existing comprehensive teacher training program in the area of eLearning and Distance education - *Reticulum M.* University professors and assistants got insight into basic principles, methodology, technologies and proper skills of eLearning and Learning Management Systems necessary for integrate IT in into teaching and learning. They also developed skills and understanding of how to create, incorporate, and moderate high-quality activities and inventive practices that integrate IC Technologies with traditional courses. During this blended course professors were developed not only technical skills but also skills of planning, analyzing learning and development needs, communicating, providing meaningful learning activities, assessment of learners and evaluation of programs.

Program of blended course Reticulum

Reticulum M was developed as a blended course. It consists of three separate modules **(Introduction to eLearning and LMS, Principles of Instructional Design, Online Assessment)** - 18 hours of classical face to face workshops and lectures, and 22 hours of different asynchronous online activities. Main MOODLE modules (Discussion board, Lesson, Glossary and Quiz) were presented to the course participants.

I.MODULE - Introduction to eLearning and Learning Management Systems

A. Lecture: eLearning - Introduction & Terminology

- Distance learning
- eLearning
- Online education

B. Lecture: Types of interaction in eLearning

- Ways of knowledge transmission - Liner vs. Dynamic
- Types of interactions in eLearning

C. Lecture: LMS - Learning Management Systems (VLE - Virtual Learning Environment)

- Basic terms
- Properties of "good" LMS
- Synchronous vs. asynchronous activities

D. Moodle I - Introduction to Moodle

- Level of user accounts
- Creation of courses (settings of different parameters)
- Resources (short review)
- Activity modules (short review)

   1. asynchronous (forum, lesson, quiz, glossary, assignment ...)

   2. synchronous (chat, instant messaging)

- Forums - bulletin boards as basic and most important form of asynchronous activities.

II. MODULE - Principles of Instructional Design - Lessons and Glossaries

A.   Lecture: Basic principles of Instructional Design

B.   Moodle II - Resource

- Types of resources - creation

   1. web page

   2. text page

   3. links to a file or web site

   4. types of multimedia files (.pdf, .ppt., swf etc.)

C.   Moodle III - Lessons

- Types of lesson
- Settings of basic parameters
- Creation (basics elements of HTML)

D.   Moodle IV - Glossary

- Types of glossaries
- Settings
- Auto-linking of entries

III.   MODULE - Online Assessment

A.   Lecture: Bloom's Taxonomy

B.   Moodle V - Quiz

- Types of question
- Bank of questions
- Importing of questions from external resources

C.   Moodle VI - Grades and Scales

D.   Lecture: Other Moodle activities and properties (Assignments, Wiki, Surveys…)

E.   Participants Presentations

F.   Evaluation

Conclusion

By the end of Reticulum M blended course, University professors and assistants developed awareness about the educational technologies and the importance of the "human factor" i.e the role of the University Professors in the process of teaching and learning. They also acquired basic technical and pedagogical (andragogical) knowledge on eLearning and Learning Management Systems and started with building their own eLearning courses.

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Internet-Mediated Process Control Laboratory

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Abstract

The Internet provides a new environment for developing a variety of applications for educational and research purposes. This paper presents the implementation of a web-based laboratory experiment on a coupled tank apparatus. The web-based laboratory has been developed to serve students and staff at the University of Kragujevac. The laboratory is an educational tool for teaching students the basic principles and methodology in performing a series of experiments on a coupled tank apparatus at any time and from any location through the Internet. With the capability to implement strategies for manual, proportional integral derivative (PID), general state-space, and fuzzy logic control, the laboratory also provides a platform for research staff to test new control algorithms. Measurement, filtering and estimation theory as well as IT skills are important part of educational potential of the designed laboratory exercise, too. Video signal has been used to provide video feedback, with a camera mounted on a platform. The laboratory can be accessed at http://weblab.kg.ac.yu (mirror http://www.cqm.co.yu/weblab).

1. Introduction

Until now the Internet has been used for a variety of purposes in education. The Internet provides a convenient multimedia communication channel between

teachers and students and between scholars and research centres. Distance education and non-traditional classrooms can reach more students with specialized instruction and self-paced learning.

The integration of the Internet into education is most commonly achieved through the following methodologies:

1. Developing a course Web site to centrally house various online functions and facilitate course management.

2. Creating a remote laboratory where multimedia animation or simulation is provided to replace physical experiments (virtual laboratory).

3. Developing a Internet mediated laboratory that enables students to set up parameters and undertake experiments from a remote location (web based laboratory).

Most universities in the world have systems that utilize the Internet as a general communication tool and aid for material download and general learning (including eLearning and blended learning concepts). Concerning with second most common way to utilize the Internet for education, it is well-known that software demonstrations of abstract concepts can be very beneficial in helping students to obtain a deeper understanding of hard-to-grasp topics. Software based demonstrations can be passive or interactive, and can in general be categorized into those that need to be downloaded for execution on a local machine running software such as Matlab or those that run directly on the Web using Java applets. The mentioned systems provide students with only theoretical and simulation materials. However, especially in science and engineering, it is more or less universally recognized that effective and efficient learning requires a mixture of both theoretical knowledge and practical exercises. For engineering disciplines is important how theory can be applied to solving real-world problems, and for engineering education practical exercises or experimentations are essential. The idea of having a remote Internet mediated laboratory although isn't new, may be the next important step in remote distance learning. Such a system will enable students to have access to laboratory experimentation anytime and anywhere via Internet. In adition to education, a remote Web-based laboratory may also allow researches in different areas to carry out research and design work co-operatively and remotely at the same time.

This paper presents the implementation of a web-based laboratory experiment on a coupled tank apparatus at University of Kragujevac (Faculty of Mechanical Engineering), as a part of the web laboratory of University of Kragujevac

(WLUK). WLUK (http://weblab.kg.ac.yu, mirror http://www.cqm.co.yu/weblab) was established at the initiative of group of professors and associates of University of Kragujevac in order to use laboratory resources more effectively and to improve cooperation between departments, faculties and universities. The main goals are development of a network of laboratory resources for usage of authorized group of users for research, academic and college education as well as life long learning.

2. Coupled-Tanks Experiment

Why Coupled Tanks System?

The control of liquid level in tanks and flow between tanks is a basic problem in the process industries. The process industry requires liquids to be pumped, stored in tanks, then pumped to another tank. Many times the liquids will be processed by chemical or mixing treatment in the tanks, but always the level of fluid in the tanks must be controlled, and the flow between tanks must be regulated. Often the tanks are so coupled together that the levels interact and this must also be controlled. Level and flow control in tanks are at the heart of all chemical engineering systems. Vital industries where liquid level and flow control are essential include petro-chemical, paper-making and water treatment industries. Tank level control systems are everywhere. All of our process industries, the human body (bio-systems in our body) and fluid handling systems depend upon tank level control systems. It is essential for control systems engineers to understand how tank control systems work and how the level control problem is solved.
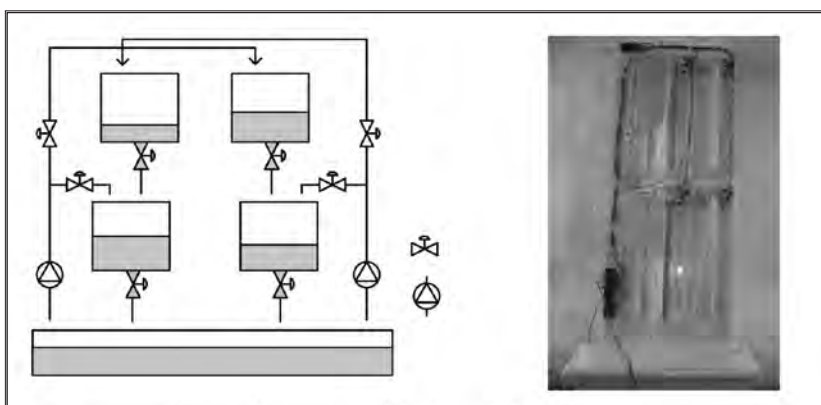
The Experimental Setup

Fig.1. Laboratory model of coupled tanks system

of a suitable PID controller and various fuzzy logic controllers, such as Takagi-Sugeno and Mamdani, for the system. A postgraduate control courses are also encompassed. By this experimental setup (as a problem case) students will be introduced to solving both classical optimal control system design problem, such as linear quadratic regulator (LQR) control and linear quadratic Gaussian (LQG) control, and advanced robust control problems, such as H^2 i H^∞ control. The Internet mediated process control laboratory will be used throughout the course homework assignments, in which students are required to solve an actual problem on the control of the flow levels in the coupled tank system using techniques learned in the class and implement their designs on the actual system through the Internet. Many students will feel a great sense of achievement when they see that the controllers they have designed actually work in the real system.

3. Internet Mediated Laboratory

Figure 3 shows the topology of the control system in the Internet mediated laboratory for the coupled tanks experiment. This is a typical single client/server structure. The control server works as the Web server as well as the local controller. It receives commands from the client and returns back control results from the control of the physical plant. The system on the server side is realized using LabView. Figure 4 shows client GUI of Internet mediated experiment of coupled tanks. Arbitrary controller can be implemented. Also, it is possible to choose manual or automatic pumps control, sample time value, time of experiment duration, and to save and download all acquired signals. The experimental configuration is announced on the experimental web portal together with educational materials for downloads.
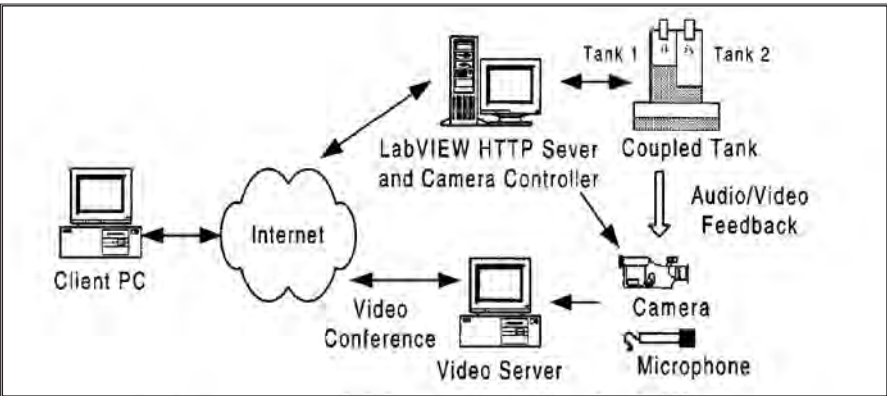

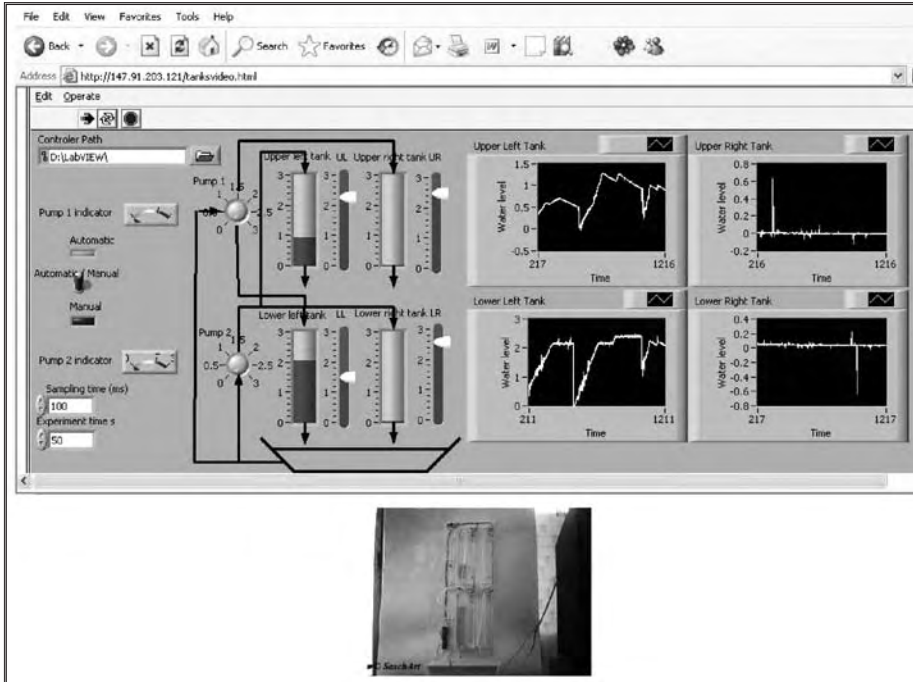Fig.3. Topology of web laboratory system based on LabView

Fig. 3. GUI of web coupled tanks experiment

4. Internet Mediated Laboratory - Experiances

Remote access via Internet has following benefits: 1) Laboratory can be accessible 24h a day every day of the year, 2) Students do not have to travel to the centre to do practical activities, 3) Optimal exploitation of resources because of a shared laboratory can mean two or more departments sharing equipment and coordinating the development of experiments (the ratio *money inverted/time used* obviously improves.), 4) Adaptation and personalisation of the laboratory environment to students with disabilities; etc..

Nevertheless, Internet mediated experimentation does have some drawbacks, such as following: 1) no direct physical contact with the experiment, 2) Unpredictability and instability of transmissions, 3) Need for a change in teacher and student mentality.

5. Conclusion

Internet mediated experimentation, enabling students and researches to access the laboratory anytime via the Internet, is becoming an increasingly

attractive way to complement or even replace traditional laboratory sessions. Placing a video camera and microphone before equipment and apparatus to capture what is actually happening in the laboratory allows the images and audio data to be streamed to the client side - whether this is in a nearby room or on the other side of the word. Researches in different countries can share equipment and conduct research cooperatively and remotely. This concept is very interesting for students, engineers, researches and teaching professionals working in areas related to the Internet, distance education and collaborative research [4].

This paper presents the implementation of a Internet mediated process control experiment on a coupled tank apparatus, that has been developed to serve students and staff at the University of Kragujevac. Experimental setup is very cheap and based on the legacy equipment. It presents a very useful education tool for training and education in several courses at University of Kragujevac, concerning to Modeling and Identification, Control Engineering, Real-Time Programming, etc. It also provides a good exercise for possible improvements for those interested in how hardware and software can be integrated to form a web based experimentation system. The laboratory can be accessed at http://weblab. kg.ac.yu (mirror http://www.cqm.co.yu/weblab).

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Implementation of eLearning at the Faculty of Civil Engineering Subotica, Serbia - Should the creators of long distance learning courses become aware of didactics guidelines for advanced training?

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Abstract

This supplement has two goals: the first to be presented are guidelines which could serve to help during planning, applying and carrying out eLearning courses, and a second step, the process of development and implementation will be examined and determined if it has an impact on evaluation results.

In the first part of this text, each step of the concept of this project is explained, and the second presents the method of work during conception and implementation of project *WUS Austria Belgrade eLearning Program 2005/2007 - Supported projects №14/06 - Serbia „Improving knowledge of the lecturers at the Faculty of Civil Engineering in eLearning"*. In the framework of this project, some evaluation-based results were obtained and used in making conclusions for development and application of didactic-methodological guidelines.

1. Framework:
Studies at the Faculty of Civil Engineering Subotica (GF), University of Novi Sad, and „Moodle", learning platform

The goal of the project „*Improving knowledge of the lecturers at the Faculty of Civil Engineering in eLearning*" was the development of teacher competence and

application of knowledge in eLearning. The project was supported by *WUS Austria* during 2006/2007. This pilot phase is still ongoing because the normal lectures began in the winter semester of 2006/2007. There were 32 (22 DL+10) students included in the winter semester, and the first exams were taken in January and April.

For development and implementation of didactic guidelines the structure and goals of these projects are very important. Guidelines for development and implementation (specific terms of application, size of teams, moderators, feature of every field of specialization) of subjects which will be applied in the curriculum of the GF, should be made.

The creators of materials and concepts (teachers) for eLearning didn't moderate and didn't have contact with students. At the beginning it should not be looked at as unreal, because at the start of this project only assistants finished the course for eLearning. One common methodological concept is nevertheless needed, and it should link all the participants (moderators and those that write the teaching material) and be adaptable for all subjects (Thillosen 2005: 149).

In the case of GF there was a need to explain the application and modeling of the multimedia teaching material, raising the level of computer skills and the way professors and instructors teach, improving ICT used in the education process, improvement of education methods which are meant for development of ICT supported models, all of this is an addition to the traditional teaching practice, capable of procuring large amounts of educational material which will serve as a foundation for distance education.

The students' ability should have been encouraged by giving assistance with learning with just such educational material.

The basis of this entire project was represented by a software package - the «Moodle» learning platform - as well as the instructions written for moderators.

Evaluation should undergo additional revision and be expanded so it could be used for different goals.

2. Concept of eLearning-courses

Tasks and their importance for education were constantly discussed so that they could meet the demands for distance learning given to the GF, and not just offer assistance in learning but much more. How to motivate students in the learning process, how to ensure successful passing of midterms and exams, how to check and correct tests, how to link tests with real work environment (working

competence), what are the most suitable tests for students, how to establish a dialog between moderators and students - these were the questions of project participants.

The conceptions, which were alternately changed, had the following steps. These were :

1. competence which should be acquired during the course, goals of learning,

2. curriculum material and

3. evaluation.

1. Professional environment from which the tests and competences needed for adaptation should be derived from (field of work, working competence, social competence, and ability to grade and so on) as well as goals for learning, played a decisive role in the creation of courses and selection of test types. Because of all of these reasons not all the tests were made simple and with the possibility of automatic evaluation (interactive), but they were some challenging ones for which a transfer of knowledge and ability is needed. Those kinds of tests were given to third year students, because they had to demonstrate that they acquired the required competence, and the moderator was the one that followed their work on the projects and only sometimes graded their results. During the creation of these tests one should take into account the methods and competences of students (one or more of them) so that a good decision is made when formulating the tests.

2. 14 assistants that work in GF were trained during the project.

When planning the structure of the curriculum, decisions that envelope many of the questions are made about time and organization:

a) What kind of information should a student get and the quantity of them?

b) Classical texts or something else - adding didactically throughout contents on the learning platform,

c) Information that can be found by surfing the internet or not?

d) How much should clips (audio, video) and multimedia in general be used

e) Should the results that other students got be given as an example?

f) The form of examination,

g) Control during learning - help with learning and motivation - feedback in the form of tests, quizzes supported by computer

h) In which way to motivate students?

i) synchronous and asynchronous interaction between teachers and students over chat, forums, e - mail - help with communication,

j) Comments and discussion forums as a possible means for learning (cooper. learning)

k) Social forms - working alone and in a group,

l) Examples and function of collaboration.

Planning was done on a basis of one semester and it was done for a particular learning unit. The work should have been about tests that were described in detail, so about creation of teaching material.

From the beginning there were difficulties in choosing what multimedia elements should be developed.

PowerPoint presentations with many pictures could extend the time needed for download because of bad internet connections (maybe a classical form of text is better?!) a recording of complete classes - then there is no difference from ordinary classes. Hyper-text is leading students through a jungle of links - it should be used only if there is no alternative.

The creators of teaching material were (not) familiar with the functions of the learning platform, which had good (bad) effects on the moderators, because creators should also have had experience about this platform. Information such as terminology, instructions for teachers, should have been given by the creators themselves. Help, glossary and instructions should have been added to the teaching material, which was not done in the majority of cases. In the case of some misunderstanding the creator should have explicitly explained the solution. Many moderators sometimes had difficulty in applying the material somebody else had made. Instructions for solving these tests given by their creator are very important to moderators. Even the answers to student questions were linked with delays, because often they couldn't/ weren't able to give them. Possibilities of feedback were limited.

Tests should have been synchronized with the teaching units.

Chat and discussion forums were not taken seriously by students (and

teachers). They should be used from case to case, instead of creating frustration and rejection in moderators and students if they are not prepared adequately. For students and moderators at the GF, general instructions for the learning platform «Moodle» were written in a form of an instruction manual.

The technical demands were left out on purpose in the short manual, only clear instructions for using this software, in the proper way, were given. Timewise this has proven to be the best method of implementation of this leaning platform.

On the other hand the manual for moderators has concrete suggestions on what CAN be done for communication with students. They are derived from the three-year-experience in moderating on-line courses for training teachers of German language (see data about the author) and they have proven to be very useful.

Participants of this project were introduced to the possibilities of the «Moodle» learning platform. The creators (read: professors) had to make their own multimedia teaching material, such as pictures, audio and video, etc. There are no technical teems/graphic artists, programmers, designers and etc. /to help with the development of multimedia material which should be incorporated in the teaching material.

Because our project is just the first step in development of teaching material, final working instructions can not be given at this time. There were several attempts to create teaching material for different subjects. Because of that the multimedia elements were used only sporadically. For many teachers it seemed too demanding. In contrast younger teachers and assistants had a lot more interest in the conceptually shaped courses from the very beginning. The management in the dean's office and older professors had the opinion that the didactically advanced training is unnecessary, as something that requires too much time.

Didactic guidelines in the field of eLearning should be condensed and constantly evaluated. Influence of creators and participation of experts in the shaping of teaching materials would show that only team work can produce a good, methodically conceived teaching material.

Didactic guidelines can not represent a theoretical model, but assistance during work for all participants. They originate from practice, they should be discussed, revised during several phases, adapted and expanded (Thillosen 2005:147).

3. Results of evaluation

The application of the first pilot courses in the first semester of regular and distance studies at the GF were evaluated, in a way that the acceptability of teaching material (tests and forms of teaching) and the method of moderating were tested.

There was some criticism about teaching material. Results of the evaluation had shown that the students want clearly formed assignments, instructions and examples. Although requiring a lot of time it was obvious that explanations in that context were necessary.

Working in groups was rare, because for most of the creators that kind of social form was unusual. During regular classes in most cases the tasks should have been done individually by every student.

Even the students felt as a group only after the first semester (difficulties in communication, because forums didn't function). In the beginning there was almost no communication between students.

Also announcement of examinations or tests should be done using this platform.

Advantages of EL are: support from moderators, phase of independent learning without time restrictions and choice in selection of pace of learning and organization of learning.

There was a lot of skepticism between creators and moderators if this model is applicable for civil engineering studies and could the lectures be conducted in this way.

Prior knowledge, work, experience of participants enrolled in DL studies on the first and especially on the third year of studies, which have previously studied at other universities, have created a special situation for moderators in the beginning, creating difficulties for them. Different needs, past experience acquired during lectures and learning influence not only learning but also motivation, because there are no common assumptions.

Further results of evaluation have shown that the education of moderators, despite all obstacles put forth by administration and a number of teachers, was helpful and that moderators were used as necessary and expert contact-persons during the use of this learning platform. Further aspects as organizing time, strategy of learning and organization are still considered as not important, but as

a support for the creation of teaching material shown that they are needed, but they are still considered as a problem in distance learning.

The whole project was very concentrated on the application of this learning platform and rapid development of teaching material. There was great pressure due to the short time interval, because the first course was scheduled for the winter semester of 2006/2007, so the training began in September, and in a case of some subjects the development of teaching material (which was not planed) began at the same time. Most of the creators did not participate in the conveying and moderation of courses.

The results of evaluation show that on the second and third level of development new multimedia teaching material must be planned, instructions should be given for use of these materials and the possibilities of group work and communication elements should be exploited, during the pilot-phase of eLearning. This development was never even mentioned. The way to a solution or a goal did not exist, the level of difficulty of assignments was not given, importance of team/group work was not mentioned and the instructions for gradual solving of assignments did not exist. Discussion forums should be used for specific assignments.
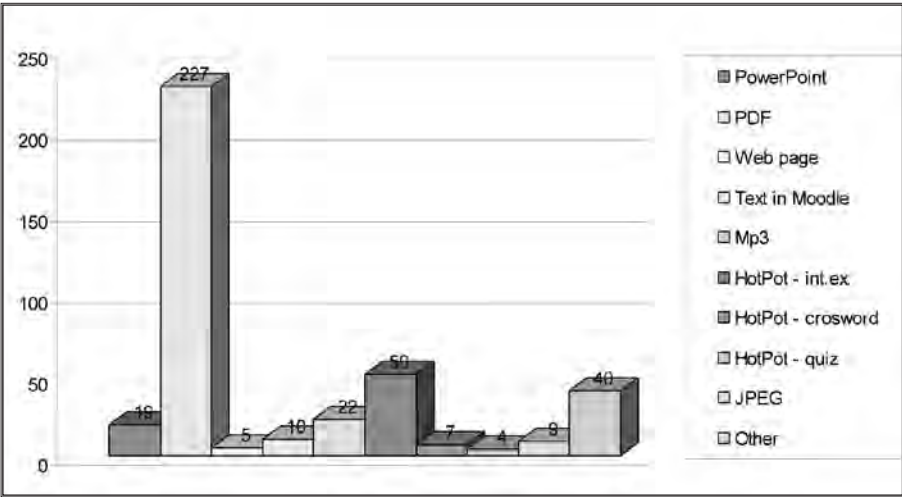
Picture 1. Different form of lectures

Besides that, one could come to a conclusion, that there is general lack of theoretical understanding of the teaching process, as well as the understanding of mechanisms of adopting knowledge and the quality of learning.
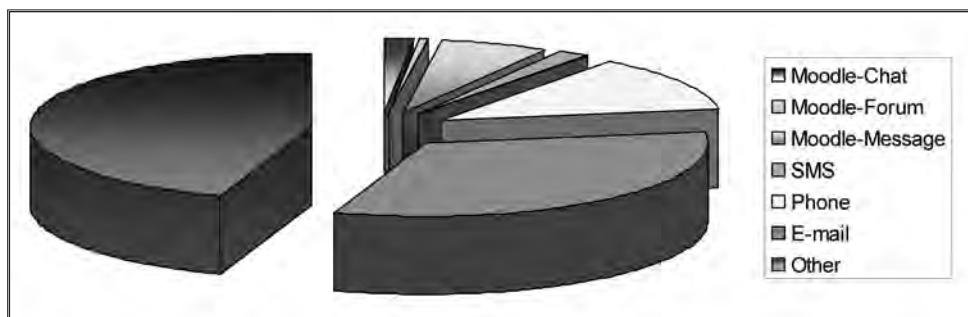
Picture 2. Contacts student-student and moderator-student

	I year	II year	III year	total
Number of lectures	11	6	8	25
Distant Learning (m)	63	43	52	158
Distant Learning (f)	14	4	3	21
Regular (m)	0	0	7	7
Regular (f)	0	0	3	3

Table 1. Number of lectures in pilot-programe and structure of students

Number of lectures	Number of students at begining and at the end of EL course	Achivemenets of DL students and regular students	Att.
25	24 DL (3 f) / 22 DL (2 f) 10/10 reg. (3 f)	No significant differences	Students did not realised some exames

Table 2. Number of lectures, number of students and their achivements

In regular teaching practice at GF, integration of new media was realized through different technical/didactical settings (from PowerPoint, Hot Potatoes in multimedia in general). They were used for DL studies as well.

Because of the small number of DL students there were no concrete evidence to which form of studies are better for learning.

One thing that is certain is the autonomy with the selection of location, time and means of studying. Independent studying is different from participation in regular lectures - it is more than adoption of knowledge, it is about understanding.

In order to shape the teaching material, which is suited to distance learning students, as an offer for studying, first the experts for learning should be contacted and then the computer experts.

Mutual support between students was much better in the second semester; it developed without planned group work. They became much more responsible for their own learning and began to communicate between one another offering assistance to one another.

With the results of project evaluation the following conclusions could be made, or the following shortcomings of eLearning could be noticed, in other words shortcomings of teaching material:

1. The formulation of goal for learning,

2. Traditional didactic and methodological shaping,

3. Lack of communication between students as well as teachers and students.

The conclusion is that the students attending eLearning are motivated, which - regarding the practical use of eLearning - is not true for teachers.

Teachers are only partially prepared for this in a didactical and methodological sense, they have good computer skills and knowledge of the internet, but in the preparation of eLearning material and behavior towards new media relevant for stimulating learning, they lack knowledge.

The motivation of students, quality of learning and their effects could be observed in the following phases, as well as collecting experiences acquired during the use of eLearning, to grade them and to evaluate starting conditions, learning process and their effects.

Demands for quality could be further examined from the perspective of students and teachers and from that one profiles of quality for the target group could be developed.

The model that is presented by Ulf-Daniel Ehlers (2005:252-254), «Modell of three levels» could be used as an example: «Factors of quality that are tied together in dimensions which are spreading into fields of quality. »

Fields of quality envelope factors of quality, and those are:

a) Shaping of moderator support (help from moderator - assignments, availability...)

b) cooperation and communication during the course (forms of communication)

c) technology of learning (eLearning platform)

d) experiences - expectations - benefits

e) (consumption of labor and student results)

f) transparence of information (which information and advice)

g) presentations (shaping, frequency of presentations, tips for learning, evaluation) and

h) Didactics (contents, goal of learning, methods, material with information, preparation of multimedia material which is media justified, explained and structured teaching material, stimulus of competences for learning, assignments made and adapted to goals and capability of each student).

4. Summary

Because there are many definitions for DistanceLearning and eLearning, here they are used to describe distance learning studies organized at the Faculty of Civil Engineering in Subotica not as a part of regular studies, and eLearning is described as a strategy for learning.

Didactic guidelines can be a support during creation of teaching subjects and can help the creators of teaching units to take into account all necessary aspects which are important during planning, especially when the creators are not directly involved in conveying and moderating eLearning courses.

Unfortunately there are no „simple recipes" - „why that way and not differently?" Didactic guidelines should be understood by creators, accepted but discussed with all the participants before accepting - in this way improvement and counseling, didactic workshops for higher education will become invaluable as well as testing the teaching material. They should be considered in a dynamic process in which every one feels responsible. Methodical - didactical education of teachers should be conducted parallel with the education in the field of new media competence.

Virtual platform for learning „Moodle" has a great functionality. Easy use gives the creators a possibility to concentrate more on methodological-didactic aspects. In order to link themselves with the contents for learning, the goal of synergic content for learning by Engler and Mikulan (2006:39) is

„to continue all the resources of teaching (or better ICT and multimedia) ... support them on a 'higher energy level' using the mutual effects of individual resources."

All of this seems to demand a lot of time and work, didactical guidelines could contribute to the assurance of quality during eLearning courses.

The basis could form the criteria and experience accumulated during time. The whole process of training teachers should be planned and financially and staff-wise supported. To avoid unwanted effects all the teachers should become aware of the new forms of teaching and media. Also their work motivation when using eLearning should be better. Success, students' results and security when dealing with ICT should improve, although it means that it is necessary to increase work. It can be justified by better competence of teachers and students.

There was courage for new, and a break with outdated university forms of teaching and learning in our pilot-project. We hope that this is not just a trial and wish for more passive consumers - students.

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Remote Experiments in Control Engineering Education Laboratory

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University of East Sarajevo, Bosnia and Herzegovina

This paper presents some experiences and achievements during implementation of the eLearning Project No. 013/2006 supported by World University Service (WUS) - Austria.

Some beginning steps of designing and building a remote laboratory of automatic control at the Faculty of Electronic Engineering in Nis are presented in this paper. The main target of this laboratory is to allow students to easily interact with a set of physical processes through the Internet. The student will be able to run experiments, change control parameters, and analyze the results remotely. This remote laboratory should allow the user to design his/her own controller by means of the MATLAB/Simulink environment, and to test it on the actual plant through a user-friendly interface. An additional feature of remote laboratory is its architecture, allowing for an easy integration of new processes for control experiments.

The aim of this project is to create a remotely controlled engineering laboratory for substainable development. This laboratory will offer new learning possibilities for the students by bundling existing eLearning facilities (presented

by the eLTF, recently established at the University of Nis) and the knowledge and experiences of the university teachers and assistants. This project is only the initial step, and will be accompanied by local activities, sharing courses accessible by all students, flexibility in approach etc. After several projects of such kind using ICT for sharing and developing knowledge in a time and place independent way, the developed laboratory will support the virtual mobility of students between the participating universities and beyond.

The created remotely controllable lab will be continually upgraded with new software versions and experiments. In the present stage, one process (magnetic levitation system) is planed to be available for online experiments. The aims and the activities are in accordance with the demands of our Faculty Development Program in the framework of so-called "Bologna Process".

It is planned that this project should produce several benefits for the students participating in the course.

Outcome 1: Purchase of new literature in order to collect literature and study the architecture of the eLearning solution which was used as a foundation of the eLearning system of the Faculty of Electronic Engineering in Nis. Recall that there is currently a technological revolution taking place in higher education. The growth of eLearning can be described as explosive, unprecedented, and even disruptive. The comprehensive books, shown below, provide a coherent framework for understanding eLearning in higher education.

Fig. 1 New literature

1. C. C. Ko, B. M. Chen, and J. Chen: *Creating Web-based Laboratories,* Springer, 2004.
2. R. E. Mayer: *Multimedia Learning,* Cambridge University Press, 2001.
3. R-M. Conrad, and J. A. Donaldson: *Engaging the Online Learner: Activities and Resources for Creative Instruction*, Jossey-Bass, 2004.
4. D. E. Hanna, M. Glowacki-Dudka, and S. Conceicao-Runlee: *147 Practical Tips for Teaching Online Groups: Essentials of Web-Based Education,* Atwood Pub, 2000.
5. S. Ko, and S. Rossen: *Teaching Online: A Practical Guide*, Houghton Mifflin Company, 2003.
6. S. Conger, and R. Mason: *Planing and Designing Effective Web Sites*, Course Technology, Cambridge, 1998.
7. William Horton and Katherine Horton: *eLearning Tools and Technologies : A consumer's guide for trainers, teachers, educators, and instructional designers*, Wiley Publishing, 2003.
8. William Horton: *Designing Web-Based Training : How to Teach Anyone Anything Anywhere Anytime*, John Wiley and Sons, Inc., 2000.
9. Bijan B. Gillani: *Learning Theories and the Design of eLearning Environments*, University Press of America, 2003.
10. Randy Garrison: *eLearning in the 21st Century: A Framework for Research and Practice*, RoutledgeFalmer, 2003.

Outcome 2: Purchase of equipment in order to realize the idea of improving and modernizing the teaching process in control engineering at the Faculty of Electronic Engineering in Nis using Internet as a training aid.

The result of our efforts should be the creation of a virtual space on the Internet that will allow Web-based control education as well as virtual and remote labs based on the equipment purchased under WUS Grants CEP and CDP+. Recall that the motto of distance education is - "anything, anytime, anywhere, available to everyone". Equipment will be used mainly for student laboratory work, projects and diploma works. Besides, advanced students will be encouraged to participate in some research projects in all phases of their realisation, starting from process modeling, design of conventional and advanced controllers, verification by digital simulation and on-line implementation.

Fig. 2 New equipment

1. TOSHIBA / L20-183 / INT.CEL.M 1.6Ghz / 512MB DDR2 / 60GB / DVD-RW / 15" / ATI128MB / XP HOME
2. TOSHIBA / L20-183 / INT.CEL.M 1.6Ghz / 512MB DDR2 / 60GB / DVD-RW / 15" / ATI128MB / XP HOME
3. COMPUTER P4/17"
4. CAMERA WEBCAM PLUS 352X288

5a. NI PCI-6014 Basic Multifunction I/O & NI-DAQ

5b. SH68-68-EP Noise Rejecting, Shielded Cable 1m

5c. CB-68LP Low-Cost, Unshielded I/O Connector Block
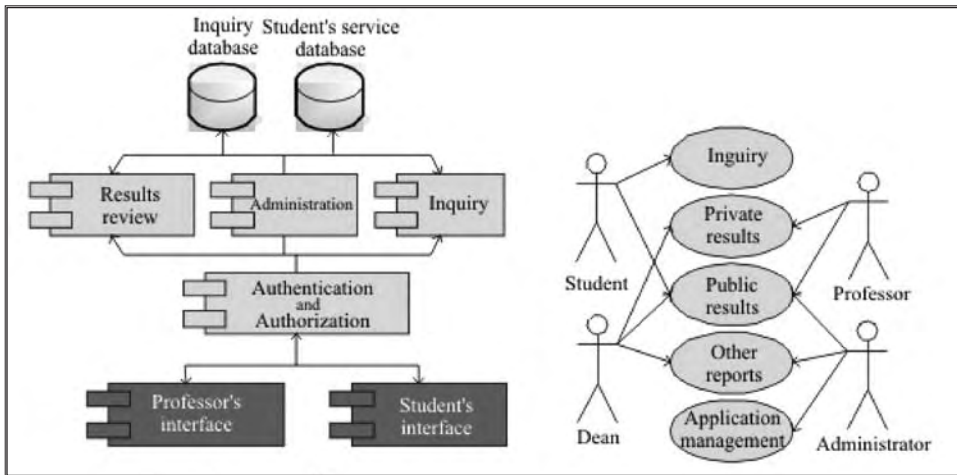
6. TDS2MEM Storage Memory and Communication Module

Fig. 3 System architecture   Fig. 4 Use cases diagram

Outcome 3: Preparation of several papers and one MSc thesis that is in relation with the effective Web sites designing. Danijel Mijic, teaching assistant at the Faculty of Electrical Engineering in East Sarajevo, Bosnia and Herzegovina finished his MSc thesis entitled Using Internet Technologies in Education. The research presented in this thesis deals with the web based application that is to be used for inquiring students' opinions and processing and displaying results. Evaluation of educational processes is one of the major activities for accomplishing Bologna processes at the Faculty of Electrical Engineering East Sarajevo. One of the most important factors in evaluation is student's point of view in various phases of educational process. Aquired results represent important feedback for improving educational process quality.

An effective software slution has been developed in a form of three-tier Web application, as shown in Fig. 3. Figure 4 shows a typical use cases diagram. The results are dynamically integrated into the HTML pages as shown in Figs. 5 and 6.
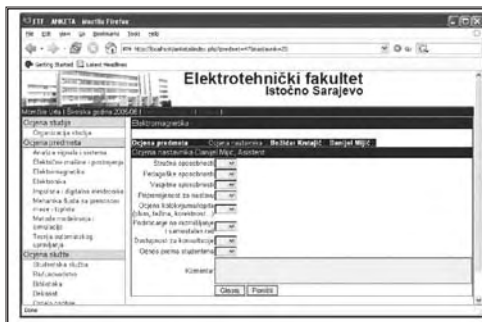
Fig. 5 Student's user interface   Fig. 6 Display of evaluation of the professors

Outcome 4: Introduction to design of remote automatic control laboratory. Our virtual laboratory makes conventional methods of using laboratory easier and alleviates theirs disadvantages. The concept of realizing remote laboratory is shown in Fig. 7.
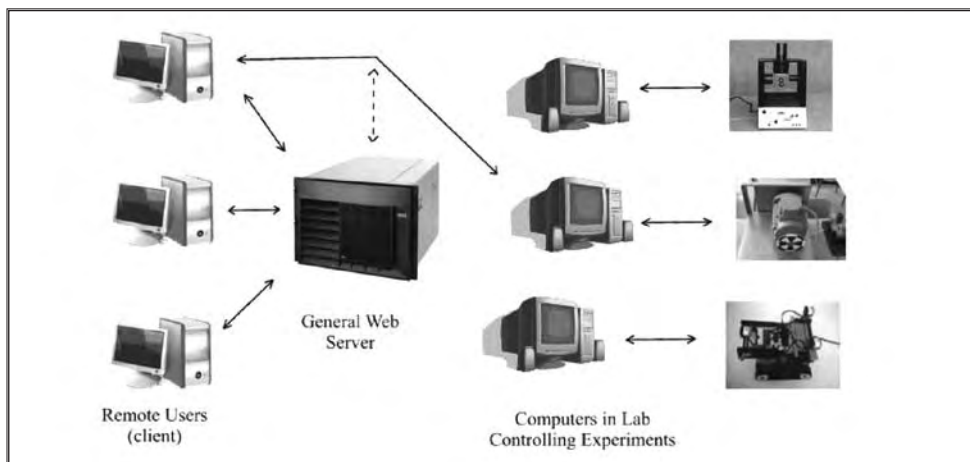
Fig. 7 Concept of remote laboratory

Certain experiments (plants) are connected to computers through their own interfaces (cards) that control them. Controlling is done using Matlab Simulinc program. Web server is layer that is located between computers that control functioning of particular plants and distant users. Distant users of Virtual laboratory are connecting to server over internal WEB site and are allowed to control particular experiment.

Our site enables viewing of experiment that could be controlled. To control an experiment, distant user should be registered in the database and should have privileges to control it. Registration and granting of privileges are in hands

of virtual laboratory administrator. Non-registered users can only view site without possibility to control experiments and they can view recorded video examples of experiments. This site is made to introduce Virtual laboratory as a system for remote control of experiments and learning.

The site is made to aid learning process through practical experimentation and that is the reason why it consists of explanation of experiment theory, possibility to ask laboratory personnel questions about experiments, and useful links to other sites that deal with similar problems.
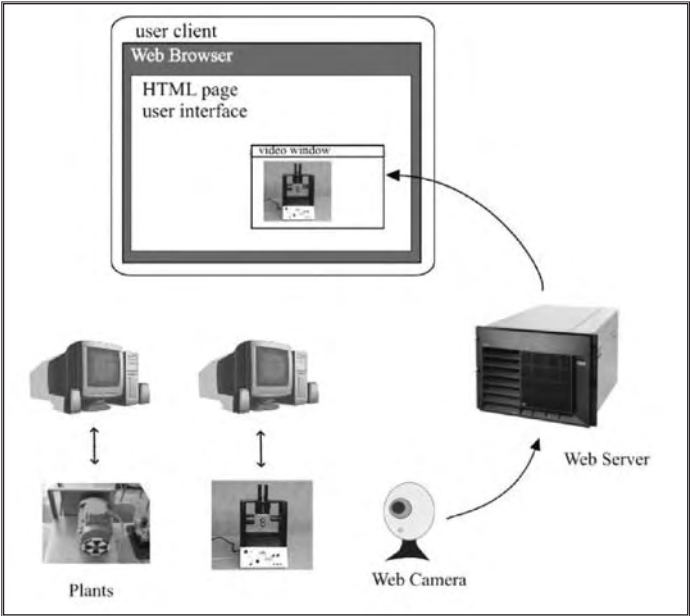
Fig. 8 Structure of our virtual laboratory site

At the moment, the hole structure and functionality of the site is complete and it is performing as expected. Also the component used to view and control online camera that shows experiments in real time is implemented (Fig. 8.). Remote control of the experiments over the Internet is yet to be tested. This is planed to be realized as a set of functions that represent interface between site and program MATLAB®.

We wish to express our sencere gratitude for the support WUS has provided to this project. We would like to emphasize that WUS-Belgrade Team has demonstrated professionalism and ability to coordinate all eforts required in all project phasis.

Implementation of the eLearning Project on University of Montenegro (eLearning Centre Podgorica)

Bozo Krstajic, PhD,
Aleksandra Radulovic, M.A.
University of Montenegro

The aim of the project was to create eLearning course support for cours Operating System on Electrical Engineering faculty and to determine the level of interest among students and teachers.

Achievements:

• Distance learning - almost complete one study programme on Faculty of Economy

• Blended Learning (Operating System course on Electrical Engineering faculty over LMS Moodle)

Operating systems are an essential part of a computer system. Similarly, a course on operating systems is an essential part of a computer science education. The first part of Operating Systems focuses on traditional operating systems concepts and it is more theoretical. The second part of the course describes an element of a modern operating system and consists practice of two popular operating systems: Linux and Windows.

Duration of the course is one semester, with 4 hours/week: 2 hours lectures and 2 hour laboratory. Lectures and part of laboratory exercises were held in the computer classroom.

Main tasks of Project Operating systems by eLearning were realization of above described course on learning management system and implementation on teaching methods during a semester.

The first part of project team learned how LMS can be used and take more experience how to use them (Moodle). Then we divided parts of course materials and prepared materials for LMS. After finishing of making LMS course we published our work, made materials how to use LMS and any teaching course on them.

The second part of project started on beginning of winter semester of school year 2006/07. We implemented this course and during semester we made corrections to be more familiar with students.

On the end of semester we made an event where we presented our results of making course, our experience and students feedback on them.

We made manuals for LMS for teachers (course making) and for students (course using), as a one of goals of our project.
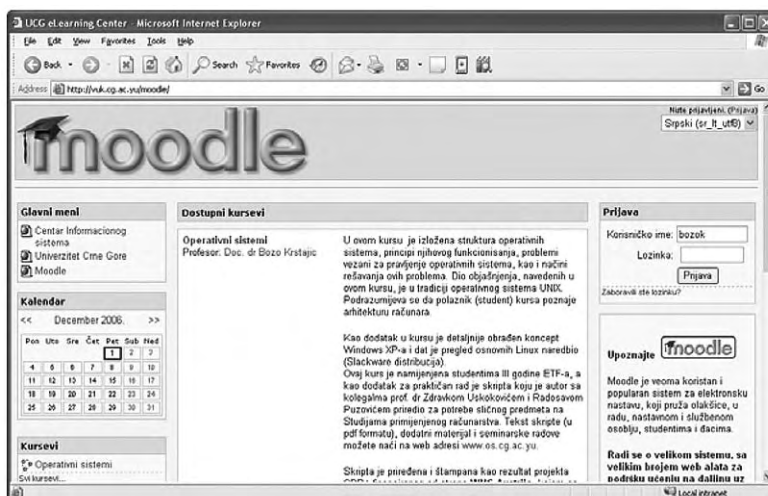
As a results of our work we presented paper "**Moodle LMS in eLearning**" on workshop "Information technology - IT 2007" on Zabljak

Abstract

This paper presents Moodle Learning Management System - based on open source platform. After identifying Moodle possibilities, blended learning project was realised on Faculty of Electrical Engineering - University of Montenegro. The paper presents overview of installation of Moodle LMS, and some of it's capabillities.

From start of eLearning project we made video-conferences between:

• CIS - Electrical Engineering faculty (Podgorica) - 1Gbps

• CIS - Faculty of Economy (Podgorica) - 100 Mbps

• CIS - Faculty of Economy (part in Bijelo Polje) - 2 Mbps

• CIS - Faculty of Philosophy (Niksic) - 2 Mbps

• CIS (Podgorica) - Kragujevac, Nis - 4Mbps

• CIS (Podgorica) - Italy (eLearning in Renewable Energy in Eastern and South Eastern European countries, Arab states, Australia, Indonesia and China)

• Faculty of Economy (Podgorica) - Faculty of Management (Bijelo Polje) - since 20.11. almost all courses were realized by video-conf.

• CIS - George Mason University, Washington DC, USA

• defense of master theses from Podgorica to **The Robert Gordon University**, Aberdinu, UK.

Experiences:

Teacher

• Experience in eLearning course realization

• Improvement in course management

• Tracking students knowledge during semester

• Efficient way of changing course due to students occupation

Students

• Better way of learning (students reached the knowledge in simple, easier, user friendly way)

• Continual offline learning and knowledge testing

• Use the advanced methods in learning

• Coming back to LMS system when they need some things during a work or other exams

• Better interaction with professor and assistant and students from same year (during classes and after them) using forums, mailing lists and chat

Activities in the future:

• Purchase new MCUs (Faculty of Medicine and Faculty of Economy)

• Expansion of eLearning wide University (Kotor)

• Teacher trainings

• Staff expansion (pedagogue, etc)

• Development of new courses

Annex 1

eLearning Conference

eLearning - Toward Effective Education and Training in the Information Society

30th May - 1st June 2007,
Bijela, Republic of Montenegro
Location: Hotel Delfin, Bijela

Agenda

Tuesday, 29th May 2007

Arrival of the participants

Wednesday, 30th May 2007

8:30 - 9:00 Registration of the participants

9:00 - 9:30 Welcome speeches

Mr. Goran Ostojic, WUS-Austria

Mr. Zoran Ponjavic, University of Kragujevac

Ms. Biljana Predic, University of Nis

Mr. Bozidar Stanic, State University Novi Pazar

9:30 - 10:00 eLearning Program

eLearning Program WUS Austria, Ms. Danijela Scepanovic

eLearning Centres, Coordinators

10:00 - 10:45 Expert inputs and discussions

E-Organization (The outback becomes standard), Mr. Franz Niederl and Mr. Johannes Feiner

10:45 - 11:15 Coffee break

11:15 - 12:15 eLearning Project Presentations and discussions

eLearning of Engineering Graphics, Mr. Zivota Zivkovic

Development of Metal Forming Electronic Instructional Resources, Ms. Vesna Mandic

Laboratory experimental setups for measurement and control via Internet, Mr. Miladin Stefanovic

12:15 - 14:00 Lunch break

14:00 - 14:40 eLearning Project Presentations and discussions

Operating systems course by eLearning, Mr. Bozo Krstajic

Transformation of traditional "Linear Structural Analysis" course into an eLearning course, Mr. Miroslav Zivkovic

14:40-15:00 Short break

Parallel sessions

15:00 - 18:00 Workshop

eLearning as an eLearner, Mr. Franz Niederl and Mr. Johannes Feiner

15:00 - 18:00 Round Table discussion

Standards for Quality assurance of Distance Education

Learning Management Systems

Thursday, 31 May 2007

9:30 - 10:45 Expert inputs and discussions

Tutoring as a part of support in an online course, Ms. Jasna Tingle

Integrated IT infrastructure for successful eLearning, Mr. Kristijan Zimmer

10:45 - 11:15 Coffee break

11:15 - 12:15 eLearning Project Presentations and discussions

The Introduction of eLearning in Business Law course, Ms. Ana Nikodijevic

eDiscrete Structures, Mr. Dragan Stevanovic

Web-based course-supporting and eLearning system for courses in informatics, Mr. Zoran Budimac

12:15 - 14:00 Lunch break

Parallel sessions

14:00 - 17:00 Workshop

eLearning as an eLearner, Mr. Franz Niederl and Mr. Johannes Feiner

14:00 - 17:00 Round Table discussion (continuation)

Standards for Quality assurance of Distance Education

Learning Management Systems

17:30 - 20:00 Boat Tour

Friday, 1 June 2007

9:30-10:30 eLearning Project Presentations and discussions

Creation of eLearning content for Rapid prototyping course, Mr. Nenad Grujovic

Introducing eLearning concept at the Faculty of Transport and Traffic Engineering, Ms. Snezana Pejcic Tarle

ELITE - eLearning IT Environment, Mr. Dragan Jankovic

10:30-11:00 Coffee break

11:00-12:00 eLearning Project Presentations and discussions

eLearning and online course development - Andragogy of Communication and Media (eL-ACM), Mr. Bojan Lazarevic

Thoracic Surgery eLearning course, Mr. Slobodan Milosavljevic

Reticulum M - Development of the University's Professors eLearning Skills, Introduction to eLearning and Learning Management Systems (LMS), Mr. Milos Bajcetic

12:00 - 12:15 Short break

12:15 - 13:20

Internet-Mediated Process Control Laboratory, Mr. Milan Matijevic

Improving knowledge of the lecturers at the Faculty of Civil Engineering in eLearning, Mr. Petar Santrac

Remote Experiments in Control Engineering Education Laboratory, Ms. Milica Naumovic

Closing remarks

13:20 Lunch and departure of the participants

Outcome of the Participants Evaluation

Title of the event	Date and place	Number of participants that have submitted evaluation form
eLearning Conference eLearning - Toward Effective Education and Training in the Information Society	30th May to 1st June 2007, Bijela, Republic of Montenegro	41

Conference organization

1. Conference schedule:

excellent	good	don't know	bad
34.14% (14 participants)	51.22% (21 participants)	7.32% (3 participants)	7.32% (3 participants)

2. Organizers:

excellent	good	don't know	bad
70.73% (29 participants)	29.27% (12 participants)		

3. Information about Conference:

excellent	good	don't know	bad
43.90% (18 participants)	48.78% (20 participants)	4.88% (2 participants)	2.44% (1 participant)

4. Conference room:

excellent	good	don't know	bad
48.78% (20 participants)	48.78% (20 participants)		2.44% (1 participant)

5. Lights:

excellent	good	don't know	bad
48.78% (20 participants)	43.90% (18 participants)	4.88% (2 participants)	2.44% (1 participant)

6. Sound system:

excellent	good	don't know	bad
36.58% (15 participants)	53.66% (22 participants)	4.88% (2 participants)	4.88% (2 participants)

Conference content

7. Lecturers:

excellent	good	don't know	bad
36.59% (15 participants)	63.41% (26 participants)		

8. Subjects:

excellent	good	don't know	bad
43.90% (18 students)	56.09% (23 students)		

9. Presentations:

excellent	good	don't know	bad
31.70% (13 participants)	65.85% (27 participants)		2.44% (1 participant)

10. Questions / Answers:

excellent	good	don't know	bad
21.95% (9 participants)	73.17% (30 participants)	4.88% (2 participants)	

11. Attraction:

excellent	good	don't know	bad
39.02% (16 participants)	60.98% (25 participants)		

12. Duration of lectures:

excellent	good	don't know	bad
21.95% (9 participants)	56.09% (23 participants)	4.88% (2 participants)	17.07% (7 participants)

13. Comprehensiveness:

excellent	good	don't know	bad
31.70% (13 students)	63.41% (26 students)	4.88% (2 students)	

14. New knowledge:

excellent	good	don't know	bad
41.46% (17 participants)	51.22% (21 participants)	2.44% (1 participant)	4.88% (2 participant)

15. Quality of content:

excellent	good	don't know	bad
46.34% (19 participants)	53.66% (22 participants)		

Conclusion (average from the questions 1-15):

excellent	good	don't know	bad
39.84%	54.63%	2.60%	2.93%

Overall esteem of the Conference (average of 1-5 marks): 4.39

The participants likes most:	The participants would change:
• Great organization • The great lectures of colleagues from Austria and Croatia • Workshops • Interaction between participants, cooperation • Presentations of the experts • New ideas • Communication between students and lecturers • New experience and contacts, meeting new people	• Duration of presentations • More discussions and practical experience • Hotel • We need more discussions as supplement to presentations • Location • More foreign participants • More examples from practices • We need more free time after lunch • More concrete workshops • More interactive work • More seminars to learn how to use LMS • More discussions about using concrete software's, new versions… • More social events

The evaluation forms of the participants have been processed by
Katarina Stojcevic

Place and date: Beograd, 18.06.2007.

Annex 3

Conclusions on Quality assurance discussion

Conclusions on Quality assurance discussion is a document which brought results of what conference participant thought were the biggest advantages and disadvantages regarding quality of studies (in terms of technical aspects, pedagogy, teaching staff and organizational aspects of eLearning).

Recommendation paper for distance education standards improvement

Recommendation paper for distance education standards improvement is addressing the issues of the current accreditation procedure established in Serbia for the year 2007 to 2009 and comments on the so called Standard number 12 for Distance Education.

In this paper the weak points and possible problems of the current standard 12 are augmented and seven proposals given in order to improve it.

Proposal of standards for quality assurance of distance higher education

Proposal of standards for quality assurance of distance higher education is a new and improved version of the standard 12 with new definition, more topics and more requirements imposed to the faculties willing to introduce eLearning and Distance Education. First draft of the document has been prepared during the eLearning Conference and later distributed electronically thought the network of professionals that have contributed to its content. All documents are available at the eLearning Network website www.eln-online.org

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right to education

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