

Internet-Based Studies in the Faculty of Computer Science

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Abstract—The purpose of the article is to present Internet-based studies at Polish-Japanese Institute of Information Technology (PJIIT). We author will discuss the current state of development and the conclusions which can be drawn from the 12 years of experience of running the studies through the Internet at PJIIT. In the first part we will describe the methodology we use and show the PJIIT's e-learning platform EDU, developed by our own specialists. We will also discuss the specific issues connected with undergraduate and graduate Internet-based programs offered by PJIIT. One of the key features of education at PJIIT is the possibility of choosing between stationary and distance way of learning a subject. We will also present the use of the EDU system in teaching stationary courses because both the methodology and technology can be applied not only in distance education but to enhance traditional studies as well. It seems that the differences in stationary and distance education are not becoming more pronounced with the development of new technologies. On the contrary, we are now witnessing a convergence of the two modes of study. That applies especially to the possibility of using electronic lectures rather than coming to the 'live' ones, computer-based individual study which supplement in-class tutorials, and more varied channels of communication between students and lecturers.

Index Terms—E-learning, knowledge management, process of teaching students, information technology in education.

I. INTRODUCTION

Polish-Japanese Institute of Information Technology (PJIIT) is the leading Polish university specializing in Computer Science. It was founded in 1994 as a result of the agreement between the governments of Poland and Japan. The Institute offers undergraduate, graduate and postgraduate courses in the main fields of Computer Science.

Over the last eight years the lectures at PJIIT have been gradually moved to electronic format (mostly Power Point). What is more, the Internet has become a powerful medium of communication between students and faculty. We have arrived at a conclusion that the time has come to introduce the new form of studies based on the Internet in addition to regular stationary courses. In the year 2001 we started teaching on-line courses on an experimental basis in cooperation with the University of North Carolina, Charlotte. The participants of the courses were graduate students from both the universities [1]-[4].

In June 2000 the Senate of PJIIT took a decision to start preparation for Internet-based studies towards B.Sc. degree in Computer Science. The new studies commenced in September 2002 with 42 students enrolled. In 2006 they were extended with the studies towards M.Sc. degree in Computer

Science. Their curriculum comprises basic knowledge in computer science enabling our graduates to find jobs as administrators, analysts, system designers, programmers, multimedia or network designers. Our graduate should possess the ability to set up information systems running over the Internet and the ability to work and cooperate over the Internet. Building the last two skills is inherent in the nature of the courses themselves, i.e. being conducted online. We believe this is the advantage e-studies have over other forms of tuition and we are convinced this advantage needs to be explored [5].

The curriculum of the new studies is almost identical to the curriculum of stationary studies towards the B.Sc. and M.Sc. degrees in Computer Science at the Polish-Japanese Institute of Information Technology. The only difference is greater emphasis placed on Internet technologies. Each student has to come to the Institute for one-week stationary sessions two or three times a year. During these visits they take examinations and participate in laboratory courses requiring specialized equipment. The new studies are based on the educational, multimedia materials available both on-line and on CD's produced and supplied by PJIIT.

The courses run either exclusively over the Internet or in the mixed mode: lectures over the Internet and laboratory classes at the Institute's premises. Each course comprises 15 units treated as lectures. The content of one lecture is mastered by students during one week. At the end of the week the students send the assignments to the instructor and carry out tests, which are automatically checked and graded by the system. The grades are entered into the grade book - each student can see only his or her own grades.

Besides home assignments and tests there are online office hours held two hours a week; seminars and live class discussions. Bulletin boards, timetables, discussion forums and FAQ lists are also available.

It is important that during their studies the students have remote access to the PJIIT's resources such as software, applications, databases, an ftp server, an e-mail server.

Partial grades obtained during the semester (coming mainly from home assignments and tests) contribute to the final grade for on-line classes. Of course, besides this grade we have always the second grade resulting from the examination administered in the PJIIT building.

It should be emphasized that in our form of studies the attendance of lectures and classes has been replaced by the necessity of systematic, week-by-week, individual work. An on-line student has to be more responsible, systematic and self-driven than a stationary student. Every week they are required to demonstrate the understanding of a part of the material by doing homework assignments and tests. It is an exacting form of studies, difficult for many students as the analysis of students' performance shows. Those students who survive the first semester, their number about 50%, seem to

learn endurance and systematic work and they are able to continue their hard work during the next semesters.

II. FORMAT OF LECTURE MATERIALS

Submit Course materials used in the on-line studies take the form of electronic textbooks in the HTML format, with navigation implemented by means of scripts of JavaScript language Fig. 1. They include: (1) material which during traditional lectures is normally displayed on the screen, usually consisting of text and figures; (2) explanations given by the lecturers during their lectures; (3) multimedia presentations whose aim is to help the students to understand the most difficult parts of the course; (4) auxiliary material such as glossary of terms and index; (5) bibliography and webgraphy; (6) references to other materials; (7) homework assignments to be done by students and short questions embedded in the text. For each course there is a syllabus presenting its most important points such as a description of course content, prerequisites, obligatory and recommended textbooks, grading policy.

The form of course materials described above is easily transferable to arbitrary learning environments whose lecture materials are of the form of HTML documents with navigation based on JavaScript language.

III. HELP IN CREATING VIRTUAL COMMUNITY

We have found out that the students who contact one another and the lecturers perform much better [6]-[9]. Therefore before starting online studies, we try to help in creating virtual community between students and faculty. After coming to the Institute for the first time, the new students attend the meeting with teachers at the Institute's premises. They spend their first week at the Institute's premises on a 5-day course at the Institute's premises devoted to working and collaborating on the Internet. Their first totally online course is optional and concerns High School Math with two aims in mind: equalizing the level of mathematical preparation and providing exercises in online learning before the basic courses start.

IV. INTERNET-BASED SYSTEM FOR ON-LINE STUDIES MANAGEMENT

System EDU was created by PJIIT students and staff. The software was written in the programming languages Visual Basic, Java and ASP. The data are stored in the Microsoft SQL Server database.

The system consists of the following modules:

Main Page: The module enabling presentation of the list of courses to which the user has been granted access and all the new information concerning these courses (such as new announcements).

Course: The module enabling the instructor to present basic information about the course such as the instructor's e-mail address, brief course description and selection of modules to be used by students during the course. The instructor decides whether the course is disabled or enabled to the students (for example disabling the course when major

modifications take place). The module includes the display of the list of the students of the course with their e-mail and www addresses. The course participants including the instructor can send e-mail messages to groups of students by selecting their e-mail addresses.

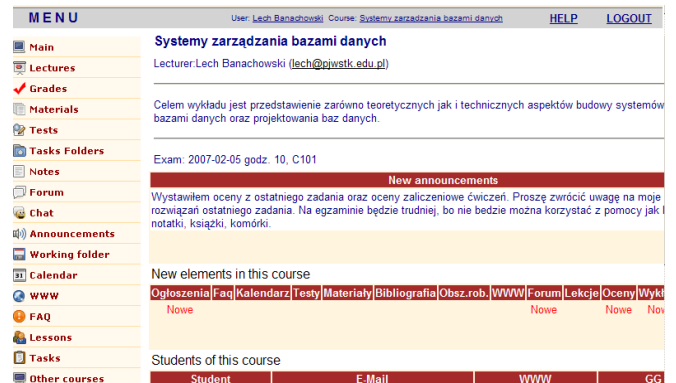


Fig. 1. Example of e-learning course.

Calendar: Before starting the course, the instructor prepares the course calendar in the form of a list of events each accompanied by a date. The events are the deadlines for homework assignments, tests, dates of on-line seminars and so on.

Announcements: The instructor can publish current announcements concerning the course. Announcements are sorted by date. New announcements (last 30 days) are also shown on the Main Page in the section "New announcements".

WWW: The module is a collection of links to WWW pages concerning the course - including pages presenting the instructor and all the students in the course.

Chat: The module enables direct on-line communication among students and instructors Fig. 2. The instructor can carry out office hours, seminars and lectures on-line. On specific dates students and instructor enter the class chatroom and conduct on-line sessions. On the right hand side of the window they can see the list of all the participants who have entered the chatroom. Every participant can write text messages visible to all in the chatroom.

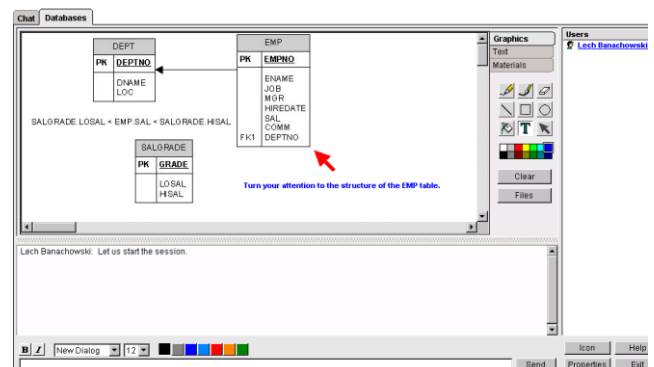


Fig. 2. Example of on-line communication among student and instructor.

In addition, students and instructors can use whiteboards:

- to draw images,
- to display e-content stored in files including text and graphics.

The instructor can restrict the number of students who can

enter a specific chat room, making possible private consultations.

Forum: The module enables off-line communication among students and instructors. Forum is organized by main topics or threads, called "threaded discussions". The instructor can carry out lessons in the form of discussions on selected topics.

FAQ: Frequently Asked Questions is the list of questions and problems frequently asked by students (e.g. by e-mail or Forum) with explanations given by the instructor.

Tasks Folders, Working Folder: the areas for exchanging files among students and the lecturer. There are two types of folders: *Working Folder* - files in this folder may be downloaded by every user in the course and *Tasks Folders* - files in this folder may be uploaded by students, but only the instructor has a privilege to download them – the folder is mainly used to collect homework assignments.

Lectures: Each lecture is an HTML presentation including graphics and multimedia all combined into one learning structure. System EDU makes it easy for a lecturer to make changes in the files forming the lecture presentation. When the student enters the module, a new browser window is opened with the lecture presentation inside.

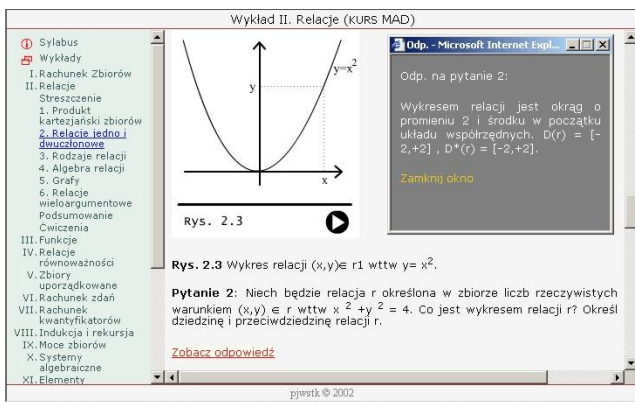


Fig. 3. E-learning lecture for discrete mathematics.

Materials: Educational materials provided by the instructor for the students to help them in their studies Fig. 3. System EDU does not restrict type of materials. It may be any file. If a student selects a file, which is saved in format recognizable by his or her browser (e.g. html), then the material will be opened in browser window. But if it is of unrecognizable format, then students will be asked if they want to save the file or open it from current location.

Textbooks: This is the list of textbooks recommended by the instructor of the course. The information goes with title, author, publisher and description. Attribute "Main" determines if the book is obligatory or supplementary for the course.

Tests: Using this module the instructor prepares tests to be taken by students. Every test may be taken only once (it counts when the student saves the test so he or she can first get acquainted with the test questions and, possibly, during another session provide solutions to them). There are 5 types of test questions: text, multi-line text, yes/no, options (only one answer is true) and multi-options (there may be more than one answer true).

Grades: The instructor enters the students' grades received for doing specific tasks such as homework

assignments, tests, discussions, projects. The instructor can attach additional comments and remarks explaining observed achievements, errors and shortcomings. The student can see only his or her grades and additionally, how he or she stands in the ranking in comparison to other students. The instructor can print course protocols automatically filled with final grades.

Lessons: In this module the instructor can design a programmed course consisting of interactive lessons. The student studies the programmed course by reading materials and answering test questions after the end of each section, each lesson and the whole course. The student moves to the next lesson only after getting enough points for the test ending the previous lesson. The instructor decides about the number of points to pass the lesson and the whole programmed course, respectively. The default threshold is set at 50%.

Notes: In this module users can enter and store text notes. Every note is visible only to its author in the current course along with the date of its creation.

Register: Every entry to a course in the EDU system is stored in the database. Using this module, the instructor can monitor how many times each student used the system and can find the date and time of every visit. Moreover the instructor can display the number of visits at each module for each student.

V. ANALYSIS OF USING THE EDU SYSTEM

All entries to the courses and their modules in the EDU system are registered. Therefore it is possible to monitor the activity and performance of students. In particular, by analyzing the number of entries, we can get information about students who ceased to participate actively in the on-line course [7].

The following conclusions can be drawn:

- 1) The average student enters each course 3 to 5 times a week.
- 2) The students use the test module most frequently, often look into their grades and often read lectures. Because the students get their lectures on the CDs as well, the statistics does not reflect fully the student interest in the content.

The students who use the system regularly perform much better than others.

VI. SIGNIFICANCE OF THE NEW FORM OF STUDIES FOR THE INSTITUTE AS A WHOLE

The introduction of Internet-based studies has had a stimulating impact on the whole Institute. As a side effect the textbooks based on lecture materials originally prepared for the on-line studies are published by our Institute's Publishing Unit. It is regarded as the most valuable publishing initiative in Computer Science in Poland. We have observed that the electronic materials prepared for the on-line studies exert influence on the way normal lectures are presented – improving greatly their quality and visual attractiveness. The automatic system of tests prepared for the on-line studies is used also to carry out ordinary examinations for stationary

courses. Moreover, the stationary students who have not passed a course can repeat it enrolling in the on-line mode, without the need of repetition of classes in the PJIIT building. It has become a popular form of catching up. Another interesting phenomenon is such that persons who stopped their studies at the PJIIT several years ago come back and resume their studies as Internet students.

VII. USING ONLINE METHODS FOR STATIONARY COURSES

The differences between stationary and non-stationary studies seem to diminish along with the development of online learning methods. We have found the following valuable elements of electronic methods for stationary courses: possibility of online studying of lectures instead of coming to attend lectures at the university, enabling computer-aided individual work of students, diversifying contacts with teachers and other students.

The following Edu modules are used for stationary courses: Announcements, Task Folders, Working Folders, Lecture materials, Tests/exams at the Institute premises, Discussion Forum, Chat.

VIII. CONCLUSIONS

Summing up, in our version of Internet-based studies we teach most of the courses exclusively over the Internet. Such courses include among others Programming, Software Engineering, Networks, Databases and Mathematics. Only few subjects require highly specialized technical equipment and such courses are organized in the PJIIT laboratories. These courses include Computer Graphics, Multimedia and Electronics.

Internet-based studies have been positively evaluated by most of our students – such a conclusion can be drawn from our standard evaluation check carried every semester. We have noticed that such a form of studies is of a particular importance for those students who either stay abroad a lot or who cannot participate regularly in stationary classes because of health, job or family reasons.

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