

# Virtual Communication among Teachers and Students in Mathematics Computer Based Learning

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**Abstract** - The paper considers methods of organization and implementation of virtual communication among lecturers and students in mathematics computer based learning on the basis of Internet technologies applied in practical conditions with available resources. This allows rousing of student's activities to improve and consolidate their knowledge of mathematics. The opportunity to extend the existing web site of Mathematics Department in Technical University (TU) Varna is examined.

**Keywords** – information technologies, virtual communication, Internet.

## 1. INTRODUCTION

The communication is an important factor in student's training. The use of Internet allows a new interaction among lecturers and students – Web Communications or bi-directional Internet interactions. They allow real time telephone connections, addition of images, sounds, video clips and movies. The conversations can be effected as series of consecutive messages or in real time with the help of text based facilities. It is possible to exchange texts, files, audio and video programs.

Such kind of training provides the students with online information for independent training, synopses, thematic plans, implementation of test papers and course projects as well as opportunity to ask questions and receive answers.

This establishes conditions to increase the interest to the subjects and to make the schooling more active. The lecturer

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can check faster the learning level of each student and might introduce corrections in the training process, if it is necessary.

The resources of the so-called Computer Based Learning, which represents a structured and purposeful use of electronic systems or computers to assist the learning process, effect the communication between lecturers and students. It allows presentation of the educational material on various subjects by Internet, audio and videotapes, satellite programs, interactive television and CD – ROM. The Internet mathematical resources such as mathematical programs, libraries, articles, books, etc., can be used as well [3,4].

## 2. SOME METHODS OF VIRTUAL COMMUNICATION AMONG LECTURERS AND STUDENTS DURING THE TEACHING PROCESS OF MATHEMATICS

*Electronic Mail (E-mail).* E-mail is the most widely used and accessible way of communication, which allows

asynchronous active correspondence of the lecturer with the students (and among the students) by sending/receiving text format messages.

It is assumed that each lecturer and student are possessing E-mail address and Internet page. The process of interaction among them is as follows: The teacher passes all necessary information into Internet. The exchange of messages is made by E-mal, while the larger files are sent by FTP-Protocol. The initially prepared new materials are in text only format. The reformatted texts are transformed then in HTML-files and are published in Web pages. The whole process of exchange of messages is logged. This allows making quality and efficiency analysis of the student's, as well as of the lecturer's work. The mathematics teaching by E-mail reduces the volume of the printed materials. On the other hand, this opportunity is particularly useful for part-time (correspondent) and distant training students.

E-mail provides the following additional advantages:

- ✓ Correspondent conferences by dissemination of full flow of messages from each one to all students included in the list of the students (Mailing List);
- ✓ Automated generation of correspondence flow, supported by environments providing such kind of correspondence and possession of all advantages of the techniques for electronic processing of documents.

One of the best ways of training is to explain the problem to somebody else. That is why the establishment of a Discussion Forum (DF) in Internet helps to improve the preparation of the students (by asynchronous communication on a certain topic). Each student can, during the semester, put his/her questions in a Notice Board (NB) – somebody else can read it and answer the question or start new discussion on the topic. However, the information can remain only few weeks there. Netscape or Internet Explorer can be used to write/read questions or messages in NB. DFs are organized in few general categories and one of them – *sci* (science) category, can be used for topics of scientific interest.

Different types of DFs are:

- ✓ Internet: Usenet: newsgroups are placed on a public news server;
- ✓ Internet: Discussion Forum: newsgroups are placed on a www page (Web based);
- ✓ Internet/ Intranet/ Extranet: Restricted for a specific community, news server or Web based (e.g. only students of one course).

It is possible by DF to: subscribe to, or unsubscribe to, one or more newsgroups, search for newsgroups or messages, reply to Group, to all users or directly to the sender of the message, post attachments like Word, Excel, PowerPoint etc.

files, use automatic signature sending a message to different newsgroups in a time, etc. By this way of interaction the students actually become aware about their knowledge and accumulate good experience to manage in other situations, as during examination for example. Answer to the remaining unclear issues could give the lecturer by E-mail, few days before the examination. E-mail is the basis for communication among lecturer and students.

DF is a fast way of communication, easy to reach the knowledge of people and can create specific groups with a lot of in detail and in-depth conversations. However, it is hard to start up an active forum by DF, especially if a lecturer has a small group of students. Sometimes the forums are full of non-relevant discussions (although a lecturer can solve this problem).

Participation of students in DF can stimulate knowledge sharing among students. They can check the forums before they ask questions. This is a place for informal contacts and furthermore, activates and focuses the students through discussions, for the next subject.

*Chat* provides a way for students with similar interests to communicate in a synchronous way. When a student chats on the Internet, he "talks" to others using text messages. This informal communication among students (improving atmosphere and mutual relationships) helps sessions with lecturer on a particular question or formal sessions between a lecturer and a small group of students. If a student wants to participate in chatting, he enters a so-called "chat room". This is a virtual environment where he/she can talk to one or more participants. Chat tools can be integrated in his webpage as his learning environment or separate environments could be established.

Different types of chatting include:

- ✓ Web based chat: a student enters a chat room and starts directly talking with other chatters in the chat room. In a virtual classroom, this type is used very often.

- ✓ Instant messaging: a lecturer can create a list of students with similar interest and see whether they are online at any time. He can start talking to them immediately. Famous free instant messaging applications are ICQ and MS Instant Messenger.

- ✓ Graphical Chat: some chat programs have software to create a graphical chat room, where chatters are displayed as comic book figures or the chatting takes place in a specific environment like a bar.

Chat allows private conversation (one to one), group conversation (many to many), chat request, use of different colors per chat participant, use of sounds and audio-chat. Some applications also support: sending URLs, sending e-mail, sending voice messages, sending files. It is fast, cheap, gives possibility to talk to many, eases the building of relationships (informal way of communicating) and if somebody can see that others are using the learning environment at the same time, he feels part of community. There are some drawbacks however, if it tells too much of your personal life; firewalls are often a hurdle because they keep ports closed; some tools might not function; talking with many will result in a very fragmented conversation (so 4 or 5

students is the maximum); learners can disturb each other by contacting all the time, etc.

### 3. EXTENSION OF THE WEB-SITE OF DEPARTMENT OF MATHEMATICS

Mathematics is one of the basic subjects the students face in the first two years of their tuition in TU. The quality and efficiency of mathematics learning process could be significantly improved by application of up-to-date information technologies. Resources are available – the presence of Web-servers in TU and in the Department of Mathematics in particular, allow building of such structure. All lecturers and students of the University have a real access to Internet.

The use of databases (DB) for storage of information, provides solutions on a qualitative higher level to many real tasks of the organization of the tuition and the scientific work of the students. Necessity arises to extend the Web-site of the department to allow implementation of this communication for student's training and improvement of the mathematics teaching process. A System for Management of DataBases (SMDB) is used for program support of the training process. Internet provides regulated access to it. DB contains information about the training process, which is regularly updated. DB can be accessed by arbitrary requests. The information is read-only for the users. The DataBase contains the following *information*:

- *For lecturers:*

- ✓ Brief biographical data for each lecturer – education, academic rank, position, professional experience and skills, personal interests, membership in scientific organizations, etc.;
- ✓ Lectures - List of the subjects of Mathematics delivered by the lecturers, specialties, credits and annotation;
- ✓ Directions of scientific work – topics, interests, wishes for contacts and joint research in specific scientific areas;
- ✓ Papers and monographs;
- ✓ Contact information

- *For students:*

- ✓ General reference information – subjects studied during the semester, deadlines of the semester and session, holidays, vacation, University events;
- ✓ Special reference information - consultations, lectures of visiting professors, extraordinary students forums, etc.;
- ✓ Academic information – methodic materials – text books published by the department, collections, systematical manuals, as well as addresses of useful and interesting Internet sites – electronic libraries, textbooks, reference books and magazines, data bases, synopses, thematic plans of seminar and laboratory exercises, methodical instructions for laboratory exercises, tests and course projects, list of recommended literature, questions for examinations, knowledge tests, evaluation criteria and system of knowledge control, possibilities for dispensation from examination, results of the systematic control during the semester, printed materials with mostly used formulae, exemplary models of mathematical problems, tests for preparations, etc.;

- ✓ Information about the life and contributions of renowned mathematicians, especially whose work is related to the

syllabus of mathematics – Euler, Euclid, Newton, Leibnitz, etc.;

- *For foreign students* – it is desirable to translate in English all information for Bulgarian students, with the development of this training;

- *For candidate students* – date of competitive examination on mathematics, solution of examination mathematical problems of previous years, evaluation criteria, reference book, courses in mathematics.

## 5. CONCLUSIONS

The studied chapters of mathematics are among the most suitable subjects for development of generalized knowledge, skills and habits, required by the engineering practice. That is why the correct organization and enrichment of the forms and ways of information exchange with the students contributes to improve the efficiency of the training process in mathematics, the level of awareness and preparation, the development of creative thinking and is an incentive for independent work. This sets up a requirement to the lecturers to study the various ways of communication and to apply them efficiently.

The proposed way of virtual communication, among the lecturers of the department and the students on the level of educational process of mathematics and the respective informational support, allow:

✓ transition to dialog interaction among lecturers and students, which leads to decrease of the costs of the training;

✓ decrease of the volume and hence the material expenses for synopses, thematic plans, laboratory and course projects, tests;

✓ Solution of the problem with the shortage of printed textbooks and books of mathematical problems, by supplying students with electronic tuition materials and E-books, necessary for the training process and the preparation for examinations in mathematics.

The transition from the traditional presentation of knowledge to the joint (lecturer-student) creative approach to work with contemporary virtual means, contributes to achieve a high quality and efficient training process.

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