Distance Education System

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Abstract - **The primary goal of this paper is to present a system for support of distance education that can be used within the Virtual University. This work represents the attempt for transferring the infrastructure of traditional educational systems (classroom, library, laboratory, student services) into digital world.**

Keywords **- Distance education, education quality**

I. INTRODUCTION

In order to support mainly the adult wishes to continue with education, some universities have offered Bachelor, Masters and Doctoral degrees through distance studies. This concept has evolved from simple educational material exchange to more sophisticated interaction between the user and the distributed resources [1].

The term "Distance Education" has many definitions in the literature. One of the most complete definitions of distance education is given by Keegan in 1986 [2]. According to this author, distance education has following features: The instructor and the student are separated during the most of the educational process, the educational curriculum is controlled by certain educational institution, educational materials are exchanged via different media in order to overcome the physical distance between the instructor and the students, and different forms of two way communications among the participants of educational process are supported.

Students in the higher education are especially common with using Internet resources for their studies and research. This fact opens the possibility of creating an effective education environment, using the Internet as a medium for human interaction. The idea of creating such environment is a challenge of redesigning the user interface systems in order to mimic the classical educational environment, as much as a challenge of improving the education process by implementing options and techniques that are hard to implement in the traditional teaching systems.

The primary goal of this paper is to present a system for support of distance education that can be used within the Virtual University.

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Educational principles that need to be incorporated within the system for the support of distance education will be given in the second section of this study. Social, economical and institutional preconditions needed for establishment of distance education systems will be also discussed in this section. Several educational materials aimed for distance students created for this study will be presented in the third section. Fourth section will contain the general description of functionalities of distance learning components. The system influence on the efficiency of the learning process will be elaborated in the fifth section. The last section will conclude the study.

II. DISTANCE EDUCATION PRINCIPLES AND PRECONDITIONS

Learning within traditional teacher - centred education systems is based on deficit student model. The educational system tends to identify student's deficiencies and weaknesses. Based on those deficiencies, students are tracked and categorized. It is more important for the student to reproduce teacher's knowledge then to build personal knowledge on certain subject.

Distance education is based on human behavioural educational theories. It should be noted that nowadays traditional education also accommodates concepts from behavioural educational theories. One of the basic educational theories of this type is the Constructivist educational theory. According to this theory, learning is active process, in which the students construct new ideas or concepts based on their current knowledge. Relevant contributors to this theory are Brunner [3], Vygotsky [4] and Piaget [5]. The Constructivist theory is a base for several educational theories. The most quoted theory of that kind is the theory of "Active Learning" [6], which incorporates different educational forms: Inquiry Learning, Problem Based Learning, Learning by doing, etc.

The common element for the above educational theories is the shift from teaching centred education to learning centred education. The education is student centred active process. The teacher's role is to canalize and enable the learning process and thus he/she becomes a trainer or instructor. Students should take initiative in the learning process whenever

possible. In that way, the general concepts which are the subject of learning become the part of students' experiences. Learning is a natural process, which can take different patterns depending on students' affinities, backgrounds and interests. The Learning is social process and thus different forms of communication and collaboration among students should be encouraged. Students should find their own facts related to the educational subject. The knowledge is created through the real world activities rather then reproduced.

The development of the Distance Education support system requires: human resources, educational platform, educational materials, communication tools, administrative support, network of educational professionals and experts.

Distance Education can be treated as a service to the community. When establishing a new service several questions should be answered. Who will be its users? Which are and how huge are the target groups? Why would they be interested in the service (distance education)? How long will demand for the service last?

According to [7], educational system costs can be divided in two groups: fixed costs (staff salary, infrastructure costs, educational material development costs, etc) and variable costs (distribution costs, rental costs, and other costs that depend on number of students). Distance education system has higher fixed costs and lower variable costs. Higher fixed costs are a result of complexity of distance education support systems and higher costs of development of educational material aimed for distance education. Lower variable costs are a result of non campus based learning. However, it is important to be mentioned that the total cost of distance education is smaller than the cost of the traditional education, once certain number of students is reached. The number of students that is needed for this financial benefit of distance education depends on regional low and economical factors.

Technological solutions for distance education support systems can be compared in two manners. The first one is comparison between the levels of the instructor - student interaction and the student interaction with educational materials. The graphical representation of that comparison is given on figure 1. It should be noted that, when using different technologies, the level of interaction does not increase. It is equal to the maximum level of interaction of used technologies. The recommended technology for development of distance education support systems from this point of view is internet technology. The second comparison manner is

comparison between availability of educational materials and their development cost (see figure 2). The traditional correspondence distance educational materials are most favourable in this manner. Establishment of Open distance learning centres can increase the score of internet based materials by increasing the availability of internet technology to the student.
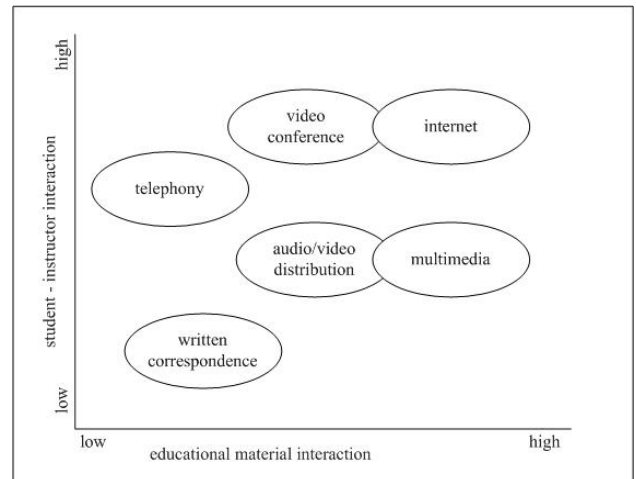

Figure 1 Comparison between the levels of the instructor - student interaction and the student interaction with the educational materials
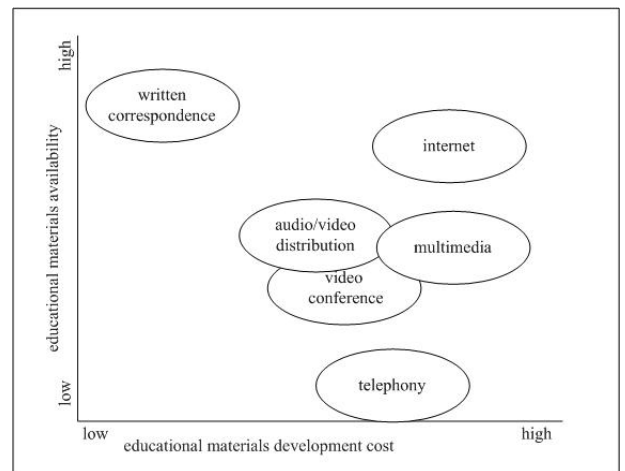

Figure 2 Comparison between availability of educational materials and their development cost

III. EDUCATIONAL MATERIALS

Educational materials for distance education are built in following phases: Analyses of target students' needs, common goals and social background, creation of educational material, upgrade of the way the material is presented depending on student evaluation and the changes in student target group. These phases are presented on figure 3.
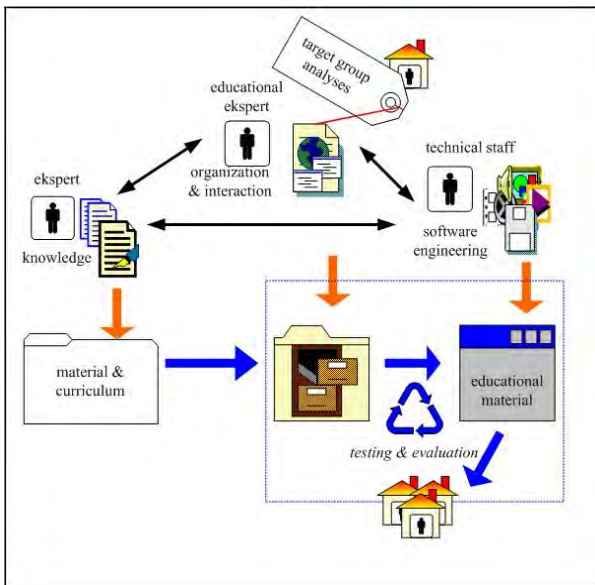
Figure 3. Phases in building distance education learning material

Principles for development of distance educational materials are not related to the expertise knowledge of the material. They give suggestions for the educational approach that can be used when creating educational material aimed for distance education [8].

Educational material should state in a very clear way what is the main contribution for the students and what kind of students it is intended to. Examples should be familiar to the student target group. Cooperative work and different forms of communication between the actors of the educational process should be stimulated by providing discussion groups, chat facilities, virtual tables and other communication support tools.

Educational material has to be divided in entities named "knowledge portions". They should be organized in hierarchy in such way that the whole course can represent one big knowledge portion. Each knowledge portion should contain information about its importance within the educational material, what knowledge is expected from student before its consumption, what knowledge student will gain after its consumption as well as average time needed for the consumption. Student should be also suggested the projects he/she is capable of doing and the way the knowledge could be enhanced.

Within this research, several web based educational materials have been developed. The subject "Databases and data structures" from the regular studies of the Faculty of Electrical Engineering in Skopje is supported with web educational materials where besides the theory students can find solved examples enriched with animations and perform a self testing. Almost all principles for building distance

web based learning materials are incorporated in the English version of UML (Unified Modeling Language) web course aimed to all interested computer science students. We received request for translation of this course in Spanish language.

IV. DISTANCE EDUCATION SYSTEM COMPONENTS

Distance education support systems are complex systems. They should keep track of student history, educational materials content and history and enable easy access to that content. Clear mapping with traditional educational system should be enabled where possible [9]. An example of a distance education support system was developed within this research [10]. The users of this system need only to have internet connection and internet browser installed on their machines. Some of the modules are developed using agent based technology [11]. There are three general groups of the activities that should be supported by this kind of system: institutional administrative activities, student service activities and student activities. Institutional administrative activities are administrative activities of the educational institution. These activities depend on the state regulative and were not be considered by this research. Student service activities are related to educational process by supporting it. Examples of such activities are: lecture scheduling, general information about the subjects, course enrolling, exam enrolling, and administrative library services. Student activities are represented through access to educational materials, consultation activities, discussion activities, laboratory work, project work, self testing. Although not directly related to student activities, instructor supported activities should be included in the distance education support systems. Examples of such activities are: publishing of the exams' results, different kinds of student notifications, educational material creation guide.

V. DISTANCE EDUCATION SUPPORT SYSTEM EVALUATION

Evaluation of efficiency of the education was done according to the principals given in [12]. The data collected from the Faculty of Electrical Engineering at the Ss Cyril and Methodius University in Republic of Macedonia were collected in order to give input about the quantity, quality and the status of achieved education. Performed analyses indicate the influence of the usage of distance education modules for increasing the efficiency of the education. The correctness of the approach was confirmed with the

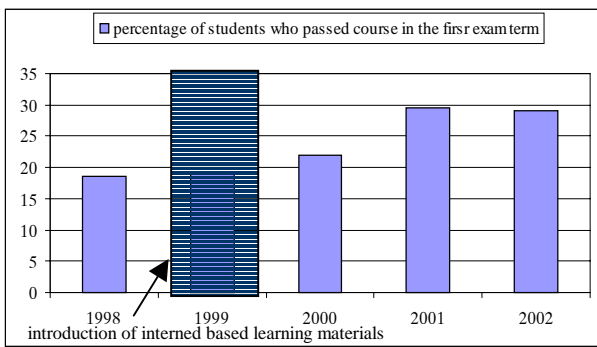conventional and distance education converging trends stated in [13].

Figure 4. Percentage of students who passed "Databases and data structures" course in the first exam term

The quality of education can be evaluated through the time needed for it to be achieved or that can be indicated with the number of students that are able to pass the exam in the firs exam term. Figure 4 gives the percentage of students that passed "Databases and data structures" course in the first exam term over last five years.
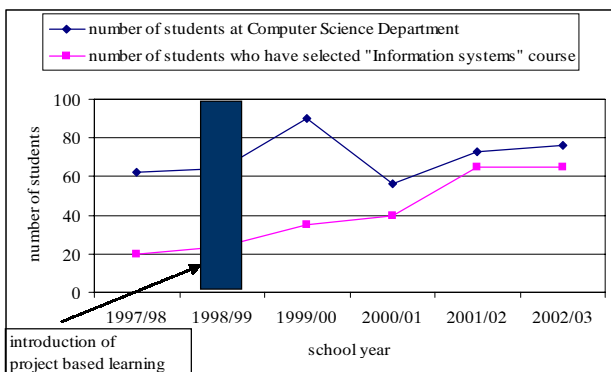

Figure 5. Number of student who have selected "Information Systems" course

The status of the achieved learning can be measured with its real work applicability. The course "Information Systems" (that can be selected from the students from the last year of the studies) introduced the distance based project work for the students in the year1998/99. The projects are done in cooperation with different IT companies in Macedonia. In that way, the course became more difficult to pass. Never the less, the number of the students who select that course increases every year. Figure 5 gives graphical representation of those facts. The survey made with 60 students that were asked why they have selected this course, ended with 75% of students giving one of two typical answers: "Opportunity to use the

knowledge in the real world situation", "It will help me to find a job".

VI. CONCLUSION

The primary goal of this paper is to present an internet based system for distance education support. Distance education has social, economic and technical prerequisites. The developed system has object-oriented architecture. It supports different forms of student-student and student-instructor interactions that are important for providing active learning environment.

The developed distance education support system's influence to efficiency of education was evaluated within this research. Performed analyses for evaluation of efficiency of education indicate the positive influence of the usage of distance education modules for increasing the efficiency of the education.

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