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KNOWLEDGE IN DISTANCE LEARNING SYSTEM

Abstract: Knowledge management is still growing in importance, also in the field of computer supported education systems. This paper presents models of education, characteristic of distance education system. Special stress has been put to knowledge treated as one of the most valuable assets. Then we discuss organization of distance education system and at the end we give some hints about the future of distance learning systems.

1. Introduction

Distance learning has been realized in countries where traditional forms of education were not possible, e.g. in Australia. Because of the fast development in computer science and telecommunication, and the open system idea as well as the need for permanent learning of societies becoming urgent, new ways of education have appeared. In recent years, new concepts of education called open learning, distance education, distance learning, e-learning, virtual learning, tele-learning, etc., are becoming more and more popular way of the didactic processes realization and all these terms mean more or less the same. When realizing the didactic process students and teachers are not at the same place, e.g. classroom, they communicate through Internet, students can follow courses (didactic modules) accessible in the net, they learn in their own tempo and when they want, etc. Such a way of learning is possible due to fast civilization progress expressed e.g. in development of telecommunication means, networks and computer techniques.

The distance learning system can be described as a system in which students and teachers are geographically separated, they communicate through Internet, students have unlimited access to didactic materials, they can learn in his/her own tempo, learning time also depends on student's preferences. He/she decides when is ready to pass the exam from given subject, etc. [Nycz, Smok 2003; Nycz 2002].

One of the most valuable assets of any didactic process is knowledge accessible in the system. Its correctness, timeliness and completeness imply the quality of this form of education as well as its further development. Knowledge, as any other assets in the system, should be managed.

2. Traditional model of education contra distance learning

In traditional education, students and teachers are at the same place (e.g. classroom) and at the same time (e.g. lesson). Students listen to the teacher when he/she carries on the lesson/lecture. Teacher is the main source of knowledge delivered to students. He can be supported by such means as e.g. audio/video materials, slides or films. When digesting the didactic material students can use additional means such as manuals, books, etc. Teacher is a person who makes the assessments of students. The quality of education process depends on the teacher's quality, his knowledge, his personal character and his ability to teach others.

In the distance learning system the situation looks different. The point of gravity has been moved from a teacher to the system. The main source of knowledge is not a teacher but the knowledge bases collected in the system as well as other bases and sources of information accessible mostly via Internet. Teacher is rather more like an instructor for students, their buddy but not a teacher in the traditional model. He can be treated by students as an additional source of knowledge. Assessment of students is realized by both teacher and the system, but the teacher as a person is responsible, in our deep opinion, for final results. The main differences between models of education are shown in Fig. 1.

Model Feature	Traditional model of education	Distance education system
Main knowledge source	teacher	knowledge bases in education system, any knowledge sources accessed via Internet
Additional knowledge	books, manuals, audio and video materials	traditional sources, teacher
Assessment	only by teacher	system and teacher who is responsible for final assessment
Quality of education	dependent on teacher's quality, his level of knowledge, his ability to share his knowledge	dependent on electronic knowledge sources quality and other didactic materials

Fig. 1. Traditional versus distance learning model

Source: own elaboration.

Building of knowledge in student's mind (learning) is a process of problem solving that makes student to be active, innovative and to develop his/her experience. Using distance learning system student can be active in building knowledge within the following cooperation forms:

- common learning within the team,
- interactive process of group building of knowledge,
- active participation in generation and selection of information,
- knowledge construction in context of other students points of view.

The teacher's task is to be a supervisor of learning process and to monitor the progress in learning [Bielecki 2003].

In distance education system knowledge resources are of very various forms but mainly they are in form of didactic modules. They allow student to learn particular portion of didactic material. Modules have modular structure. Passing to the next module may be dependent (or not) on whether he/she has positively completed the previous one. The same is with courses. Usually student can access three types of modules:

- modules covering material of particular subject/course,
- tests and exercises modules, and
- help modules,

The didactic process can be organized in various ways. The most common one is based on didactic path [http://zdzych... 2003]. Student can be directed on a given path in result of e.g. enter test. Such a test is mostly built in shape of decision tree. Recognition of student's skills and knowledge begins with simple questions, through questions based on material from the next modules. Questions with bad answers can be used when deciding about material to be taught. Directing on paths may also appear in result of poor results of tests after modules. In such a case student either has to return to a given module or some extra explanations in form of help have to be presented to him.

Within the repetition of the module, student can be asked either to repeat the whole module from the beginning or to go through additional explanations and maybe to repeat more difficult portions of material.

Realization of auxiliary, optional material covers very large range of tasks: extra tasks to be solved, manuals and other books from a given discipline, possibility to ask by e-mail colleagues or teacher/instructor for help.

The realization of help materials is possible when either a student chooses the help option or he unsuccessfully tried several times to solve a test. In such a situation, the control – after inferring with what (which problems) he has difficulties – suggests additional explanations, exercises or maybe reading appropriate books. Realization of help option is under special supervising of control due to the fact that maybe not all suggested exercises have to be done. In that case student obtains the suggestion to stop the help mode and return to “normal” work. Another possibility of leaving the help mode is the student's decision to stop it [Bielecki 2003].

Obtained results are collected in the system. To enter the next course, the student has to pass the final test of the previous one. However, sometimes the system enables the student to enter new course without requesting to pass final test of previous course. This situation takes place when the student wants only to read the material

covered by the course or to check his knowledge from the course but not to be assessed by the teacher/system, only for him. What should be underlined here is that the final assessment of the student is the teacher's task. The teacher can be supported by the system of course. This support can be realized in many different ways: either using simple mechanisms delivered by the system or using specialized external tools that carry out all inferring process about student's progress in education process and generate for the teacher's use a piece of advice about the final assessment.

3. The characteristics of distance education environment

The education environment can be seen from different points of view. The communication and application aspects have been those that are often taken into consideration [Ismangil 1998]. In such an approach, two layers can be distinguished:

- the communication layer, and
- the application one.

The communication layer can be understood as the communication and network infrastructure, which is essential to realize the distance education. The communication infrastructure can be realized in many different ways, e.g. using so-called agents or virtual classroom. The communication is in both directions: student – teacher and teacher – student.

Virtual classroom can be defined as the education environment that expands traditional teaching/learning environment. It has been done not only by using distance, interactive teaching/learning but also by exploitation of multimedia via Internet [Baborski, Nycz 1999]. Student has an access into library files that are situated either in "his" school or collected in libraries outside the school. The communication layer plays also the second role within the didactic process: it enables the contact between student (if he/she wants such a contact) and between student and teacher when student sends his works for assessment or asks for help/advice.

The agent technology (agent system) is used when solving problems by some objects called agents [Russel, Norvig 1995]. Application of this technology is still in progress, but some first achievements are very promising. Especially, when artificial intelligence aspects are introduced into realization of didactic process. In intelligent education environment, the agents communicate with each other, cooperate by exchanging messages, and student can access larger knowledge assets than in traditional learning process.

The education environment may also be organized according to **hypertext** approach where the education aspect rather than technologic or communication has been underlined. The didactic units can be organized by using hypertext. It allows students elastic navigation through the didactic material (forward, backward, usage of different entries in literature, etc.). Hypertext has been used for long time in didactic computer supported systems and can be a very good input point when preparing modern system supporting education.

When internet appeared in common use some years ago, quite new possibilities arose for education. These possibilities depicted some aspects such as, e.g., accessibility of information resources collected in systems working within the network, exchange of information among persons as well as computers, organizing teleconferences or discussions. New opportunities for realization of virtual classroom become at hand. The didactic material is achievable on www pages. Applications based on Internet allow making use of other systems and due to this the scope of cooperation between students as well as between students and teachers has been increased. This cooperation can be carried out either asynchronously (e.g. e-mail) or synchronically (when discussion among students and teacher or only students is being conducted). Usage of Internet delivers huge, new possibilities within distance learning and teaching, especially when it is combined with the special software such as e.g. Lotus Learning Space (more learning platforms can be found in e.g. [<http://hale...> 2001]).

4. Knowledge as one of the most valuable assets in distance learning

When commonly speaking, knowledge is necessary in everyday life. But it is worth of attention to use this term in such a sense as artificial intelligence does. Generally knowledge is connected with erudition or with data assets. If it were, it would be unnecessary to implement the synonymous term to “database”. But there is other aspect of knowledge: knowledge as a tool that enables drawing conclusions from premises. So knowledge can be defined as a set of information that enables drawing conclusions from premises [Baborski, Nycz 1999]. Premises can be a situation description, set of facts, input conditions in dynamic model or other sets of information. A set of information being knowledge can have various forms. This way we came to difference between knowledge base and database. Database is a set of descriptions of facts made by using a data model. Knowledge base is database plus rules of inferring from data.

In traditional model of education, teacher is this “element” of the system which possesses knowledge, delivers it to his students during lectures or exercises. Students, besides the teacher’s knowledge, can use additional knowledge sources as e.g. manuals or audio and video materials. The teacher evaluates how deep the student has learnt this material in a given time and makes assessments giving appropriate marks. The quality of education depends on quality and level of the teacher’s knowledge as well as on his ability to share knowledge with students.

In the distance education system, the gravity point has been moved towards the accessibility of knowledge sources via Internet, and their quality. The teacher plays a role as a buddy who supervises the learning process and assesses the results rather than the main knowledge source. In this situation the role and importance of knowledge gathered in the system becomes one of the most important factors in distance education.

Knowledge is collected in knowledge bases. It is of different nature and can be organized in various ways. Knowledge management in the education system can be understood as in any other system and covers such areas as knowledge acquisition, its maintenance, accessing, updating and verifying [Nycz et al. 2001]. Knowledge should be timely, complete, certain, consistent as far as possible, etc. Knowledge comes from different sources. Among them one can distinguish: didactic courses and modules prepared by teachers, bibliography, books and manuals accessible in both traditional and electronic ways, didactic materials in form of audio and video, exchange of knowledge between students and/or institutions, etc. Knowledge covered by courses or other didactic units may quickly become not actual. The problem of knowledge updating and acquisition of new knowledge is very difficult and complicated. The methods of automated acquisition as well as methods of data mining are used when solving this problem. New knowledge must be verified either by teacher or by special verifying procedures.

5. Architecture of distance learning system (DLS)

As a distance learning management system we understand such a system that allows creation, storing, updating and management of didactic material used within the education process [Koolen 2001]. It realizes the approach that enables multiuse of didactic units or knowledge, offers collected modules and courses and should fit international standards [Peraya 2003; Singh 2002]. The education system is required to:

- 1) collect only positively assessed didactic material,
- 2) enable building new course/units by teachers without programming by them, only using sheets accessible in the system.

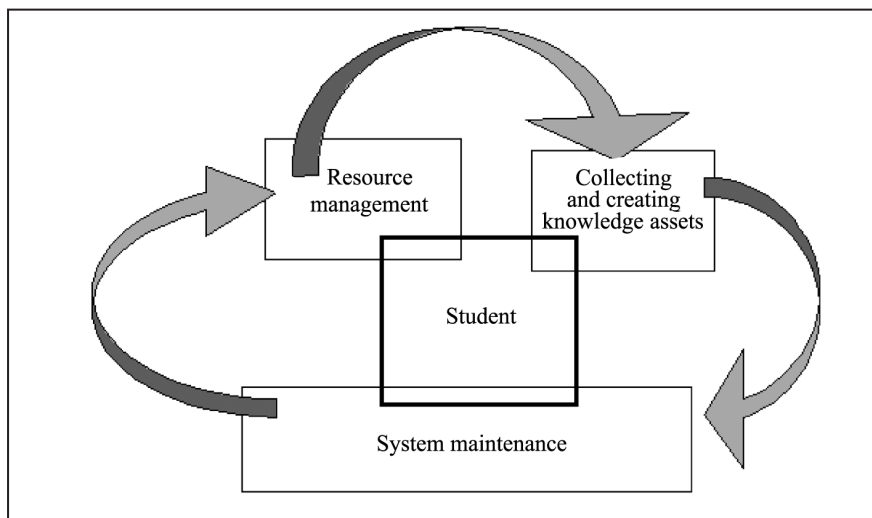


Fig. 2. Idea of distance learning management system

Source: based on [Hayhoe 2005].

Database should be opened to be flexible and both teachers and students should accept formats of presented material [Hayhoe 2002]. The main idea of the distance learning management system is presented in Fig. 2.

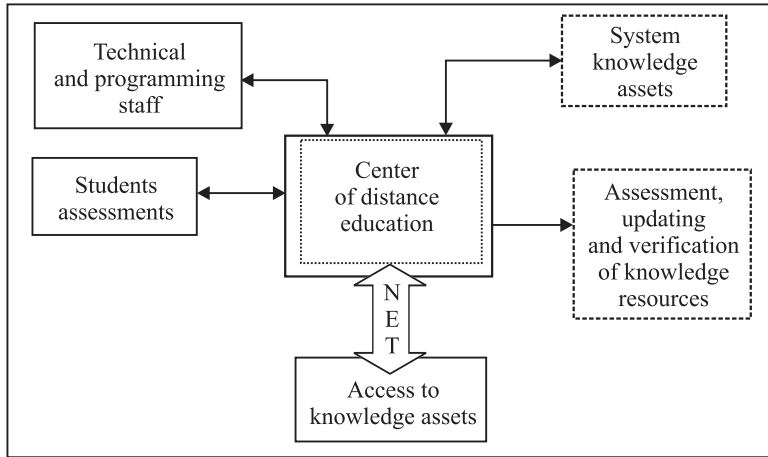


Fig. 3. Center organization for distance learning

Source: [Hayhoe 2005]

From the student's point of view it is not important how the education environment has been organized. He is interested only in interactive access to large resources of knowledge necessary within learning. In Fig. 3 we present how such an environment can look like.

6. Future of a distance learning system

Nowadays knowledge is treated as one of the most valuable assets and its value will be increasing. One can observe the tendency to know more and more. New information and communication technologies offer better, faster and more powerful tools and techniques and from the other hand these new possibilities create new needs. When adding the aspect of world globalization, the role of education in these conditions seems to be obvious. It is not enough to graduate school or university, permanent, long-life learning is a necessity. And what is important: knowledge should be accessible at this moment when it is needed. Due to huge and still growing amounts of knowledge, it is impossible to possess all necessary and required knowledge but it must be easy and fast to find what is needed. It means that learning just in time has (and still will have) the future.

But there are issues that require a lot of work. We think here first of all about quality of knowledge collected in knowledge bases. Procedures of automated knowl-

edge acquisition are still the area of investigations. The same is with knowledge validation. In fact there are no satisfying solutions up to now.

There are some other unsolved problems connected with knowledge assets: security aspects, law issues (e.g. copyright) as well as boundaries of knowledge base. If a distance learning system is to be of real value, they ought to be successfully solved. Learning platforms as e.g. Lotus LearningSpace try to offer some mechanisms to deal with some of these problems, but they are far from perfection.

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