
THE TECHNIQUES FOR DEVELOPMENT OF E-LEARNING COURSES ON COMPUTER NETWORKS

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Abstract: *The paper describes the application of distance learning techniques to presentation of instructional materials on Computer Networks. The subject of the work is the discussion on the effectiveness of selected lectures creating methods for workshops. The techniques presented have been applied to the development process of newly built distance learning platform used at Rzeszow University of Technology.*

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Introduction

An integral part of the educational process are teaching aids, which are usually complementary but also a key element of the cognitive process. They make the transferred knowledge from ineffable chaos transform into an outline structured by the imagination of something that we try to fathom. They can speak vividly to the senses of a man who uses them to shape the view of studied issue. The attractiveness of teaching aids, or rather the materials related to teaching makes the transferred knowledge become accessible. Certainly the rate of assimilation and the satisfaction of science itself grows in the eyes of students.

There will be no revelation to say that the attractiveness of the materials has a direct influence on the exploration of knowledge by the same way. The question is rather what is attractive and how to express it? Of course the answer is not simple only because of the diversity of knowledge transfer and ways to reach students. There is no universal standard methods, however, for individual cases (as in this article) it is possible to study certain known forms and techniques of action. With some probability they will allow an effective selection of learning solutions.

The Transfer of Knowledge

Distance learning, as the classic form of cognitive process, is associated with motivation for learning by students. This motivation comes from the cognitive needs, the desire to acquire certain skills, explore materials and other sociological needs such as belonging. Power of motivation is an element that is crucial. There is a problem in finding verbalization of knowledge and its counterpart in the form of distance learning.

In traditional teaching the teacher establishes more direct contact with the student through the use of verbal techniques. The appropriate voice modulation having intrigue the listener, or relevant examples from reality told in an interesting way should be mentioned. Non-verbal techniques go along with the verbalization of communication. In order to intensify the effect of listener curiosity in transmitted information gestures and multimedia presentations filled with elements of sound and moving are used. In transmission of information dynamics of communication is also very important. The passion with which the teacher should provide the information often is passed to the audience. By this action the teacher "moves" part of the enthusiasm on the audience, which makes the audience get knowledge faster and improve the rate of lecture leader in the eyes

of students. Lecturer uses aids in the transmission of teaching materials and these aids give adequate expression to make this transmission complete.

The techniques used in teaching classical way may also be applied to distance learning. To provide information multimedia presentations are used, passively or actively transforming the listener into the reader. To avoid such transformation, in order to diversify communication, mobile audio components such as videos, animations and sounds clear instructions, are implemented. Materials containing dry text of the lecture contents are less interesting than those which have examples of practical applications. Such activities contribute to the teaching method as "non-verbal element". The listeners can fully understand the topic in question, knowing its real destiny. Then they see the merits of acquiring the information collected in the context of the problem under consideration. This will ensure that the listeners are likely to reach the next topic. Distance learning often puts the listeners in the role of decision makers. It gives them some choice, which materials they want to acquire at the time, and which allow for subsequent assimilation

The age of the learner plays major role in the use of distance learning. Young people, by virtue of living in times of extremely rapid technological progress, are much better predisposed to benefit from this form of learning than older people. Materials for distance learning must be prepared in the universal form, because you never know what age group will have to deal with them.

The quoted characterization of the two learning technologies in the context of the way of transmission of educational content shows with how a big problem we face. Although in the short way this method treats the problem, it highlights some important themes that you might consider building or designing the virtual equivalent of the traditional pattern of teaching [Rzucidło, 2011][distance learning, 2011] [Giurko, 2008].

The Gamson's report [Gamson, 1987] concerning education, conducted over several decades at universities, can specify the following principles of good educational picture. It should be characterized by:

- activity,
- co-operation,
- demanding (labor intensity) (classes should be absorbing.)

Contrast material should be:

- accessible,
- understandable,
- practical
- wide range of applications.

Despite the passing years the principles set out in the report have not lost value. This is confirmed by subsequent publications on the human predisposition for the effective assimilation of knowledge and information [5].

Comparing the preferences of students with learning pyramid [5] one can conclude that students like effective teaching methods. E-learning in order to be an effective method of teaching must go hand in hand with practical teaching. It should also be aware of the possibilities of students [e-learning raport, 2005].

According to the report for 2008 [Peterson, 2009] on e-learning market in the UK 57% of study participants have been using this tool in teaching. At the same time, this form of distance learning is only 12% of the time spent on education. For comparison, e-learning in the U.S. represents 30% of teaching time. The vast majority (95%) believe that e-learning is effective only in conjunction with other forms of learning. Respondents see the need for a new attitude towards people using the service.

The same report notes that the value of e-learning market in the UK increased between 2007 and 2008 by 25% (from 160 to 250 millions £), and between 2006 and 2007 12%. However, the leader in this regard is Scandinavia,

where the e-learning seems to be one trillion euros (in the UK about 700 million). At the same time increase in the market value at the same time between 2008 and 2009 was only 8%. [Peterson, 2009].

In Poland, e-learning is not growing so fast. One of the problems in popularizing this form of teaching is the lack of official standards that the State Accreditation Committee could add to the evaluation of the curriculum by using e-learning. On the other hand, the development particularly in higher education has been recognized [e-learning in Polonia, 2006] .

On the other hand, government authorities take measures to develop e-learning in Poland. In 2006, the Ministry of Education organized a tender for the high-quality e-learning in economics and information technology (IT) [e-learning in Polonia, 2006] . Courses designed in this was are widely available.

The development of e-learning in Poland was influenced by the availability of the Internet. According to the CSO in 2006, only 36% of the population had access to the Internet. For comparison, the average for the EU was then 52%.

In addition to the availability of an impact on changes in the e-learning skills affect Internet users. In 2006, only 20% of Poles had e-mail account (e-mail), and 23% actively used the forum and chat [eurostat, 2007] .

Another problem is that only about 5% of Polish citizens are educated for life. As the main cause (67% in 2007) people provides the improve of their work or improve of their careers (niejasne). Only 7% learn complex in the direction of their interests. For comparison, the UK, up to 82% of residents are trained to acquire new knowledge, skills, according to your interests. [eurostat, 2007] .

In all countries, more than half of their residents choose to participate in various forms of teaching because of the desire for better jobs or careers. Another worry is the learning rate according to people interests aimed at their development. Only in Poland from all EU countries, its value falls below 20% and not the entire 8%. For e-learning it means that the average Pole is not working enough to be interested in training, and the main aspect, which will look at the form of teaching is useful for work or career. This can lead to the fact that the main criterion for selection will be, what value will have a certificate, a certificate or diploma that will get after completing the course, training, seminars and other forms of education.

A chance for the development of e-learning is higher education. This group is open to new teaching methods, and more willing to deepen their knowledge and skills according to their interests. To interest working people with further training would familiarize students with this form of teaching and make the opportunities in order to seek further training. The problem may be cash, which can allocate a person for the purpose. It should also be noted that in many cases, e-learning is cheaper or even free, which may contribute to one's development.

E-learning should be addressed to specific recipients, so they want to continue using this method. Consideration should be given to individual preferences and skills of the group, so that the form was attractive and effective for them. After reviewing the potential participants, the advantages of this specific project should be demonstrated. With skilful use of techniques and forms of teaching and the software the author or authors of the training course or other form of teaching use, e-learning can succeed.

Teaching Techniques

The largest percentage in remembering the content (90%) applies to students who teach others, or "on the fly" use the acquired knowledge. Active methods are the most enjoyable [5] (Fig. 1).

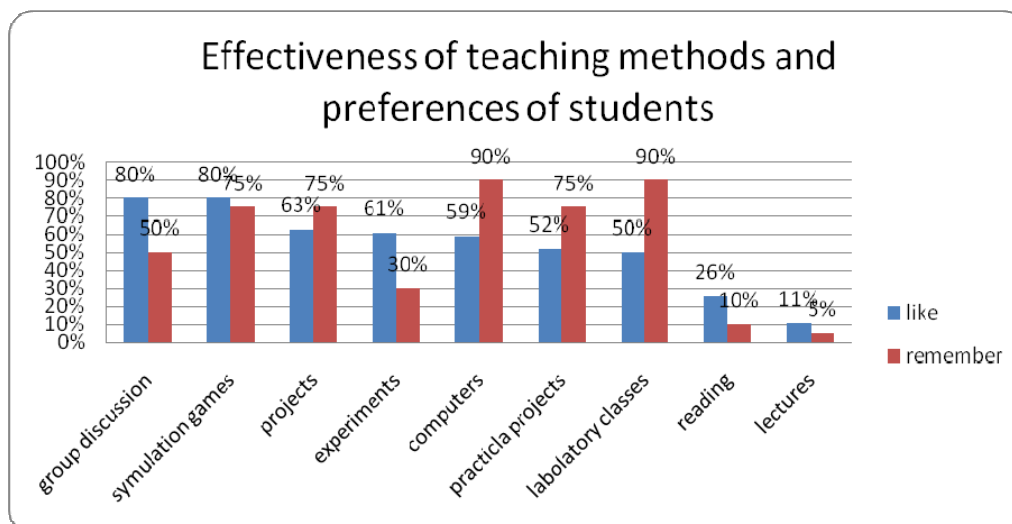


Fig.1 effectiveness of teaching methods [Geoff, 2010]

During the process of teaching a student uses a variety of senses. Studies have shown that the more senses students will use the better they will assimilate new knowledge. The most effective method of teaching are one student by another and the application of knowledge "on the fly." In both methods, the students acquire knowledge as much as 90%. Additionally, studies have shown that 80% of students like group discussions, games and simulations [5]. It is worth noting that in the Polish higher education knowledge transfer takes place in lectures, exercises, labs and project activities.

The lecture is a form, which has the lowest efficiency of transfer of knowledge from those used in education. According to Geoff Pette [5], the student is not able to concentrate on the lecture more than 15 minutes. After this time, followed by involuntary short-term deconcentration and rapid return of concentration, but no longer such a high level as at the beginning. These spikes occur periodically, although the time between successive cases of loss of concentration can be at once less. Long-term loss of concentration during the lecture is also possible. The effectiveness of the lecture as a teaching method sums up the following quote: "The lecture is an event during which teachers' notes and information go to the students' notes without passing through the head of any of them" [5]. Given the obvious shortcomings of the lecture, a question arises why it is used as a form of teaching? The answer is prosaic. It is the simplest form to forward any new material in a short time.

Conductors of lectures are trying to interest students of the subject classes using various teaching aids such as presentation on the projector, store design / important information on the blackboard. Often, teachers are not aware that the concentration of the substance of the lecture are repeated over and over words specific(niejasne) to the lecture such as "do you understand ?", "Mr. and Mrs., please listen to me", body language and tone of voice. It is not easy to capture all those aspects oneself, not to mention the controlling factors arising from the behavior distracting teacher. Using lectures in the form of distance learning described distracting factors can be eliminated easily. The teacher can prepare to the lecture in the form of a multimedia presentation, or in the form of a text file. Such materials may be used as an e-learning course. In addition, this eliminates the problem of distraction associated with the time and amount of knowledge. The student may stop at any time and return later to lecture. The period between successive stages of acquiring knowledge from the course can be quite long. In order to consolidate critical information and reminders lecture should have an implementation plan in the form of bulleted or mind map. Examples of practical applications of knowledge are fun, but related to the topic illustrations, or anecdotes will help to better comprehend the material by a student. At the same time course should preferably be short and pithy, so that the student was not saturated with newly acquired knowledge. On the other hand too summarized lecture without graphical support may not be readable to the recipient. Text

and figures should be seen against the background of the template of the course. Too fancy background or a large amount of graphics can distract from the merits of the lecture. It is important that the layout was clear, the font was too small and sophisticated, and that the paragraphs were not too long.

Sometimes the lecture as an e-learning material containing images and text is not sufficient to transfer the knowledge of a topic or field. You can spice up a lecture with recorded voice of lecturer (teacher), preach or with video from recorded lecture. These are two ways to increase interest and intelligibility of the lecture topics e-learning require a greater commitment from the operator and attention to detail that had previously been described. The advantage, however, is that such recordings may arise in environment suitable for the teacher and the teacher will not have to try to do well every time, only once during the recording.

Much more challenging is to create an effective course design. Manual execution of the project should be available at every stage of its implementation. Additionally, each stage of the project should be described in detail in a separate statement.

User Guide should be short and provide a summary of the stages of the project. Depending on the specific project may be specific deadlines for putting the next part, or the approximate duration of individual stages and the whole project. User Guide can be made in the form of a text file, as a plan. The projects carried out using a computer a good method for the presentation of such instructions may also be an interactive mind map, but also the course skillfully done.

A detailed description of the various stages of the project should be mainly clear and complete for this project to do. But it is not easy. If the instruction is too large then the students will overlook some important parts of looking for those that interest them. In some projects it may be useful to include glossary of terms used, which may be interpreted differently, or inventory of used abbreviations, markings, bibliography.

Same statement concerning the stage of the project depending on its characteristics can be made with the help of e-learning course, or video. In the first case it may be helpful to use photographs, drawings, screenshots, etc. to facilitate the realization of the project. They require a proper description and can be referenced later in the instructions (for example, technical drawing, the menu includes a screenshot). These graphic aids may be interactive so that pupils can see some parts of the transition between each stage of the project during execution. If such material to show the move is a lot or easier to show than to describe it is better to record a video. It is not easy to carry out a good instruction video. You have to take into account not only the factors described in the lecture (body language, voice, etc.), but also a skilful show different parts of the project such as the object during processing, so that the student can later restore it yourself.

The greatest difficulty in carrying out project activities such as classes of network structures or equipment or software setup are all kinds of questions students about the project. Even the most accurate, understandable instructions did not prevent specific questions related to the project. Problems faced by students can be very surprising to lead to such an extent that even when personal contact is hard to find the cause. In the case of projects carried out by means of computer files can be sent by e-mail, put on the page, where you can download (eg `chomikuj.pl`, send it!). But this is insufficient, because you do not see the steps performed by the project. Another problem is that the design may look different on your computer, the student than teacher. In such situations you can use programs (eg, TeamViewer) to allow the screen to show the student along with this, and its proceedings, whether the teacher showing the student to solve the problem. It is also useful verbal communication for this purpose can be to support programs like Skype, Teamspeak, etc. In the case of projects carried out without a computer or parts will be useful to use the video call, which allows more and more programs such as Skype.

The same tools can be used in laboratories. However, you do not need to follow the main or detailed instructions. You can follow the instructions for each lab in the form of course, video, or text file. Pay attention to the same aspects as for instructions for the projects.

Laboratories can be done via video - a conversation with the Internet and relevant software. It is not easy to perform such a laboratory. Teacher must be well prepared and be able not only to present the material, but also encompass the group.

To sum up, materials must be comprehensible to the recipient, complete topic in the desired range, but possibly informative and attractive form presented to the recipient.

The Tools of Presentation of Knowledge for The Subject Computer Networks.

Some of the popular methods of distance learning include:

- Methods in asynchronous mode - based on individual learning. During the study there is no interaction between teacher and student (also called the student at). The students themselves choose a term of science, which should perform the tasks and tests.
- Methods in synchronous mode - teaching takes place in real time and is taught by a teacher. The method is based on communication with the teacher and student participants of the course. With this method, students have the opportunity to ask questions and get immediate answers.
- Databases - this method provides multimedia encyclopedia, instructions for exercises, etc.
- Online BB - allows quick response to questions and obtain complete answers. Information is exchanged through various forums, chats, e-mail.
- methods combined - rely on a combination of these methods in order to better teaching. It is used when there is a large diversity of groups and some students prefer their own pace of learning, while at the appointed time, led a discussion on the course [e-nauka, 2011] .

In the process of teaching the subject "Computer Networks" it is important to select the appropriate methods. But they cannot provide rigid guidelines for implementing e-learning course. Lectures on this subject require proper communication. The best way to be here for the presentation, which should be further enriched by a variety of illustrations in order to better assimilate knowledge. Presentation itself, however, is insufficient, it is necessary in this situation, to help the operator provide answers to questions asked by students in a specified time.

Laboratories with the subject "Computer Networks" require a completely different approach. You cannot use the presentation here, because during exercise the student may experience difficulties because of their number and different levels of complexity can not be described in the presentation. Necessary instructions are therefore enriched with short instructional clips that step will lead the student to complete the task within the laboratory. These films should also include a lectureship. The person that captures video should clearly make the next steps of the exercise which probably contribute to its understanding by the student.

An important choice in creating the course with the subject "Computer Networks" is the selection of appropriate tools. With the help of coming here and free software, free Moodle, based on Apache, PHP, MySQL or PostgreSQL. Undoubtedly, the advantage is the ability to install software platform for different operating systems. Additionally, the software supports almost 30 languages. It allows communication through forums, chat and exchanging messages. E-learning platform Moodle supports the SCORM standard, which allows you to create materials free programs that allow you a record of courses to this format. For these programs include:

ELearning XHTML editor (eXe)

ELearning XHTML editor (eXe) is a Web-based development environment designed to support teachers and researchers in the design, development and web publication for learning and teaching materials, without having to become proficient in HTML, XML or complicated applications published on the Internet. [EXELearning, 2011]

The Web is a revolutionary educational tool because it presents teachers and students from the perspective of technology, which simultaneously provides to talk about (content) and the means to store the conversation (interaction). Unfortunately, the power of this medium is constrained in educational settings because most teachers and researchers do not have the skills to build their own websites. It must therefore be based on the creators of websites creating professional-looking content online. EXE is still under development, to overcome a number of constraints identified:

- Traditional software is associated with a steep learning curve and it is not intuitive and conclusions were not intended for publication curriculum. Therefore, teachers do not accept these technologies for publishing content on the Internet for learning. eXe aims to provide an intuitive, easy to use tool that allows teachers to publish professional websites for teaching purposes;
- Currently, learning management systems do not offer powerful tools for creating Web content (compared to the software capabilities to create content published on the Internet and the skills of experienced web developers). eXe is a tool that provides the ability to publish professional content on the Internet, giving the ability to easily import by reference or standard learning management systems;
- Most content management systems and learning management systems use a centralized server model, which requires an authorized connection. This is a limitation for authors with low bandwidth or the total lack of connection. eXe is a program working offline without an Internet connection required.
- Many content management systems and learning management systems do not provide an intuitive WYSIWYG environment where authors can see how their material will appear in the browser after the publication, especially when working offline. eXe will mimic WYSIWIG functionality that allows users to see how the didactic material published by them in the network will look like.

With eXe, users can create educational structure that corresponds to their content delivery needs and build resources that are flexible and easy to update. The Outline of the Control Panel window eXe enables users to design an outline that reflects their own preferred hierarchical structure and taxonomy, i.e. topics or units-of books, chapters, poems, etc. This can be fixed at the beginning or it can grow with user demand .

IDevice (instructional equipment) consists of a collection of components that describe the content of the course. Curriculums are developed by selecting from the menu iDevices iDevice and the introduction of teaching content. Educational resources may consist of several or many iDevices required for the effective delivery of content.

eXe offers users the ability to tailor the content published by selecting multiple sheets of graphic styles.

eXe enables the publication of materials in two ways. As a standard web site or as a SCORM content that allows you to place the course in any learning management system.

Moreover, among the applications you can use to create courses, can also be found:

CourseLab

This is a free program for advanced functionality that is used to create high quality e-learning courses. Their power is equal to commercial counterparts. After opening the application and selecting a new project, it offers several built templates to create courses. You can also upload your own template for the program.

The application has a WYSIWYG editor (called What You See Is What You Get). Editing text is done by adding a text box and double-clicking on it. The program allows you to import different kinds of objects using drag and

drop, including: Objects of Adobe ® Flash ®, Adobe ® Application ® Shockwave, Java applets, video clips in various formats, navigational facilities, forms for creating test questions for students.

The program lets you record rates, inter alia, the format LMS SCORM 1.2 and SCORM 2004 LMS.

Learning Content Development System(LCDS)

LCDS is a free application from Microsoft for creating e-learning courses in 16 languages, including Polish. This tool offers basic functionality, and Upper Intermediate. The basic feature concerns the appearance of the course, its layout, font size.

After creating a new project course is divided into lessons, which you can choose among various options. The application has 6 major divisions conducting the lesson. These sections are further divided into 6 different ways of presenting course content.

The first way is "Interaction." Here are five methods of topic: fiction exercises, drag and drop, interactive assistance in completing the task, the slider, the game: Place the order. They provide the student's active participation in exercises.

The second way is to teach classes, "Watching." There is a choice of 4 possibilities of multimedia: animation, demonstration, multimedia material from the key issues and a table with animations. The application, in addition to standard media formats, can also add material created using Silverlight.

Further methods of conducting lessons include games, reading, practical exercises (providing laboratory simulations and scenario / offline) and the classroom.

We provide prepared materials in the form of web pages. It is also possible to import the course into a Word document and export to a package conforming to SCORM 1.2. The new version also offers export to Learning Snacks. These short, interactive presentations, delivered in a Microsoft environment Silverlights. Such files can contain animations, tutorials, and other media. Unfortunately, the program has limitations, which allows you to export only the 6 subjects for a Learning Snacks.

In assessing the above schemes in terms of created materials for the course with the subject "Computer Networks" can be seen that the application eXeLearning offers advanced text editing (color, font size). This is especially important when there is a need to highlight specific text (eg definitions). The program offers a highly intuitive user interface, which allows for quick and easy way to create materials. Therefore, the program will be used to create lecture materials.

Advanced ability to create interactive courses offer two other programs. They allow the creation of various types of quizzes, tests and trials, and the addition of instructional videos. Unfortunately, Microsoft's program has a flaw, which is undoubtedly a poor ability to edit text. The manufacturer has limited his practice to the minimum possible, even forgetting that the basic element as the size of text editing. This causes the program LCDS cannot be used to create lecture materials, which will dominate the text and graphics.

The most appropriate program for creating materials in the subject "Computer Networks" is an application CourseLab. It is a complete program that allows creation of all these materials, enriched the library of objects, which allows adding different types of footage.

Conclusion

The paper has presented the history of distance learning. Description of methods and their analysis are presented as well as programs for creating courses. These courses will be divided into two main types: lecture materials and laboratory materials. The first of these will replace the information provided in lectures in the traditional forms of teaching. This information will, in turn, be divided into materials, containing only text, and such

information will be dry but enhanced with graphics. Some of the lectures will also include films, which in a practical way can assimilate new information.

The second group of materials will be laboratory materials. Due to their specificity, they must in addition to the standard instructions also include instructional videos that provide step by step how to perform exercises. It will be both movies with a teacher, as well as screenshots.

The above-described materials will be made available to students through the use of e-learning platform Moodle. It allows you to manage materials and share them with the right people, while blocking access to unauthorized persons. The application will also enable contact between the student and the teacher and other students, so that any potential problems will be quickly dispelled.

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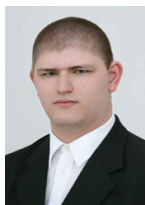
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