

INTERNET TOOLS IN EDUCATION AT DIFFERENT LEVELS OF TEACHING

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ABSTRACT

Modern education opens up broad prospects for the use of the Internet and its applications. Global computer network helps us to cross all limits allowed for the development and transfer of knowledge and to stimulate and create personal skills. Time and distance are no longer an obstacle. Recently, it has also been popularized in the use of online tools for professional work and intellectual and to the education at all levels of education. In this way, teachers are able to adapt teaching tools to the students' individual needs. Moreover, the aspects of graphical visualization can be more efficient and interesting for students from previously used resources. This paper presents various methods of the Internet in education, and in particular the use of software to solve advanced problems in the art, for example, to calculate transient states. These tools are not only used for training skills or to solve specific tasks but also to shape attitudes and social behavior.

Keywords: modern education, training software, e-learning, research software.

INTRODUCTION

Modern information technology, which is based on computers, has a huge impact on students, teachers and on the whole process of education. The era of ubiquitous access to mobile devices absorbs standard teaching techniques. Increasingly, traditional student's books and handbooks are less popular nowadays as they are replaced by e-books, tablets and smartphones. The methodology of teaching must keep up with the rapidly changing environment. Teachers at all levels, starting from primary school, through middle school, high school and ending at universities should adapt to the needs of their pupils. Nowadays when, even a four-year deals well with a tablet type toy or an interactive pen, the Internet aided education might be more understandable, interesting and above all more fruitful. The consequence of this situation is a continuous need to improve skills of teachers. They can not close themselves or ignore increasing technological progress. They should make use of the vast resources of information and opportunities that the internet

brings. And on the other hand the teaching processes with the use of software and their applications should be modern and necessarily valid. The role of the teacher is not only to explore innovations of taught subjects but also the corresponding transmission of information which is a message to the students. It is a huge challenge for the teachers because they need to keep up with technological advances and sometimes learn the programs or applications from a scratch. What sense for students would be to transfer knowledge about the "archaic" technology - not usable to the world today. In order to effectively and interestingly convey messages many methods and means are used during teaching process but the best of them turned out to be the use of information technology.

AIDED EDUCATION AT DIFFERENT LEVELS IN RELATION TO THE REFERENCE

Lublin University of Technology actively participated in numerous tests in computer network applications in education. The Faculty of

Technology is leading in the research on applied computer science. The tests show that internet mainly provides educational material for 90% in higher primary schools, for 55% in secondary schools and 25% at higher levels – academic, for example. That is because we can find especially some basic information in the internet. The process to find high-technology (specialized) information is a much more sophisticated task and thus more complex.

Internal research carried out at the Faculty (in different research, groups reached about 100 students) show that during daytime activity, described by most of the stationary students as 18 hrs, even 90% of them are connected continuously to any of computer systems for all the time (including mobile phones) but more than 50% time i.e. 9 hrs. and more, systems are actively used (including different types of entertainment and communication).

Recent studies on the use of the Internet conducted by the Public Opinion Research Center in 2014 showed that within 10 years the number of people using the Internet at least once a week has increased more than double (from 26% to 63%). Studies have also shown that the accessibility of the Internet very much influences education. Most people who use the network has a university degree (93%) or lower secondary school degree (94%), although in the second case it is due to their young age. The lowest use of the Internet is among people with primary education (20%), the reason for this is that many of them are people who are over 60 years. Age group that is most likely to use the Internet and its applications are those between 18 and 24 years old (they represented 96% of the study group). The research show that it is almost impossible to live without internet nowadays. If we are not at home we use smartphones or tablets to surf in internet, it is almost like a life style or can be an addiction. The research was carried out in June 2014 on a population of 1028 people [1].

APPLIED METHODS

Problem solving processes in many areas of research in all fields of technology take advantages from simulation tools of different access possibilities. Researchers use typical software available in the whole world and particular dedicated software installed on personal computers or in

local networks but also use online software (not only popularly recognized as freeware) which is very advanced and often requires special license. It is omitted in this consideration if it is permitted free or by payment.

The paper is focused on the methods enabling the researchers on different level of fluency use Internet as a tool for serious and advanced investigations, to solve deep scientific problems and to generate reliable results.

The first area where such methods can be applied, and that is considered in the paper, concentrates in the broad thematic field of energy and environment which is in the focus of interest in the regional policy of research, education and commerce. The examples that can be used for the description of this method are TRNSYS [2], CIRCUIILAB [3], ANSYS Fluent [4], WUFI+FLUX [5], etc. These are quite well known tools, for specialists, to investigate transient states in energy supply systems for either renewable or conventional systems and, in general, heat and humidity transfer problems.

The first group of problems that can be solved this way, are based on the needs to design concepts, then if user's skills allow, one can introduce local environment conditions and engineering parameters, and on the top level of advancement, mathematical calculations according to relevant energy flow formulae and their modifications if they are available. The solving processes, at different levels of visibility, are based on numerical methods, usually represented by Finite Element Method, Circuit Theory methods, Elementary Balance Method, which are the most popular in technology but of course more advanced mathematical tools are also available and used in e.g. neural network problems and nanotechnology. All types of simulations e.g. forecasts, behavior in different circumstances, application of varied parameters and time changes in transient states form different approaches towards solutions in this group.

Some other methods are used in teaching of Software Engineering. Software Engineering is one of the most important areas of modern science and is included in the curriculum provided by the Department of Technology Fundamentals, Lublin University of Technology. It trains students for careers in business involved in the generation, adaptation, implementation or administration of the variety of software.

There are some increasingly important areas in the design of information systems. These are design systems that allow recognition of this process as a whole, in all aspects of the system and at all stages of its creation. The main importance is the language i.e.: the notation of the technology integrated, UML software design and project management, which is recognized both from the theoretical side as well as through independent performance system designs. The students form a software specification, i.e.: they establish a theoretical internet enterprise and determine the requirements that the software must comply with [6].

The next step is to design and thus to determine the overall system architecture and requirements for each of its components. Students work out use case and suitable scenarios and diagrams. Usually it is sufficient to formulate use case diagrams, class and object diagrams, action and state diagrams and time sequence diagrams. The selected part of the class diagram is shown in Figure 1a. It contains information about the statistical relationships between elements – classes. The drawing shows, according to UML rules, classes (as rectangles divided into names, attributes and operations) and also established links between them (association, aggregation, conjunction). This interpretation of the system allows to formalize the specification of data and methods. Figure 1b presents a diagram of objects that visualizes hypothetical actions of the system at the time. Object diagram notation uses simpler notation than the class diagram, showing objects that are instances of the classes. There is a diagram in Figure 2 that shows operations that are used to model the dynamic aspects of the system. It visualizes a gradual course of action. Thanks to the work in Star UML^R it is possible to design the system architecture and any modification before putting into implementation and system integration [7].

The aim of teaching in this course is not only to provide knowledge and skills in the program. The process of design and creation of diagrams is only the end result made thanks to the creative activity of students, preceded by a thorough analysis of the issues, reading the projects already functioning in the market, often proposing innovative approaches and preparation of use cases scenarios. Among others, students develop projects for the retail and service systems, fault diagnosis systems, reservation and even electronic banking systems. They are encouraged and stimulated to think independently how project will operate, what mechanisms will guide him and they are suggested to recognize and describe the relationships between employees and beneficiaries. The last aspect is not the least and it is even very important because it helps student to recognize the service and commercial relations that prevail in companies and institutions. This way, the students acquire the skills of individual and group creative work, instead of frequent copying and pasting information searched over the network. Usage of own ideas based on previously analyzed independent ventures makes that the systems become less virtual and more strongly associated with life and reality. In the process of teaching many mechanisms are being developed which are necessary for conscious functioning in the information society and some creative skills are trained to engage further graduates in the process of modeling. Surprisingly to the learners, computer classes character is based on knowledge of psychology and sociology much more than it could be expected and this way additionally shows the importance of these non technical areas to the students.

The other group for the consideration is the one with the possibility to create and use an interactive simulation on a selected platform. This group examples the main focus of interest in the paper because, thanks to these tools, advanced

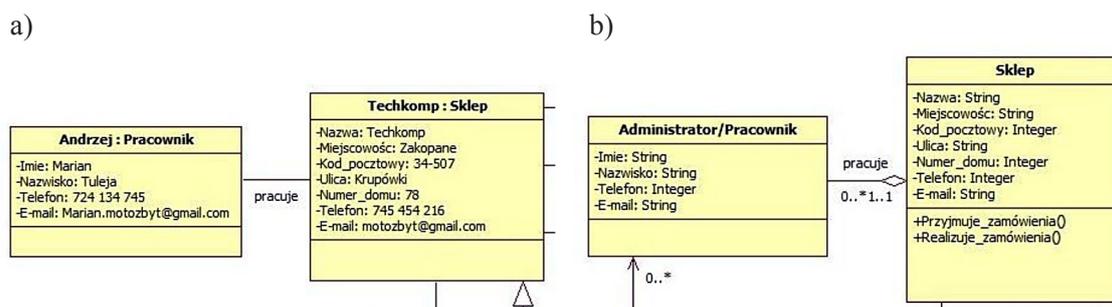


Fig. 1. The application of the UML Star visualization system architecture in computer sales online: a) a selection from the class diagram, b) a part of the object diagram

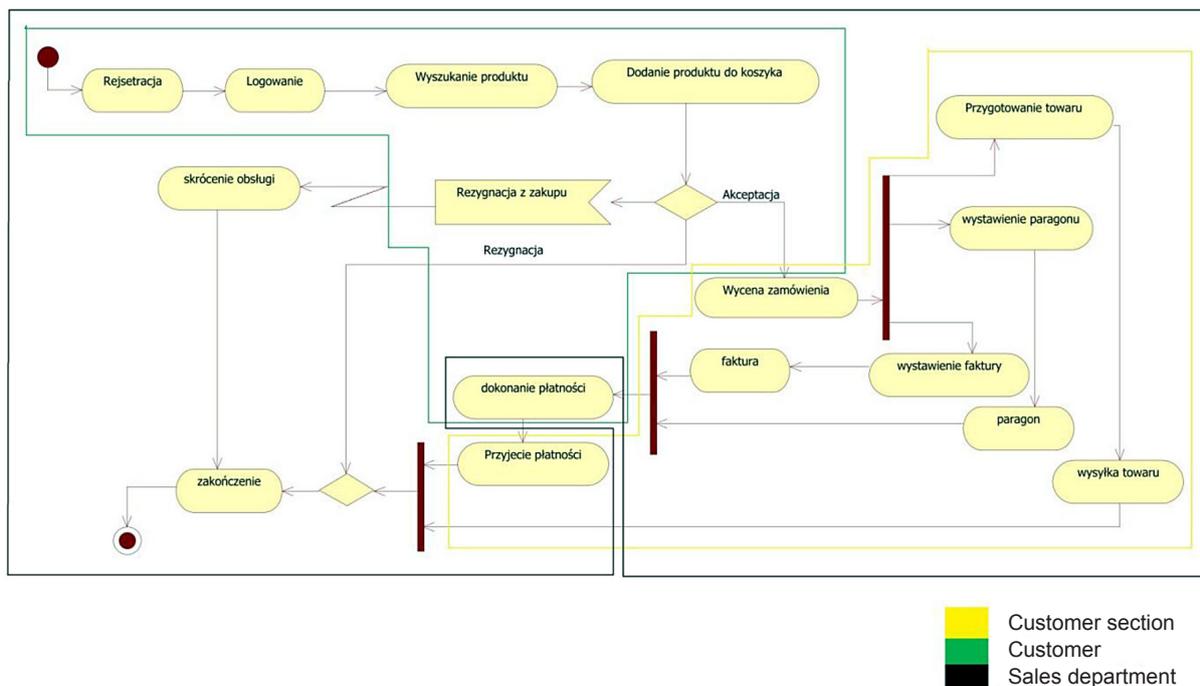


Fig. 2. Visualization of dynamic sequence of steps in the modeled sales system, shown in diagram steps by means of UML Star

students, still remaining in their process of education, can show their creative and discursive abilities and develop them into deep scientific research.

The first task of young academic researchers is usually connected with didactic process and that is why it is suggested to stimulate these abilities through the course creation and its development processes. The configuration of a course starts this process and it is presented in the paper by means of an example of a course entitled “Training service in the area of renewable energy sources on the basis of theses elaborated in the Department of Technology Fundamentals”. The configuration procedures make that creators take the position of a decisive person and make possible for new users to set up their account on their own through a confirming e-mail to activate the account and to enable the enrollment.

For the purpose of the particular course three course subcategories have been developed, i.e.: photovoltaics, solar thermal and biofuels. Activity modules that should be available for an efficient course are: Registration, Tasks/Problems, Forum, Reply information, Questionnaire, Survey, Lesson, Quiz, Workshop. These modules make that courses are not only delivered but also their effectiveness can be checked, students can be evaluated and the system can evaluate different levels of usage and give the information to an administrator who at the

same time serves the role of a remote teacher. All such surveys are necessary even currently in real time when e-learning is used.

It is also worth to remember that graphic visualization aspects can be adjusted and they are especially important if higher perception need is considered. If engineers are evolved it can be assumed that they represent good imaginative skills but the wide range of future teachers can benefit from standard graphic styles which are also available but need additional download, unpack and installation. Afterwards, personal skills in HTML, CSS, PHP and optional use of software such as for instance as Gimp[8] and Notepad++[9] are trained.

Because e-learning procedures allow for the diversification of time boundaries, the character of courses can be adjusted to educational effects that should be achieved. One can decide whether one of the following approaches is advantageous:

- Weekday – administrators can define exact time boundaries when a course is to be carried out.
- Social – courses are carried as the exchange of knowledge on established problems.
- Thematic – subsequent lessons are available as long as administrator decides.

Another methodological aspect is the decision if all sections of a course should be hidden or visible, as for example marks or activity reports. It is dependent not only on privacy aspects but on the

course content. Let's take the example of a lesson named "Characteristics of operation of photovoltaic cells" in Photovoltaic course. This is the introductory and fundamental lesson in this course but not the simplest. The administration of further material depends on proper considerations and memorizing of this lesson and it is understandable that successful test after this lesson enabling the entrance to the next one does not guarantee that a student will remember its content all along the whole course. The possibility to return to the content of the previous lesson should be available but should not be visible or a subject to control, to let the students use it freely for their benefit but their activity during the lesson before the successful evaluation should be under control (including time control). It is important to activate a section for lesson flow control which stimulate students to increase their self-control.

It is justified that lessons created in this course are linear. Students can go back to the previous lesson and enter the next one if the test is successful. Wrong answers can be corrected but the number of corrections is registered and can cause relevant reaction from the course or its administrator remotely. Lessons consist of text, graphics, voice and video. The introduction of these elements is possible thanks to HTML graphic editor or YouTube imports. Tests can be diversified in their forms as the following:

- multiple choice questions,
- true/false decisions,
- short answers,
- numerical answers,
- select-and-drop the right answer type,
- text answers with no possibility of copy/paste function.

Another method, which can serve as an example of usage either in research or in didactics, is a multimedial course. This can be used to explore and test students' creativeness and to train others. Although the effectiveness testing is typical then, the creativeness exploration is worth mentioning and can be different in the variety of science and even art fields.

Let's maintain the focus of Faculty of Technology Fundamentals practice. New educational string has been developed related to labor safety and thus new courses appear continuously. Regional safety inspection practice is of course of long history and students can frequently benefit from, but also can add quite stantial values to

it. This is possible in a kind of synergy system when regional bodies cooperate well with research and educational centers. This process can be traced on the example of the below presented course for the work at height, its problems and requirements.

Such comparatively typical course requires and should be elaborated in a kind of discursive way, let's say just at the level of Master's thesis. At this level, students acquires the knowledge but also become co-creators of multimedia content adaptation and thus training not only technical skills but also psychological methods and tools to adapt the course of safe behavior in the workplace, to their colleagues and potential learners using available tools. The use of animation and slide transitions is a good practice to add expression and influence students' skills in the hidden way under the course content. It is particularly important when safety intuitive behavior is trained and at the same time content appreciation, understanding and also professional layout matters. *Articulate storyline* software product are flexible with the library of animation ins and outs, available for images, motion pictures etc.[10].

It is also useful if *Record Screen* tool can be used to add multimedia to the course without necessity to engage additional software. Creative-ness resulting from own production of motion pictures cannot be overestimated and the possibility to insert a motion file or record a movie is helpful.

Typical course units should have average content comparative to one full lecture if the general purpose of e-learning is to be maintained. In the series of trial the author has established this within the following frame: 40 multimedial slides + 80 layers composing the whole content, 4 quizzes to memorize the knowledge, 10 problems to be solved in the final test [11].

CONCLUSIONS

The elaborated tool was tested in two target groups: students in the regular curriculum and employees of regional inspection office who are regularly involved with their activity with client enterprises. The student group consisted of equal proportion between men and women and the level of knowledge assimilation after 1 hour trial was 60%, the employee group (consisting of 60% women and 40% men) showed 95% assimilation [12].

Both groups had earlier knowledge in the subject but students did not treat this activity as an opportunity to extend their knowledge. This was in the contrary to the employees who, however not involved in this field of professional life (not engineers), showed much more responsible attitude to their obligations. Majority of students reported that the course was boring but the majority of employees were pleased with this form of education.

This research, however estimative only, can be indicative that the appreciation of e-learning is very strongly vulnerable to personal motivation. The previous research conclusions published by many authors and presented in the introduction of this paper are very dependent on general conditions usually not envisaged by such simple questionnaires as they report. The general acceptance of e-learning by academic environment is somehow not justified when only brought up aspects matter, partially justified when educational aspects are important and well justified only when economical aspects are leading in front of personal brought up and high quality processes. Personal motivations can be comprehensively raised when proper brought up processes extend far beyond school and high school education.

Universities train not only employees, but also, often, not their own researchers and thus, academic institutions should not limit their high quality methods only to the target group of their further most promising individuals. The other aspect of conclusions refers to the applicability of software tools in training of research skills and this is positive.

Moreover, the aspect of researcher's personal responsibility is again a problem to be solved not by means of computer software. The continuous positive feedback between e-learning and personal tutor's relation towards students is impossible to overestimate.

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