

Virtual Electronic Learning in Vocational Initial Teacher Training

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***Abstract** - The paper outlines the European and local situation regarding the use of virtual learning environments in technical teacher training and retraining and presents an overview of the content and methods of the continuing education for technical teachers. Introducing and running retraining courses on virtual learning environments including IT and its multimedia application is a strategic necessity in all technical teacher training institutions because hundreds of teachers and trainers have not been prepared for using the new teaching and learning technologies.*

1 Introduction

The Institute for Engineering Education of Budapest Polytechnic as the successor of the Technical Teacher Training Department of Bánki Donát Polytechnic has been involved in preparing graduates to be teachers and trainers of technical secondary and vocational schools for 32 years. Only a small number of these teachers and trainers were able to keep pace with the rapid changes in information technology.

The development of information technology has entirely changed the scope of communication skills. Only teachers, who are capable of using IT applications, can efficiently develop the new communication skills. Therefore, there is a great need for retraining courses at technical teacher training institutions.

The Working Group for Innovative Learning and Teaching Methods of the SEFI originated Socrates Network Project: E4 (Enhancing Engineering Education in Europe) examined the situation of virtual learning environments in Europe. It revealed during a discussion in Florence that, Blackboard is used mainly in the UK and Holland, Web CT is used in Finland and in other Scandinavian countries, various types of individual software are used in Germany, Italy and Portugal while

countries like Austria, Poland and Hungary rarely use virtual learning environments in their higher education institutions.

Dr. David Lord and Dr. Matthew Pearson from Huddersfield University (UK) as partners of a former international project (Lifelong Learning in Technical Teacher Training) initiated a project supported by their experience on virtual learning environments. In 2003 the project received foundation under the Leonardo scheme from EU. The title of this new project is Virtual Electronic Learning in Vocational Initial Teacher Training. The web-site of the project: www.banki.hu/velvitt. The project is co-ordinated by Bánki Donát Faculty of Budapest Polytechnic and experts from Finland, Greece, Holland, Hungary, Portugal and the UK form the consortium.

2 The pedagogical aspects of the electronic teaching-learning process

Electronic education, like education in general, takes place in order to achieve certain pre-defined objectives, the achievement of which results in the formation and development of students' knowledge that is of an adequate level and is achievement competent. The above mentioned educational objectives form a hierarchy, the description of which was carried out in the 50ies and 60ies by Bloom, B. S. [8] and his colleagues [9] in the three fields of personality development: cognitive, affective and psychomotory (taxonomy investigations). In order to acquire achievement competent knowledge, electronic learning may be realised at four levels of environment:

- through the acquisition of knowledge (facts, concepts, relations, regularities, procedures, etc.) that is dynamic and integrated into a system - type 1
- the application and practice of knowledge (acquisition of expertise and abilities) through students' interaction - type 2
- processing the syllabus requires the co-operation of students (student-teacher communication system - virtual classroom) - type 3
- processing the syllabus through group work, the combination of traditional classroom and electronic education - type 4

Comparing the above mentioned four types of learning environment with Bloom's cognitive object and achievement levels, the following electronic education system is to be specified (Fig. 1):

	type 1	type 2	type 3	type 4
Knowledge	Web pages; Web			Training as a combination of traditional and e-learning
Understanding	presentations; Electronic course books	Computer Based Training (CBT)		
Application			Virtual classroom; Electronic communication system – on-line	
Analysis				
Synthesis				
Evaluation				
pre-e-learning education		←————→		e-learning education

Fig. 1 The types of electronic educational systems

With respect to the operation of electronic educational system shells, three educational forms of e-learning are to be distinguished:

- training of individual timing (CBT)

The syllabus is stored on a LAN base server or on CD. Students are to decide themselves when and how much time they want to allot to syllabus processing. The syllabus is divided into smaller units, which can be processed in 20-25 minutes, therefore students' attention is ensured. The students' work is directed jointly by the structure of the syllabus and navigation opportunities, so they need to be easily manageable and logically structured. The easy processing of the syllabus is ensured by a varied set of media (animation, video, and simulation exercises beside the material contained in electronic course books). Before each syllabus module, the students' level of knowledge is tested to decide whether processing the particular syllabus is necessary or not. End of module testing is to show the success of knowledge acquisition. Testing is electronic.

- synchronous training (virtual classrooms)

Here, too, the syllabus is stored on a central server, however, its processing is fully directed and supervised by a teacher during the training. Students can

follow the syllabus on their own computer. Part of the system may be an electronic board as well, on which the teacher may write or draw, and which appears on the students' computer. Experiments and simulation exercises presented by the teacher appear at the students' workstation. Sophisticated communication support the system: live audio and video contact between the teacher and the students; e-mail contact, chat between the teacher and the students or among students. Testing may take place orally or in electronic form. The methods applied in the system are very similar to those of traditional education.

- asynchronous training

It is in fact none other than a variant of training with individual timing completed by electronic communication. Students may keep in touch with one another or the teacher through e-mail and/or electronic debates.

3 Changes in learning strategies

The organisation of information and planned interactions in IT based learning require new learning styles and strategies. Handling the information is part of the active participation in the teaching-learning process. IT enables autonomy in learning therefore learners take more responsibility for learning.

The noticeable change in the learning strategies is that there is a move from sequential to an organic structuring of learning. Previously teaching materials e.g. textbooks suggested a linear path for learning even if some tasks required repetition or survey.

There is some similarity in this area to the differences, which exist between verbal and visual presentation. Verbal communication is possible only in a sequential order while visual representation provides information simultaneously which contributes to a sudden insight into concepts or problems. [5]

Experience with teaching-learning programs has proved that these programs cannot replace teachers and face-to-face discussions are irreplaceable.

Computer networks allow for virtual presence from remote site, allow presenting course material in highly interactive form and allow presenting questions and get answers within minutes. Both the teacher and the learner can enjoy the privacy in their home environment. [2] Internet due to the World Wide Web provides cheap

and easy access to information sources of immense diversity. Interactivity is offered at a large scale and variety.

Most learning materials are obtainable in both electronic and paper-based form, including books and materials downloaded from web. Networked learning offers the opportunity to deliver training programmes in a flexible and learner-centred way.

4 The influence of the perception types on learning styles

One theory of learning strategies focuses on the role of perception in the e-learning based teaching-learning process. Various types of media have essential role in improving and applying electronic teaching materials, so we have to examine the influences of perception types on learning styles.

Learning in a structured educational setting may be thought of as a two-step process involving the reception and processing of information. In the first step, external information (observable through the senses) and internal information (arising introspectively) become available to learners, who select the material they will process and ignore the rest. The second step may involve simple memorization or inductive or deductive reasoning, reflection or action, and introspection or interaction with others. The outcome is that the material is either “learned” in one sense or another or not learned.

Felder, R. M. and Silverman, L. K. [10] studied the connection of learning styles and the teaching styles and defined a complex model. They establish a student who favours intuitive over sensory perception, e. g., would respond well to an instructor who emphasizes concepts (abstract content) rather than facts (concrete content). On the other hand a student who likes visual perception would be most comfortable with an instructor who applies images, pictures, charts, etc. Their model is based on Jung’s and Kolb’s complex theories.

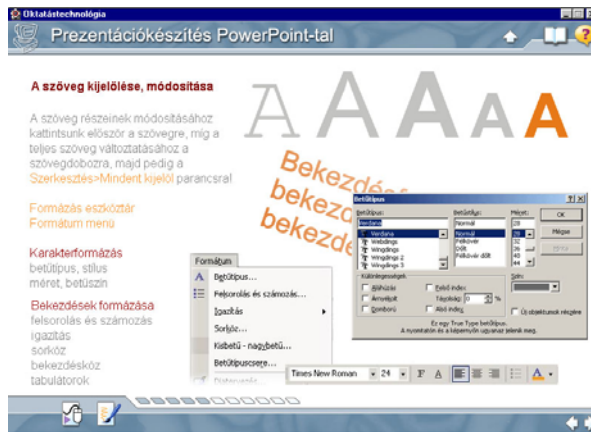
According to them it should be important to harmonize applied teaching methods with students’ learning styles. It is especially true in the case of electronic teaching material based learning environment, when there is no direct connection between students and teacher.

Learning styles (methods)	Teaching styles (methods)
perception sensory ↔ intuitive	content concrete ↔ abstract
input visual ↔ auditive	presentation visual ↔ verbal
organization inductive ↔ deductive	organization inductive ↔ deductive
processing active ↔ reflective	student participation active ↔ passive
understanding sequential ↔ global	perspective sequential ↔ global

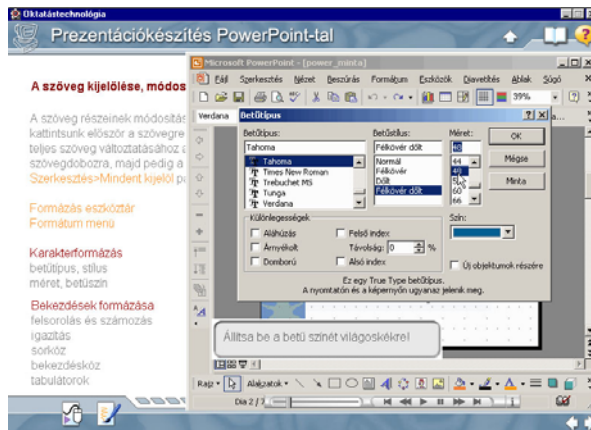
Fig. 2. Dimensions of learning and teaching styles

An extensive research proved that most people learn most efficiently with one of the three perceptive modalities (visual, auditory, kinaesthetic) and tend to miss or ignore information presented in either of the other two. Accordingly there are visual, auditory, and kinaesthetic learners. Visual learners remember best what they see: pictures, images, diagrams, flow charts, animations, videos. If something is simply said to them they will probably forget it. Auditory learners remember much of what they hear and more of what they hear and then say. They get a lot out of discussion, prefer verbal explanation to visual demonstration, and learn effectively by explaining things to others. [11]

Most learners are visual while most teaching is verbal, namely the information presented is predominantly auditory (lecturing) or a visual presentation of auditory information (words, symbols written in texts and handouts, on transparencies, on a chalkboard, or on a screen). In an electronic teaching-learning environment it would be very important that a learner could select the appropriate modality forms for him. Therefore the electronic teaching materials could content encoded information in different forms by which the learner can choose the adequate modality forms (Fig. 3). Second part of the figure shows a frame of digital animation, which demonstrates an operate of making presentation. the animation is developed by Macromedia Robodemo software. The developer can attach any verbal and/or written interpretations to animation and can place any interactive elements in this media type by which the students can guide their own learning process.



a.)



b.)

Fig. 3. A multimedia based electronic teaching material with different visual-auditive elements

As seen in Fig. 4 the learner may become active in the teaching-learning process by using interactive contents. The learner may give any input parameters of the process and after that he can analyze the output. Due to this analysis the learner will be capable of drawing conclusions from the results. This is an inductive component of the teaching-learning styles (methods).



Fig. 4. A multimedia based electronic teaching material with different interactive elements

5 Staff development

In the new type of teaching and learning process teachers can not control access to knowledge any more. This encourages and also forces a shift towards a facilitation role for teachers. This role includes not only the provision of the adequate virtual learning environment with learning materials, but also the offer of adequate learning methods.

The web itself is a great challenge for both the teachers and the learners. Since the majority of the schools are “revolutionary” regarding the general development of IT culture, teachers have to “go with the grain”. [4]

The speed and navigability in web is improving and the socialising function of the school entails the necessity to prepare the learners for the overall changes in the methods of communication. Since the learners will never have enough time to take all the thousands of entries within a program, teachers need to play an intermediating role suggesting bookmarks, strategies when it is necessary.

However flexible the learning programs are, the teachers also have an interpreting role if parts of items are not understandable for learners.

On the other hand there is an opportunity for teachers to shift balance of activities from laborious tasks to higher level tasks. It is inevitable that teachers “scaffold” the learning process.

The content of staff development includes the basic knowledge in virtual reality, the concept and features of virtual learning environments. During the course basic technical skills and methods for the use of virtual learning environments are developed. Learning new technologies by using them is the main concept of development.

The main stream for providing training on virtual learning environments is the continuing education of technical teachers including the staff of vocational education and training and the staff of training centres.

6 Review of local conditions

As P. Pentelényi and P. Tóth’s analysis [7] has shown, in Hungary there is no unified system of the application of virtual learning systems. Distance learning centres through which postgraduate training is organised often operate in-house developed VLE systems or hire known ones (Blackboard, WebCt, etc).

At present the Budapest Polytechnic is centrally operating its home developed “virtual -registrar’s department” (NEPTUN), also available on the Internet and set up for the support of the credit system introduced in Hungary last year. In the course of module enrolment the system makes access addresses available as module requirements. However, the running of these is only realisable after quitting the system. NEPTUN unifies administrative work at the Polytechnic.

As regards ICT supported learning, the following opportunities are utilised:

- In order to promote individual learning certain chapters of some of our modules (multimedia, education technology, methodologies, etc) have been processed in the form of electronic syllabus (HTML, multimedia).
- The syllabus of several modules (multimedia, methodologies, educational technology, etc) has been made ready for download in electronic form (doc, rtf, pdf).

- Module-related student assignments are submitted by upload on the FTP server.
- Student-teacher communication takes place in the form of electronic correspondence.
- Module-related mailing lists, ensuring the manifold exchange of information, have been also created.

7 Distance learning courses

The Bánki Donát Faculty of Budapest Polytechnic is one of the oldest engineering schools in Hungary. Due to the long traditions in engineering training the staff inherited a methodology culture from their predecessors. Multimedia laboratories for teacher training provide a sound basis for workshop based courses. A large range of study materials is used on the computer network for the courses. Electronic mail for tutorial support is being used in practice. New models of teaching and learning with IT are being examined.

Laboratory facilities and staff of technical teacher training institutions provide a firm foundation for implementing retraining courses. The content and methods have to be planned with great care to raise the motivation of participating teachers, who are adult learners and may have achieved high esteem in other professional areas. [6]

Educational planners need to be aware of the fact that new technologies have as much potential for wasting time and money as they have for inducing progress. Nevertheless, we also have to keep in mind that “we cannot afford not to go up this slope if everybody else goes up” as C. Padfield said in the Budapest meeting of the Working Group on Continuing Engineering Education. [3]

Many teachers (groups) suffer from a lack of access to training and development programmes and the increased delivery of training through networked learning will have a direct benefit to them. Networked learning offers the opportunity to deliver training programmes in a flexible and learner-centred way.

In 2003 the Institute for Engineering Education in Budapest Polytechnic introduced a four-term distance learning course for technical teachers by utilising virtual electronic learning.

The aims of the newly introduced distance learning framework are to investigate the effectiveness of using computer-mediated communication and promote the use of virtual learning environment. It is also important to increase the teachers' awareness of the advantages and limitations of virtual learning environments.

As regards curriculum development we had to identify modules suitable for adaptation for electronic delivery. The learning strategies are being observed by our staff.

Conclusions

The European collaboration provides an excellent opportunity to analyse research data gathered on the use of different virtual learning environments. Investigating the possibilities of virtual learning environment operation across different platforms contributes to making recommendations for future EU harmonisation regarding virtual learning environment usage. Virtual learning environments and networked learning will increasingly become key factors in the delivery of training and education in the 21st century.

Additionally there is a great potential to use networked learning environments to enhance world-wide dialogue in technical teacher retraining and add an international perspective to national programmes.

Technical teacher training institutions may have a driving role in the expansion of using virtual learning environments in higher education.

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