Resources for a Modern Society and Grants for Democracy. ICT in Technical Higher Education

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Abstract: The paper presents the Romanian expertise in ICT-based education in technical universities. It is emphasized that the master orientation of the entire Romanian society regarding the European values and standards has triggered the political decision made by the Romanian Ministry of Education and Research to implement the ICT-based Education Program. Using examples from the educational activity developed in the University Politehnica of Bucharest, the paper focuses on learning and teaching as processes which have always been closely related to technology. Discussing the fact that the introducing of ICT in education is a significant investment for the future, the paper shows the impact of the instructional strategies assisted by computer on the achievement of learning objectives.

Key–Words: teaching/learning methods, interactive feature, education-research-innovation, curricula, knowledge society, peer production, e-learning

1 Introduction

Teaching assisted by computer in a real academic laboratory raises several particular problems distinct from those connected with the general context of e-learning. First of all, the professor-class relationship, viewed from the cognitive and affective psychosocial perspective, must not be structurally deformed by an invasive virtual technique. Rather, the computer models are called to supplement the rich interaction between professor and class so that to optimize the transfer of knowledge and abilities. In this respect, it is important to address the points (mechanisms, experiments, concepts, etc.) which are difficult to explain in a classical manner (including verbal description, laboratory experiments and demos, thought experiments, etc.) but are prone to visual modeling. Lessons can be prerecorded/projected on to large screens, paused, rewound, played on iPods and downloaded from resource banks anywhere in the world. Is it conceivable that students will not have to rely on professors to direct them from the front of the class, provide content and mark work? The simple answer is yes, it is conceivable but perhaps not desirable. Someone has to control the class, lead discussions, create a safe learning environment and direct learning. Because of the rapid rate of technological development and the need for continual update of skills, training has become an ongoing process within the industry [2]. Computer educators must keep abreast of current developments and must be able to master new skills quickly. Depending on the level of responsibility and the particular job role involved, duties may also include:

- Assisting in the development of internal training programs in line with ongoing needs identified with management
- Conducting regular training sessions to ensure staff competence
- Maintaining up to date records of training activities
- Assisting in identifying performance problem areas and recommending various training methods and development to improve performance
- Developing course material, including visual materials, student handouts, training exercises, and reference material; and the assessment of students
- Taking overall responsibility for the customer training function
- Managing instruction and administrative staff
• Managing education budget for external training
• Developing training programs to meet customer needs and liaising closely with industry leaders
• Translating customer training needs into marketable training solutions

2 A Didactic Approach

The didactic approach stems from the conception that the introduction of technology can lead to the introduction of new didactic or teaching/learning methods. Active, research-oriented methods of teaching/learning are almost always mentioned in this context. Thus it makes another conceptual step beyond the curricular approach since it does not conceive of ICT as a neutral tool in the service of the new ICT subject or of the prevailing subject matters (which it takes to be unchanged). The didactic conception claims to the impossibility or undesirability of such situation. It points to the inevitable or desirable change ICT is bound to, or should, bring about in the teaching/learning of the subject matters. It almost always still presupposes the prevailing disciplinary curriculum (with frequent allusions to problem-based interdisciplinary orientation). This approach characterizes the conception of ICT and education held by most academics and many experts and teachers [1].

The Romanian technical education pays full attention to the innovative use of ICT as a support learning. It also implies the active involvement of the research community and it will aim at influencing the regional and local policy makers.

In this paper we refer in more detail to the initiatives taken by the University Politehnica of Bucharest in the field of ICT and the interactive feature of the education content manifested by the efficiency of the learning process, by increasing students’ ability to acquire new skills.

The University Politehnica of Bucharest (UPB), founded in 1886, is the largest technical university in Romania, with more than 22000 students, 4500 full-time staff (2000 full-time faculty and 2300 research staff and auxiliary personnel) and 1800 part-time staff. The UPB has 13 faculties five of Mechanical Engineering, three of Electrical Engineering one of Power Engineering, one of Metallurgy and Materials Science, one of Chemistry, the Faculty of Engineering Sciences – with all the courses in modern European languages (English, French and German) and a Faculty of Applied Sciences.

The undergraduate curriculum leads to an Engineer Diploma. At the end of the first cycle, the graduates have to defend their final Diploma projects (half year for preparing) and to pass a License examination. A second cycle, consisting of two years of study and a Master degree thesis, leads to the Master of Science title. The studies can be continued with the preparation of a doctoral thesis in Engineering Sciences (900 Ph.D. students in 90 specialties).

The research activity takes place both in the chairs of the faculties and in research centres, working on long term contracts in all the fields of expertise of the departments.

3 A Centre for Advanced Technologies

Research and application of ICT at the University Politehnica of Bucharest aims to propose solutions to the changing role of teachers and trainers in the education systems, through recognition and accreditation of non-formal and informal learning by creating an integrated European system of identifying, assessing and recognizing vocational competence-based qualifications. This role is fulfilled by CTANM. The Centre for Advanced Technologies (CTANM) is a research and training unit of the University Politehnica of Bucharest founded for continuing and developing the achievements on a three years TEMPUS project ended in 1997.

Founded in 1996, CTANM has financial and functional autonomy inside University Politehnica of Bucharest and is acting inside the Faculty of Engineering and Management of Technological Systems, the Manufacturing Engineering Department and with close links with over 10 other departments from University Politehnica of Bucharest. CTANMs funding is realized exclusively from research and training contracts. The highest part of the CTANM financing is realized through participation in Joint European Projects (over 30 projects).

Some of the CTANM partners are as follows: Renault-Dacia Group, Schneider Electric, Parisot Group, Ministry of Education, Turbomecanica, Research Institute in Machine Building, Romanian Society for Quality Assurance, National Institute in Informatics, National Research Institute in Metallurgy, National Research Institute in Electrotechnics. CTANM represent the Bucharest Region in the European network SAIL-Strengthening Academic & Industrial Links which is funded by the European Commission. The areas of expertise developed by CTANM within the European Projects are as follows:

• Management of European Projects
• Knowledge triangle education-research-innovation
- Development of partnerships with enterprises
- Graduate and post-graduate training courses
- Training programs and courses specially designed on customer demand
- Development of training programs based on tutoring and coaching
- Modernization of curricula with innovative learning contents
- European Credit Transfer System (ECTS) and recognition of degrees
- Training of non-university teachers
- Training courses for public services (ministries, regional/local authorities)
- Strategy of Total Quality Management in Education Organizations
- Quality and technological audit of the SMEs
- Project Management
- Incubator Schemes; Knowledge Transfer; Technology Transfer and Research and Development
- Cooperation with Romanian enterprises including SME’s (to bring Romanian SME’s in partnership or to disseminate the results of projects in Romanian SME’s)
- Dissemination of European projects and translation of teaching materials in Romania
- Creation of WEB pages and CD Rom’s
- Development of multimedia educational software
- Open and distance learning
- Regional development
- Sectorial development
- Development of international relations
- Introduction of the three-cycle system

**The thematic area of expertise includes:**

- Industrial Logistic and Supply Chain Management
- Total quality Management
- ISO 9001-2000
- Autoquality and autocontrol
- Data acquisition and analysis, process monitoring and control
- Modelling and simulation
- Tribology- Surface Engineering
- Technology of new materials products
- Development of a new modularized courses in Quality Methodology in five Romanian partner universities, in order to promote, disseminate and encourage the application of quality assurance and management in Romanian industry.
- Development of a Restructuring Programme for Polytechnic Higher Education, in order to achieve its integration into EU systems.
- Development of a National Network of university departments between 15 participating Romanian Universities for cooperation with enterprises and organizations, in view to improve and further develop the practical training of students, continuing education capacities and technological cooperation
- The Correlation Strategy of the Tempus and Leonardo da Vinci Programs in University-Enterprise Cooperation and Development of Necessary Structures
- Network of Leading Centers of Continuing Education for Industry
- Development of Continuing Training Center for Romanian Prosecutors on the fights against new forms of criminality
4 Context and Resources

Context and resources are important dimensions for all these e-learning programmes. The entire educational endeavour greatly depends on the way in which content is presented, a condition for efficient perceptive-visual learning. Therefore the design of support materials for e-learning is an important element when calibrating the formative value of the educational message.

Elements regarding the visual and pedagogical design of learning materials in the digital environment are as important as the focus on content design principles such as page layout, visual arrangements, use of illustrations and colours. In order to develop effective e-learning, the conversion of educational resources into e-content should be carried out following generally agreed rules [7]. To assimilate and interpret the (mainly) visual content, learners in technology-based environments develop a series of psychological processes such as visual perception, attention, understanding, motivation, memory, thinking and conscience. In order to provide a significant learning situation, effective design must rely on several basic principles aiming to support the participants confidence and comfort, but mostly their learning performance. Pedagogical design requires decisions on specific procedures and rules in every step of the process, from the choice of the learning objectives to the choice of the assessment strategies [4].

The basic visual and pedagogical design ideas presented in this article are meant to constitute a support for further reflection and an invitation to reconsider, expand and empirically validate the theoretical foundation of e-learning, especially concerning a very much evoked and a less clarified issue: how digital resources and new web tools improve the quality of learning.

This paper reports on the experiences of the first large scale effort to share educational resources for University Politehnica of Bucharest. Thus it does not address authoring or the use of learning resources, but provides experiences of interest to any organization wishing to act as an educational content broker, matching supply with demand. Even though there are many educational resource repositories, they are many times inaccessible to teachers due to a number of reasons, such as not knowing about their existence, the different ways of describing the content, etc. In order to overcome these difficulties, at academic level, in Romania, a series of programs bring together educational content from trusted providers from all over Europe and makes it available again to interested parties. This requires the implementation of a number of technical solutions. Here are some initiatives, programs and operational projects in Romania:


- The project ICVL (2006, www.icvl.eu) International Conference on Virtual Learning News Technologies in Education and Research, supported by the University of Bucharest and NASR (National Authority for Scientific Research), Siveco Romania and Intel Corporation;

- The Portal e-learning.Romania (2006 www.elearning.ro) - educational resources platform, initiative of TECHNE (Center for Development and Innovation in Education);

- The project eLSE (2005, http://adl.unap.ro) International Scientific Conference eLearning and Software for Education, supported by the National Defence University Carol I, Bucharest;

- The project CNIV (2003, www.cniv.ro) - Virtual Learning Conference Promotion of Modern Technologies in Education and Research, supported by the University of Bucharest and NASR (National Authority for Scientific Research), Siveco Romania and Intel Corporation;


- The Program / Portal SEI (2001 www.portal.edu.ro) – Computerized Educational System coordinated by Ministry of Education, Research and Innovation (MECI) and Siveco Romania.
5 Promotion of Modern Technologies in Education and Research

Implementation and use of modern technologies in education and research requires mobilization and support of various initiatives, programs and projects of public institutions, professional organizations or eLearning professionals, researchers and university teachers, inspectors, advisers, psychologists and students. Thus, after 2000, when technologies Web 2.0 and Learning 2.0 expanded and developed, new programs and projects were developed. These programs and projects were related to:

- development and training strategies,
- projects management,
- working in teams,
- implementation methodology

Also, the initiators had to promote and integrate new technologies in education and training. Romanian educational system should be adapted to new requirements and challenges which have been imposed by the building of the knowledge society according to the European Strategy Training in Knowledge Society [5]. By implementing and using ICT for education and training, teachers have obtained deeper insights in searching and browsing, finding the offered learning resources useful for the classroom and appreciating the cross-linguistic and cross-border use of content. The concept of peer production was also considered as an important opportunity for cultural exchange and a way to broaden horizons in terms of getting new ideas for teaching from other countries. Peer production and user-created content is becoming an important element in modern e-learning, supported by the development of the Internet from a one-way information distribution channel to a two-way communication channel. Peer production, the term coined by professor Yochai Benkler (Harward Law School) describes a new model of economic production in which the creative energy of large numbers of people is coordinated (usually with the aid of the Internet) into large, meaningful projects mostly without traditional hierarchical organization. In the peer production of e-learning content, the essential feature is that the learners are also acting as creators of the content and that the separation between an author and a consumer is blurred. In practice, learners are no longer purely consumers but they actively participate in the learning process and thus influence it. This fundamental feature is also imposing a different view on quality. Peer production is not only a new method to produce e-learning content, but it is also an approach to empower a wide variety of professionals to the learning content production. However, the quality management challenge related to this kind of content can undermine the merits of the method. A number of useful tools and approaches are currently being applied in academic education to ensure and improve the quality of peer produced e-learning content.

Regarding the recent Romanian achievements of technical education I should mention the activity of TEHNE - Center for Development and Innovation in Education Bucharest - Romania. It is a non-profit organization, aiming to support educational initiatives through projects and programs covering areas of non-formal education, formal curriculum development, education for democratic citizenship, education through ICTs, e-learning, lifelong learning, and in-service teacher training. As a non-governmental organization, without political purposes, TEHNE promotes the European principles and values in the field of education through innovative approaches and technologies. High-level experience of TEHNE is reflected by the partnerships with different types of institutions - governmental, non-governmental, private and public. TEHNE is a member of SEE-ECN, supporting the network in local research and projects. SEE ECN (South East Europe Education Cooperation Network) is developed by the Centre for Educational Policy Studies (Slovenia) and KulturKontakt (Austria), within the framework of the Stability Pact for South-East Europe. The project is developing systematic on-line presentations of educational systems in the countries of South East Europe in comparison with the systems of other, mainly European countries. Thus, the project is improving access to information on main changes in the educational systems of particular countries. It improves access to research, legislation, documents, information sets etc. and it presents individual experts and institutions. All the data and information are available on the web and are gradually provided in languages of the region covered by the project. TEHNE is a partner of EULLearN (European University Lifelong Learning Network) a Socrates Erasmus Thematic Network aimed at identifying coherent strategies and practical measures to foster university lifelong learning. This Thematic Network supports the exchange of good practices and experiences and the identification of common problems, ideas and priorities. TEHNE is a member of European Foundation for Quality in e-learning, an initiative of European Commission funded by the Triangle project, aiming to enhance the quality of e-learning and ICT in education programs in Europe. TEHNE is the initiator and an active member of e-learning Romanian program, a national initiative aiming to gather
all the stakeholders in the area of using ICT for education and training. The examples I have given in this article are important approaches in assuring the quality of peer-produced e-learning content. The fundamental finding in educational work developed at the University Politehnica of Bucharest is that quality is the result of the interplay between peer production of digital content and peer validation processes of digital content. Overall, the key issue in these projects is to develop a holistic approach to the peer production, which enables the effective utilization of this unique method of content creation. Online databases with educational resources for the needs of academic education demand an objective evaluation of the information provided, the raw material of knowledge, the basis of an exploratory understanding of the world by the students. Resource evaluation is thus vital in the development process of such databases in order to serve as high-quality repositories of learning material for teachers and students [6]. Within this framework, the research projects carried out at the University Politehnica of Bucharest has established an extended list of criteria for the evaluation of educational resources on the web.

6 Conclusion

The projects developed in Romanian technical universities are the measure for the added value in quality assurance and for the contribution to innovative formal and non-formal education practice. Promoting, supporting and monitoring the implementation of the ICT in education and training, with a focus on e-learning and computer assisted instruction represent programmatic missions to sustain the activities and projects developed in these universities. The plan for the next two years includes two strategic intervention paths: dissemination and mainstreaming the results obtained so far in the projects developed and lobbying for specific education policies. At the same time, the activities in universities will be continued and ways will be found to multiply and scale the successful grass-root level actions. Main methods used are oriented towards direct intervention for the selected target groups: development of new curriculum and teaching and learning methods/tools, design of extra-curricular activities and other attainment incentives, design and delivery of training programs for main actors involved at academic level - teachers, mediators, school management, design and implementation of specific network building at local and national level [3]. The projects aim to support the development of student participation mechanisms and structures at academic level and to offer students real opportunities to exercise the democratic participation. It also aims to enhance the technical learning transformation towards a democratic learning environment with a participative management, flexible curriculum offers, and a modern, democratic organizational culture, based on fundamental principles of democracy and human rights. E-learning Romanian projects also aim to raise the quality and the efficiency of the computer-assisted education area, through offering theoretical support, through best practices and significant local e-learning experiences dissemination, through continuous informing regarding the events and the relevant announcements, through promotion of the best solutions, systems and services for e-learning.

References: