

STUDY ON THE PROGRESS OF LEARNING STRATEGY IN EDUCATION AS RESULT OF NEW CONCEPTS DEVELOPED BY EUROPEAN PROJECTS

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Abstract: ICT-based learning resources include interactive simulations from CD-ROMS, intranet or internet-based resources including reference databases. Learning support can be provided by using interactive computer-aided learning and various applications software (e.g. spreadsheets, statistical or textual analysis, CAD, 3-D modeling, multimedia etc. Assessments can be carried out by intranet or internet-based tests with electronic marking and feedbacks. The paper is based on experiments and results in training of human resources made through EU projects such as: “FISTE - A Future Way for In-Service Teacher Training across Europe” (Project no. 118766-CP-1-2004-1-RO-COMENIUS-C21) and “VccSSe - Virtual Community Collaborating Space for Science Education” (Project no. 128989-CP-1-2006-1-RO-COMENIUS-C21). “MENUET - Mobile E-Novative Use of E-learning Technologies” the Leonardo da Vinci project (Project no. LLP-2008-1-RO1-LEO05-00813). “CIFRU” – Development of careers in Education through Human Resources Training” (Project POSDRU ID 6508)

Keywords ICT –based learning resources e-Learning; on-line courses; learning objects; teacher training

INTRODUCTION

It is obvious that the domain of Sciences is powerfully based on experiences, observations and experimentally applications. In reality it's not recommended to elaborate principles or specific laws without a clear realistic confirmation, process which can take sometimes many years. In this case the theoretical support has a great importance; its consequences must be checked only through remarks or experiments. These two demands are crucial in scientific investigations in all the Science areas.

At the present time scientific subjects are presented as helpfulness concepts to students of different ages and different backgrounds, trained with different degrees of simplification. The curricula provide also special laboratories for remarks or experimentation. One could admit that, like in the scientific research, the experimental area plays an essential role, being absolutely necessary in the teaching of Science areas, in spite of the degree of strictness.

There is no doubt that scientific experiments could be presented as simulations through specific software applications. Thus, the students have the possibility to start again and to repeat the simulated experiments. Teachers can include the simulations in their lessons but they can also use educational video-clips for the presentation of different correlated experiments. In fact, the educational video-clips became a real help in Mathematics, Physics, Chemistry and Natural Sciences lessons for a better understanding of real experiments.

Many educational video-clips or virtual experiments have been designed in various European projects. There are a series of web-sites which present learning objects designed by the teachers who attended specific courses organized in the frame of European projects. Many courses were organized as on-line courses using an e-learning platform. This is the case of two distant courses held in the frame of three European projects: “FISTE - A Future Way for In-Service Teacher Training across Europe” (<http://fiste.ssai.valahia.ro>), “VccSSe - Virtual Community Collaborating

Space for Science Education” (<http://vccsse.ssai.valahia.ro>), both of them coordinated by Valahia University Targoviste, Romania, and “MENUET - Mobile E-Novative Use of E-learning Technologies”, coordinated by Politehnica University of Bucharest, CIFRU” –Development of careers in Education through Human Resources Training” (Project POSDRU ID 6508).

THE FISTE PROJECT

The overall aim of the *FISTE* project (2004-2007) was focusing on finding new ways of how to teach in-service teachers in their long-life training programs and how the teachers themselves can learn and upgrade their knowledge and teaching methods by using ICT. The attainment of this aim involved the achieving of the following specific sub-objectives: to develop methods for integrating ICT tools with the face-to-face learning methods in the teachers’ daily work, to apply methods for teaching in various learning environments (*cooperative platform, virtual reality environment, videoconference environment*), to improve in-service teachers’ using and understanding of ICT to support their own work in meaningful ways, to develop the European cooperation and awareness, to improve the research base of knowledge about how to integrate face-to-face learning with web-based learning in European initial and in-service teacher education, to disseminate the results of the project at local, national and European level.

245 initial and in-service teachers from the partner countries (Romania, Spain, Finland, Iceland and Latvia) were enrolled in the on-line course “*Integrating ICT in Traditional Training*” and trained on acquiring knowledge and methods for integrating face-to-face and web-based learning tools. They shared the knowledge using the constructivism concept and collaborated through an e-learning cooperative platform (*BSCW*), equipped with built-in functionalities (discussions, documents and courses materials sharing options).

Each trained teacher prepared at the end of the course a learning object which contains a lesson plan and an educational video-clip. The products are gathered in an *Outcomes Table* and uploaded in the project web-page.

THE VccSSe PROJECT

The three years *VccSSe* project (2006-2009) has as declared objective to adapt, develop, test, implement and disseminate training modules, teaching methodologies and pedagogical strategies based on the use of *Virtual Instruments*, with the view to their implementation in the classroom, through ICT tools.

A number of 363 teachers from Romania, Spain, Poland, Finland and Greece were enrolled in the training modules “*Virtual Instrumentation in Science Education*” and worked inside the *Moodle* e-learning platform. At the end of the modules, the in-service teachers were asked to choose one of the presented software environments (*Cabri Geometry II Plus, Crocodile Clips, LabView* and *GeoGebra*) and create at least one learning object that has to include a *VI* application. Their lesson plans - designed under a specific *Template* - proposed explanations on the concepts to be learnt and also promoted a *VI* experiment for students with a significant level of interaction.

206 teachers finalized the training sessions and prepared the learning objects which were uploaded in a database entitled *VccSSe Products Matrix*. The Matrix is accessible from the project website and its content is available to any project website visitor.

In addition, a *Virtual Experiments Exhibition* was set up with the best virtual experiments produced by the in-service teachers who finalized the training modules. 50 experiments were selected and presented as educational video-files, assuring a clear representation of Mathematics, Physics and Chemistry categories, together with 9 *On-line / Remote Simulating Laboratories* (produced by the project partnership) that allows teachers and students to work directly inside the experiment.

The video-clips were designed with the view to present details concerning the pedagogical use of virtual experiments in the classrooms. Some of them emphasize on the designing of the experiment and other part describes the experiment itself and how it can be used with the students.

The experience gained in the *VccSse* project was synthesized in the *Guidelines for Best Practices in Educational Use of Virtual Instrumentation* that was designed in order to offer to the teachers an instrument that assists them during the implementation of the virtual experiments in the classrooms, available also in the project web-page.

THE MENUET PROJECT

The aim of this EU Leonardo da Vinci project, called *MENUET* (2008-2010), coordinated by *Politehnica* University of Bucharest, is to develop art and skills for teaching in the m-Learning era. In the actual context of *knowledge-based society*, the project is focused on the study of relevant didactical concepts and methodologies developed in the field of *mobile learning* and intends so that to offer a strong support for the dissemination of best practices in the use of ICT in environmental protection for sustainable development, with the accent on *mobile technologies in ODL*. The use of E-Learning Technologies throughout educational systems will bring about a major revolution in teaching world-wide. It is now possible to transmit files throughout the Internet containing all the elements of multimedia: video, animation, text, graphics, stereo sound and computer software. In this context the partners involved in this project have been prepared comprehensive guidelines in order to provide a logical framework for promoting and coordinating new m-learning practices adapted to the needs of learners and teachers. The project intends to gather innovative solutions in the field of e-learning environment by making use of advanced multimedia content such as audio/video interactive content, video conferencing, web-based communication and learning tools (*e-mail, forums, blogs, LMS and discussion groups*)

THE CIFRU PROJECT

The *CIFRU* Project is willing to create a complex system of information, training, promotion and support for training teachers focusing on providing quality education and key IT competences. The main idea is to offer to professors the possibility to create and apply in schools virtual interactive lessons, able to support effective teaching speech, including communication facilities on the Internet. Through such virtual lessons on physics, chemistry, natural sciences or mathematics many phenomena that are difficult to study or understand by traditional means or impossible to reproduce in a school laboratory can be presented through simulations and can be better explained to students.

RESULTS AND DISCUSSIONS

When developing learning objects for Science Education (especially in case of distance education), it has to be taken into consideration an important experience, because the work input for designing an educational video-clip or a virtual experiment is relative big. More, the selection of the proper software (easy to manage and design the experiment, easy to be manipulating by the user) is very important.

But, educational video-clips could be created using special movie maker software application. As example, the participants in the on-line course "*Integrating ICT in Traditional Training*" used *Camtasia Studio* as environment, a software application which introduces to the teachers the techniques of screen recording and video editing, by producing a video for the web or other media. Figure 1 illustrates two snapshots captured from the video-clip "*Expansion of Liquids*" designed for the same subject Physics lesson (author: Prof. Liliana Borcea, Coresi School Targoviste).

An example of designing of a virtual experiment is offered by the using of *Crocodile Clips* (*Crocodile Chemistry*) software, an application that allows simulating a chemistry laboratory where experiments and reactions can be modeled safely and easily. In this sense, 4 teachers from

Dâmbovița County, who achieved the Training Modules “*Virtual Instrumentation in Science Education*” designed several virtual experiments adapted to the Chemistry curricula scheduled for Romanian lower and upper secondary school.

Figure 2 illustrates scenes of the virtual experiment “*The Electrolysis - A Method for Obtaining of Chemical Compounds, Metals and Nonmetals*” dedicated to the presenting of the electrolysis phenomena (author: Prof. Alexandra Gabriela Marinescu, *Ion Luca Caragiale* High school of Moreni).

Even the virtual experiments are more used in higher education some real experiments are not available in student laboratories due to the higher costs of instruments or their difficult maintenance. That is the reason for taking into consideration the remote laboratories which can be available via Internet. A characteristic of the remote laboratories is that they are based on the set of the real computer controlled experiments or simulated experiments that can be accessed and controlled externally through some communication medium, the Internet being the most used environment. As example, a Physics lesson for studying the “*Functioning Simulation of Series RLC Circuit*” (developed with *LabVIEW*) can easy appeal a remote laboratory where a virtual experimental environment for presenting the Series RLC Circuit is built (figure 3 - author: Prof. Gabriel State, *Ienăchiță Văcărescu* National College Târgoviște).

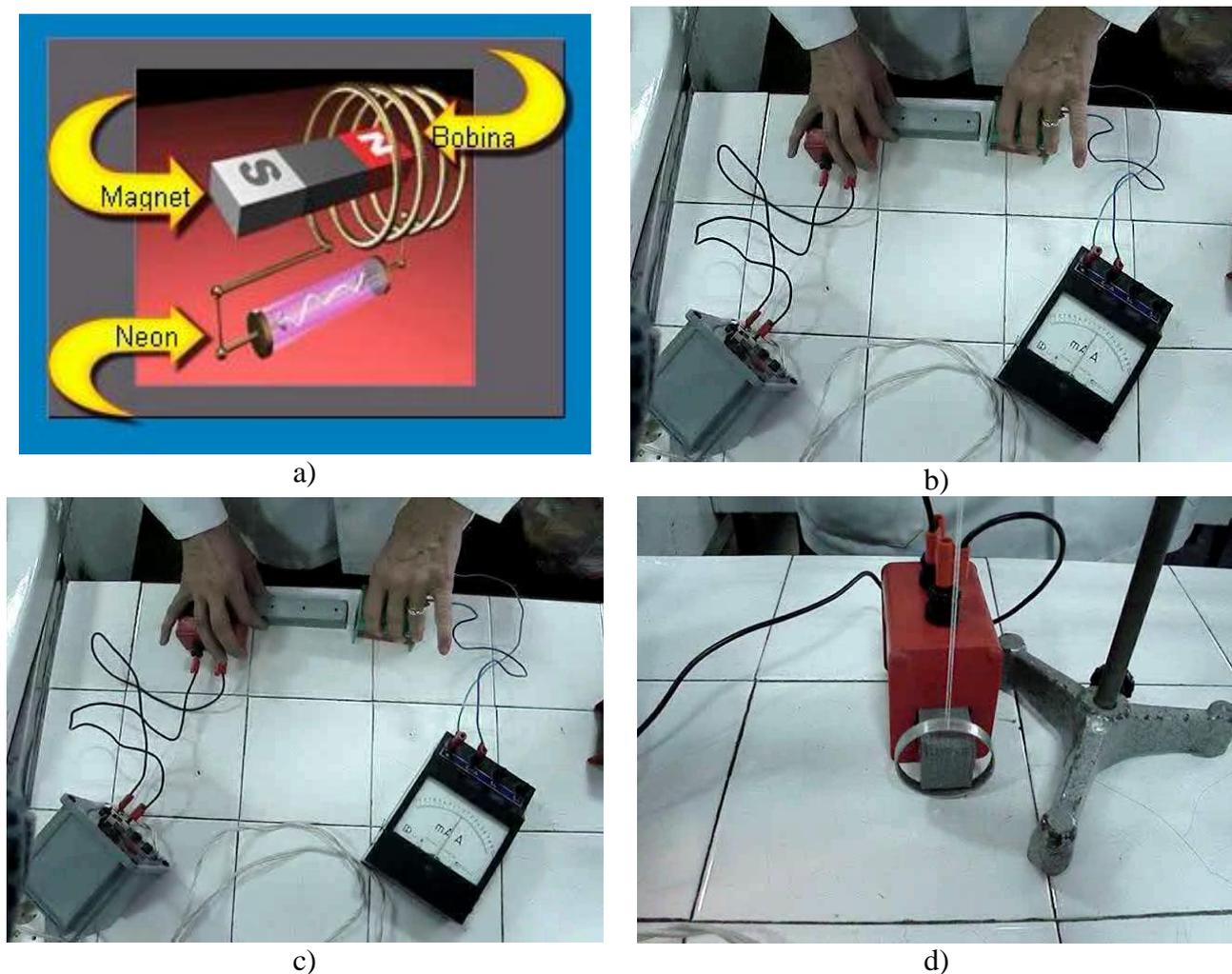
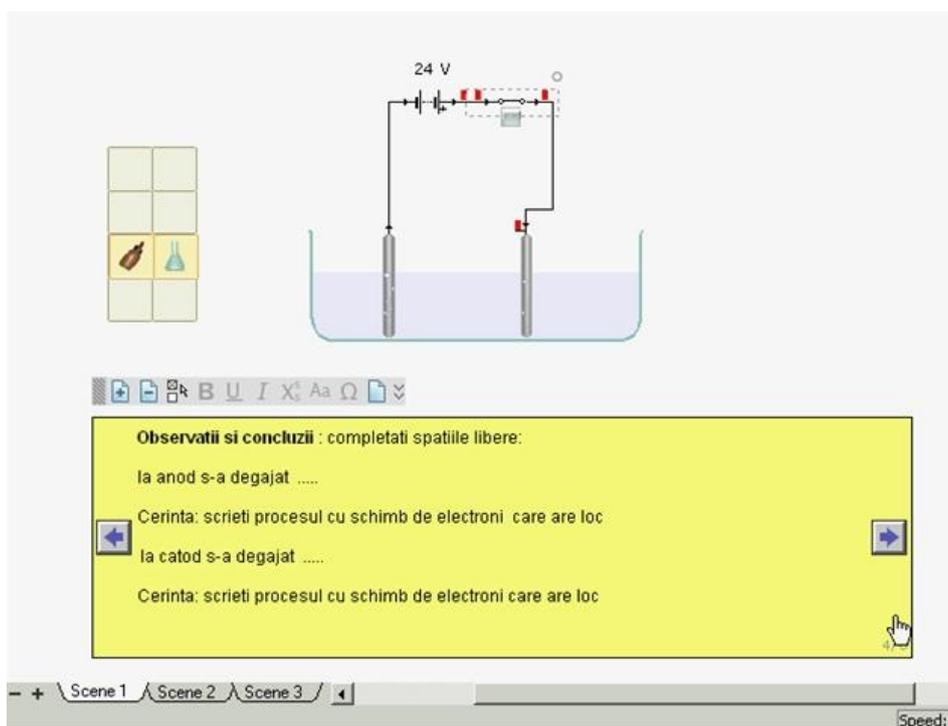
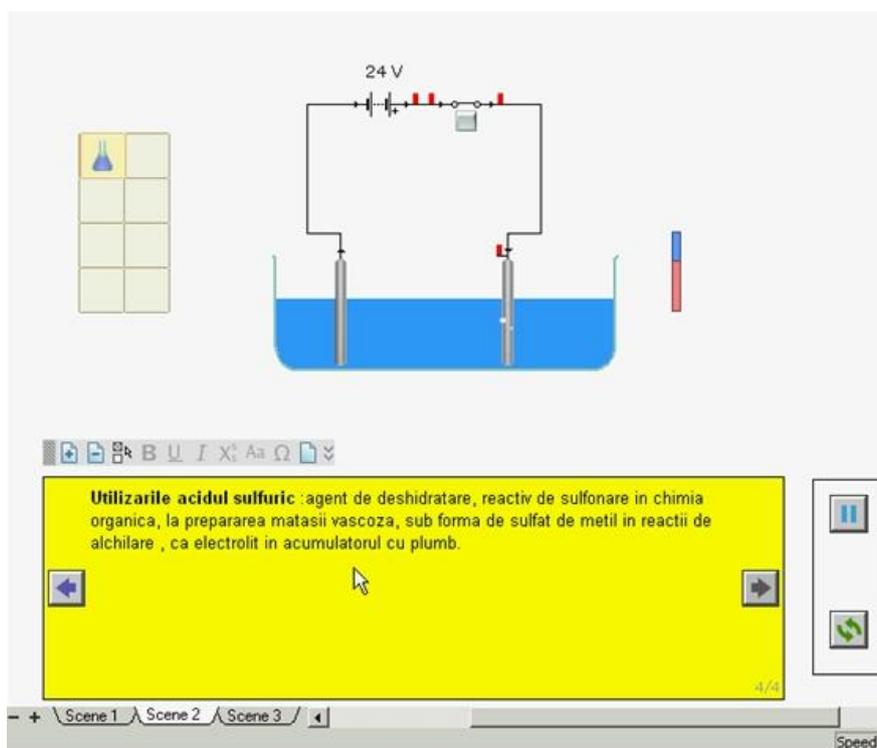


Fig. 1 Snapshots from the video-clip “*Electromagnetic Induction*”



a)



b)

Fig. 2 Snapshots from the designed virtual experiment “*The Electrolysis - A Method for Obtaining of Chemical Compounds, Metals and Nonmetals*”

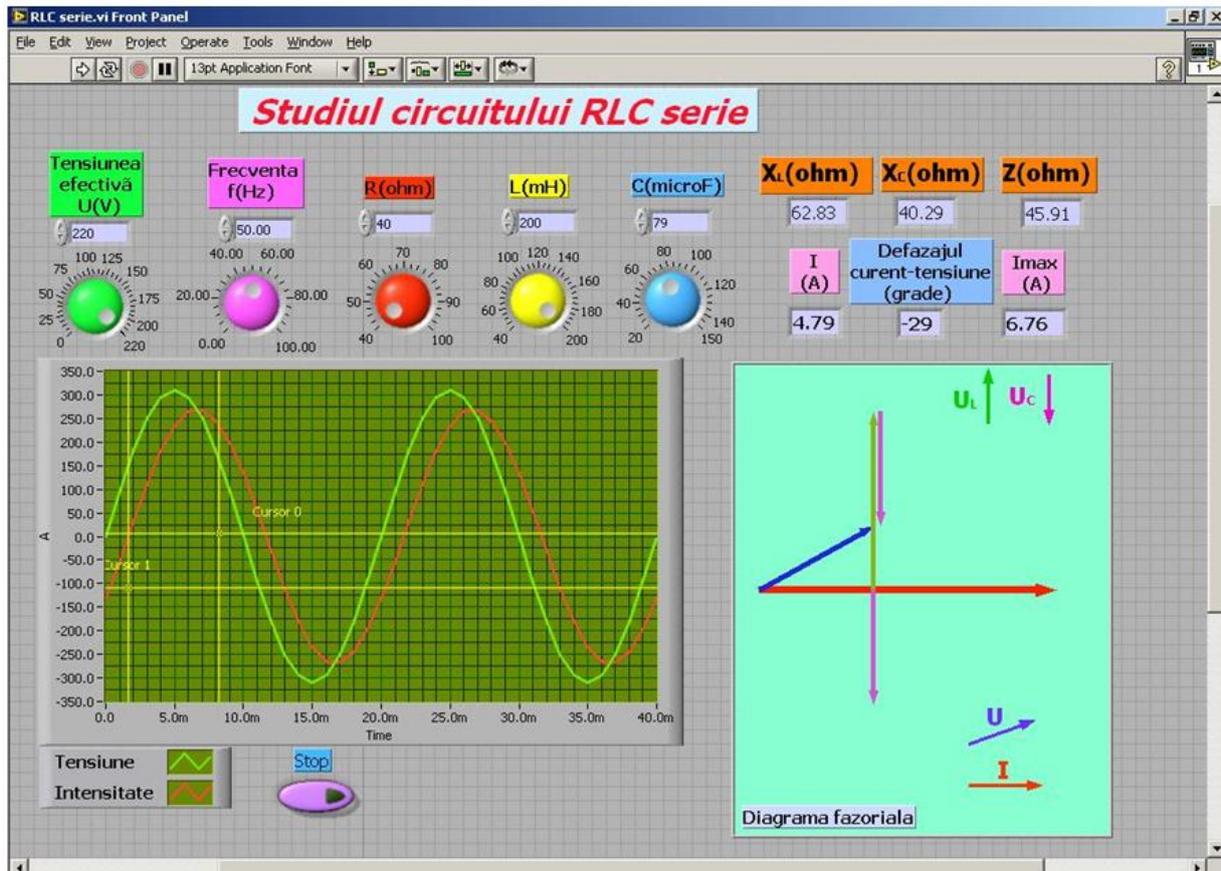


Fig. 3 Snapshot of the front panel of the *Functioning Simulation of Series RLC Circuit* experiment

CONCLUSIONS

Instructive and didactic video-clips and virtual / remote experiments stand for a good option in favor of Distant Learning especially for understanding the fundamental of scientific objects such as Mathematics, Physics, Chemistry and Natural Sciences as well as for providing the possibility to carry out the experiment in some cases. However, the role of the teacher / trainer / tutor remains as a key factor due to the importance to imagine and design the logical succession of the experiment steps in order to guarantee an easier understanding of the scientific processes at a micro scale (laws, chemical reactions, interaction between phenomena etc.). Thus, for Sciences of Education, it is obvious to conclude that beside the presented methods of training, the traditional experimental methods still offer a deeper understanding of experiments on one side and a permanent communication between teacher and students on the other side. It is however to recall that teacher in fact represents the most agreed solution offered actually by the educational decision makers.

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