

## Aspects Related to the Usefulness of a Distance Training Course Having Moodle as Course Management System Support

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**Abstract:** - The citizens benefit of technological progress in an equitable and non-discriminatory way in the Knowledge Society. Being part of the long-term governmental strategy, the permanent upgrading of the access to information and expanding of the Internet represent the main pillars of the actions developed in the field of education. In this direction, the implementation of ICT in the teaching process led to the change of the educational perspectives and instruments. As example, the concept of e-learning brings together modern methods of interaction by using ICTs.

Many educational projects have promoted and introduced e-learning as an alternative to traditional education. Even for teachers, the on-line training programs represent a good option to increase their knowledge in their related areas. In this respect, the European Socrates Comenius 2.1 Project “VccSSe - Virtual Community Collaborating Space for Science Education” (128989-CP-1-2006-1-RO-COMENIUS-C21) promoted the use of virtual instrumentation and experiments as new teaching methods for the Mathematics and Science teachers. As the training sessions were developed under the Moodle course management system, this paper presents some aspects related to the training process made in the frame of the project and other considerations regarding the usefulness of the distance course, taking into consideration the participants’ opinions.

**Key-Words:** - E-learning, training modules, virtual experiment, Moodle, Comenius 2.1 project

### 1 Introduction

The *Virtual Learning (e-learning)* is represented by the interaction between the teaching / learning process and Information and Communication Technologies - *ICT*. Electronic educational materials have become a real reference and imaging presentation for preparing the lessons or solving the tasks and the teachers can benefit of training especially oriented on *ICT*. Worldwide, there are more and more educational institutions operating exclusively through the Internet, offering either a full cycle of education or specialized courses addressed to a very large range of users [1].

The traditional training claims a prerogative for the direct dialogue between teachers and students, which creates an optimal framework for modeling the personality, more obvious to maintain the spirit of competition, but also the necessary psychological support [9]. Without claiming exclusivity, the virtual education offers new opportunities for training and communication and it becomes very popular more and more.

### 2 The Educational Web Environment

The educational Web environments (*Web-Base Course Environment - WBCE*) represent complex didactic systems, having also a special platform for Web learning. Some institutions design their own educational Web environment, but in general, a well-known e-learning platform is adopted (*Blackboard, Lotus, WebCT* etc.). In many cases, the platform is used not only in the area of distance education, but also for daily courses. In this sense, it can be said that Internet became a support for the educational process in any field [2].

An institution that proposes an educational Web environment is active on multiple plans in the virtual education area: it organizes courses for different levels, develops an educational support (programs, courses, materials, counseling, examination or assessment) for other similar institutions, and participates in consortia or partnerships with other academic organizations. Near the teachers of different specializations who have the mission of training the students, a team consisted on psychopedagogy and *ICT* specialists supervise all the training materials prepared by the above-mentioned

teachers, following the requirements claimed by the functionality and human-computer interaction in the World-Wide Web space [5, 7].

An e-learning site offers support for organizing of an education system solely through the Internet, having a specific structure and complex functionalities. As a compulsory aspect, it should include a public area, generally accessible having an informative character, and also private section for students, teachers and administrative staff.

The section accessible to a student (after authentication) includes [1]:

- accessing the appropriate information related to the courses in which is enrolled;
- offering facilities for viewing and making the tasks, including on-line support;
- browsing the on-line announcements related to the courses;
- managing a calendar for marking the own activities (meetings with teachers / other students, deadlines for different tasks);
- managing own directories or files, e-mail account, personal profile.

The section related to a particular course should be accessible only to enrolled students and teaching staff (course owner, teaching assistants, content editors etc.). Its content includes [1]:

- presentation of the curriculum;
- information about the agenda of the course and other related educational activities (seminars, labs etc.);
- information for students or groups of learners;
- possibilities for accessing the training materials and resources (textbooks, software tools, Web sites etc.);
- facilities for communication between teachers and learners using synchronous and asynchronous channels.

News and other important information, like the deadlines for solving the tasks or the date for examinations, can be automatically included in the homepage of each student.

The private section of a teacher involved in educational activities should include facilities for [1]:

- on-line editing of teaching materials (courses, tests, laboratory tasks etc.);
- adding / removing of students from the course;
- uploading of general announcements or particular information related to the course;
- establishing the calendar for the course, seminars and laboratories;
- setting the work themes / tasks (editing the information on minimal requirements, scores, ways of achieving, additional resources etc.);

- planning the schedule for virtual lectures or videoconferences;
- indicating of useful resources for fulfilling the course (references, web documentation);
- managing the examinations;
- managing the on-line catalogue;
- generating the related numerical or graphic statistics.

The e-learning platform can be installed and use as a suitable tool in the frame of educational projects. In the last years, various projects targeted to develop training courses were using educational web environments having the structure (sections) presented above.

### 3 The VccSSe Project

“VccSSe - Virtual Community Collaborating Space for Science Education” (<http://vccsse.ssai.valahia.ro>) is a three years Socrates Comenius 2.1 European Project, which started in 2006, being proposed in the European context offered by the contribution of teacher education and training to the Lisbon strategy (“Education and Training 2010”) [11, 14]. Targeting to the permanent improvement of the teaching profession, from initial teacher education to continuing professional development, especially for Mathematics and Science teachers, the VccSSe project tried 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 [16].

Together with 8 educational institutions from Romania, Spain, Poland, Finland and Greece, the coordinating institution - *Valahia University of Targoviste, Romania* - assumed the role of promoting of the virtual experiments in the educational environment. In this sense, the partnership designed and created specific training modules and materials related to the use of *Virtual Instrumentation in Science Education*. Basically, the developed materials were dedicated to in-service teachers from primary and secondary schools involved in Sciences subjects in the partners’ countries. On the other hand, they are uploaded in the project web site and can be used by each teacher interested to introduce virtual experiments in his / her work.

The training materials focused on presenting of four specific *Virtual Instrumentation environments* (*LabVIEW*, *Crocodile Clips*, *Cabri Geometry* and *GeoGebra*) [3]. According to the training

requirements, the participants, function of their background, had to select one of the presented software environments with the view to understand its main capabilities and facilities, and then - as following step - to create a learning object which has to propose at least one virtual experiment.

The training session duration was scheduled for approximately 42 hours, including initial, final and impact web evaluation. As structure, the modules proposed 3 seminars and 3 laboratories, each of them being finalized with specific tasks.

The training modules were developed as e-learning courses under the *Moodle* platform. A number of 363 teachers, together with 32 tutors, started the training modules also as *Moodle* users.

#### 4 The Moodle Platform

As generally known, *Moodle (Modular Object-Oriented Dynamic Learning Environment)* represents a *Course Management System (CMS)* as a free *Open Source* software package designed using sound pedagogical principles, to help educators create effective on-line learning communities [12].

*Moodle* is used mainly in education and aims to improve the teaching experience, through the enriching of the traditional training and assessment methods with the ICT-based ones. By using *Moodle*, the students have the opportunity to access learning materials, interact with teachers and colleagues and receive specific tasks as home-works.

*Moodle* presents multiple characteristics which made it to become in short time a representative e-learning platform. Some of its features can be synthesised as follows [12]:

- creating and managing content / lessons / resource management;
- class or learning groups management;
- forums, chats and messaging;
- assignments for courses and users;
- blogs;
- wikis;
- databases;
- survey engines;
- support for more than 60 languages.

In addition, four major concepts arise behind *Moodle*: *constructivism, constructionism, social constructivism, connected and separate* [13]. Those concepts recommend *Moodle* as an e-learning environment where each participant at a course can be a teacher as well as a learner.

In this respect, even a great part of *VccSse* project tutors and teachers took contact with *Moodle* for the first time, they experienced the *Moodle*'s

organization and features with great interest and expressed their opinions in related discussions. A specific organization of the *VccSse* training modules, inside the *Moodle* space, is illustrated in Figure 1.

Orar săptămânal		
	News forum News forum Bine ati venit la cursul nostru! Ghidul Studentului Ghid Moodle	
11 Februarie 17 Februarie	Agenda Modulelor de Formare VccSse	<input type="checkbox"/>
18 Februarie 24 Februarie	Evaluare initială	<input type="checkbox"/>
25 Februarie 2 Martie	Seminar 1 Sarcina 1 (sectiunea "Teme rezolvate", prin incarcarea fisierului de lucru)	<input type="checkbox"/>
3 Martie 9 Martie	Seminar 2 Sarcina 2 (sectiunea "Teme rezolvate", prin incarcarea fisierului de lucru)	<input type="checkbox"/>
10 Martie 16 Martie	Seminar 3 Sarcina 3 Macheta Word Macheta web1 Macheta web2	<input type="checkbox"/>
17 Martie 23 Martie	Laborator 1 Predare / Invatare folosind Cabri Geometry Predare / Invatare folosind Crocodile Clips Predare / Invatare folosind LabVIEW Predare / Invatare folosind GeoGebra Sarcina Laborator 1 Validarea experimentelor virtuale in educatia in domeniul Stiintelor	<input type="checkbox"/>
24 Martie 30 Martie	Laborator 2 Sarcina Laborator 2 (sectiunea "Teme rezolvate", prin incarcarea fisierului de lucru)	<input type="checkbox"/>
31 Martie 6 Aprilie	Laborator 3 Sarcina Laborator 3 (sectiunea "Teme rezolvate", prin incarcarea fisierelor de lucru: "Aplicatia mea VI" si "Macheta lectie")	<input type="checkbox"/>
7 Aprilie 13 Aprilie	Evaluare finală Chestionar referitor la impactul utilizării VI în clasă Chestionarul de feedback al elevilor	<input type="checkbox"/>
14 Aprilie 20 Aprilie	Discuti Finale	<input type="checkbox"/>

Fig.1 Moodle space organization for the VccSse project training modules “Virtual Instrumentation in Science Education” (Targoviste category)

#### 5 The Training Content

The *Virtual Instrumentation in Science Education* training modules contributed to training of the following types of competences:

- a) Use and application of specific Virtual Instrumentation software in teaching of Mathematics and Science subjects;
- b) Educational design abilities for including Virtual Instrumentation applications in Mathematics and Science lessons;
- c) Use of *Moodle* e-learning platform.

The access to the *VccSse Moodle* platform was realized on the basis of an account and password. To be able to open an account and to access the training materials, the platform administrator provided the

necessary information and the particular key for enrolling the participants to the training modules.

After opening the account, the access was made without restrictions, including also the possibility to see the specific calendar which displayed the activities planned for specific days.

The structure and the format of the training modules were framed as weekly type. In this case, the tutor added information and resources in each week and stipulated the necessary time allocated for study.

In general, this type of schedule is very practical and most widely used because it is based on the distribution of the materials in the static format (*doc*, *pdf*) and also on the direct setting of important dates for the students.

The training materials were uploaded in the central part of the *Moodle* interface and positioned in the specific frames for the defined weeks. In this way, both information and navigation were clear and simple to be accessed by any participant.

The training syllabus proposed useful and easy tools for creating Mathematics and Science virtual experiments to be used in the teaching process at different levels. In this respect, as *Virtual Instrumentation software environments*, the *VccSse* project partnership selected and designed training materials for *Cabri Geometry II*, *LabVIEW*, *Crocodile Clips* and *GeoGebra*.

*Cabri Geometry II* constitutes a piece of educational software which is not limited simply to support an alternative approach to teaching with the use of computer, but which also supports the development of a dynamic, investigative and exploratory approach to the teaching and learning of Geometry [8]. *LabVIEW* is a very useful tool in the teaching process for the development of interactive applications such as simulated experiments from very simple ones (as phenomena demonstration) to advanced experiments based on electronic instrumentation [6]. *Crocodile Clips* consist of a set of simulation and modeling packages which cover Physics, Chemistry, ICT and Programming, Design and Technology, and Mathematics, that allow flexible experimentation in accurate virtual laboratories [15]. *GeoGebra* is dynamic mathematics software designed for all levels of education which joins arithmetic, geometry, algebra and calculus [10].

## 6 Results and Discussions

During the final session of the *Virtual Instrumentation in Science Education* training

modules, the trained teachers were asked to design at least one virtual experiment ready to be used in their classrooms. The virtual experiment was referred by a lesson plan, both of them constituted a learning object which was uploaded in a special database (*Teachers' Products Matrix*) created for hosting the teachers work and results. Finally, a number of 206 teachers uploaded their products in the *Matrix*, some of them proposing more than one experiment.

In the end, the trained teachers were asked to express their feed-back concerning the pedagogical use of virtual experiments in the educational process. Some of the questions were addressed also in strong relation with the proposed software environments [4].

From the initial selected target group of Dambovită County, 24 Romanian in-service teachers attended the training modules. The educational levels were very good represented: 33% of teachers came from primary education level, the rest were teachers at lower and upper secondary levels. The group included Mathematics (37%), Chemistry (17%) and Physics (13%) teachers (figure 2).

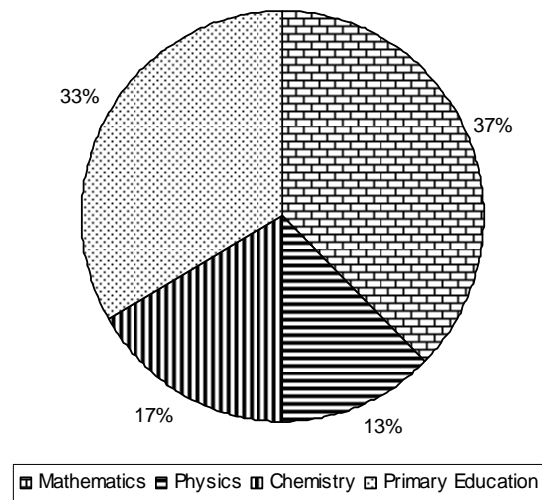


Fig.2 Distribution of the graduating teachers related to their specific areas

The teachers offered a very good feedback (92% of them) related to the usefulness of the didactic materials necessary for solving the tasks (figure 3). In addition, 87% of them appreciated also at a high level the usefulness of the source texts and links provided in the training materials (figure 4).

As mentioned before, the training modules embraced the form of an e-learning course developed inside the *Moodle* platform. Due to the fact that the modules structure proposed 3 seminars

and 3 laboratories, it was interesting to hear teachers' voices related to the usefulness of seminars and labs for the implementation of virtual experiments during the lessons. In this respect, 83% of teachers offered a very good feedback concerning the role of the seminars content (figure 5) and 92% of them appreciated at a high level the importance of laboratories for the implementation of virtual experiments in the classrooms (figure 6).

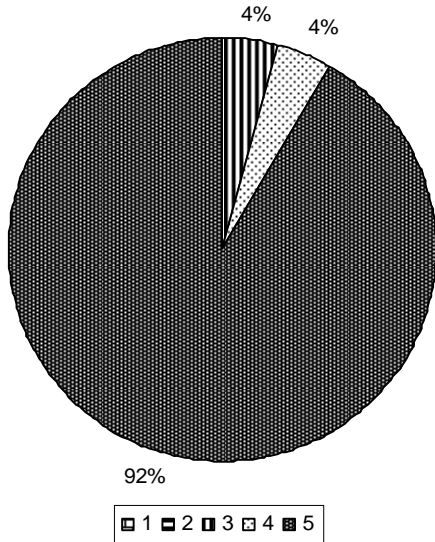


Fig. 3 Rates for the usefulness of the didactic materials necessary for solving the training modules tasks (scale: 1(poor) - 5 (excellent))

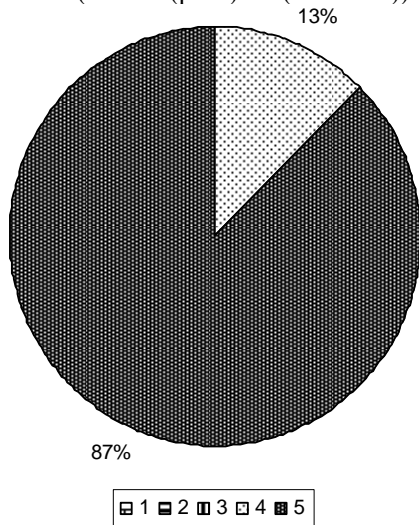


Fig. 4 Rates for the usefulness of the source text and links provided in the training materials (scale: 1(poor) - 5 (excellent))

It is important to emphasize also that teachers learnt to use the Moodle platform, and due to the fact that many platforms are designed on the same usability principles, it can be concluded that the

trained teachers are able now to transfer the abilities and skills acquired in this context, in future e-learning situations.

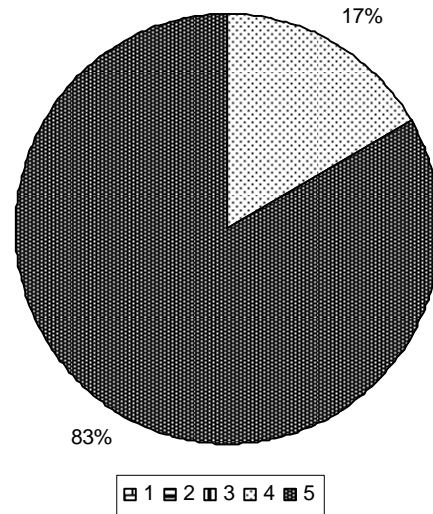


Fig. 5 Rates for the usefulness of the theoretical content (seminars) for the implementation of virtual experiments in the lessons (scale: 1(poor) - 5 (excellent))

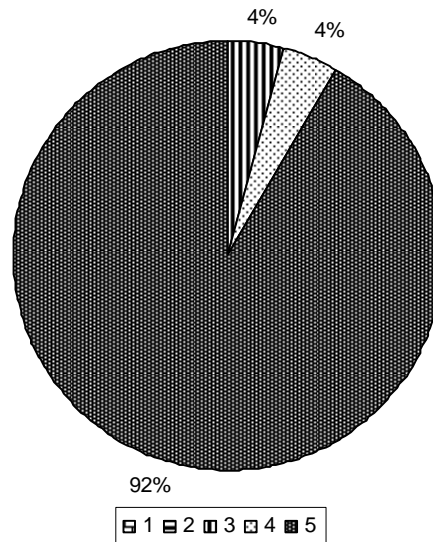


Fig. 6 Rates for the usefulness of the practical content (laboratories) for the implementation of virtual experiments in the lessons (scale: 1(poor) - 5 (excellent))

Communication was also an important aspect of teachers' collaboration. At the platform level, the communication between the trained teachers involves their interaction as individuals. It had a random character and appeared as a result of personal initiatives, being done especially by e-mail and chat facilities.

## 7 Conclusions

Nowadays, it is obvious that ICT tools can be implemented successfully in various educational contexts, including distance education, even for areas like Sciences which involve practical activities. Taking into account the aspects presented above, it can be concluded that due to its multiple facilities and especially its easy accessibility, even for the beginners, the Moodle platform proved to be a powerful educational web environment for developing different teaching / learning activities in the frame of various on-line courses.

More than that, as many platforms are designed on the same usability principles, the users who have been enrolled in different on-line courses developed on Moodle platform can easily transfer their abilities and skills acquired in the distance training practice, in future e-learning situations organized on other educational web environments.

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