EURONET LAB, A CLOUD V-LAB ENVIROMENT

ABSTRACT:

In this paper we present a proposal for the creation of a European V-labs web space. In its essence it would result in an open online laboratory, with a primarily practical nature. In this laboratory students will have the opportunity to develop skills in the "know-how-to-do" area, enabling them to conduct a series of practical experiences in "try-out" philosophy that will substantiate and consolidate all knowledge that the students acquired in lectures. It is quite possible that these resources aren't available in all universities and institutions, specifically in the university where the student is. This environment provides substance to the Directive stated in the declarations of Bologna and Prague that expresses "the teaching process is therefore student-centered", strengthening the final pedagogical aim of "learning to learn", as lifelong learning is assumed as an indispensable stage. What we propose is the creation of a virtual environment for e-learning where a series of virtual labs in many areas of electronics, automation and robotics are available, in this environment it will do possible for any student of any of these universities to scheduling of experience in any institution that belongs to this cloud, and thus can perform is work for anytime that will be available and with technical resources available or not available in its own university.

Keywords: E-learning, Cloud-Learning, Virtual Labs, Virtual Learning, Remote Laboratory, Cooperative E-learning

1. EURONET LAB ENVIROMENT

1.1 Introduction

Today, with all information communication and technology available, it is theoretically possible to implement online laboratory where different activities and experiences are provided.
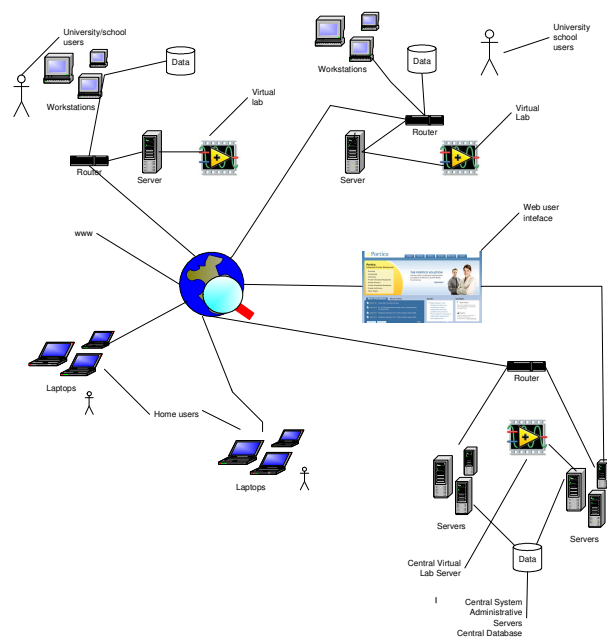

Fig. 1 – EURONET LAB network.

Using this infrastructure, students can schedule and conduct online experiments, without worrying about where the physically experience is effectively taking place.

Thus taking advantages of this technology proposed to build a environment of education and training in philosophy "Cloud-learning" where all members from all participating institutions can register and use all the technical, educational and scientific resources that are provided.

The structure will be implemented specifically as shown in Fig. 1.

1.2 State of the Art

This kind of Laboratory doesn´t exists yet, but there are already various experiments available online in the area of Virtual Labs.

The term Virtual Lab has been around the Internet for a while. There are several types of Virtual labs on the Internet, from the more modest ones, without graphical resources and interactivity to the more sophisticated ones with visual interaction, realism and accuracy in reactions and interactions with them.

Most existent Virtual labs complement the learning process, particularly theoretical concepts in certain domains, mainly in the scientific areas. The so-called Virtual labs can be classified into three categories:

• **without interaction**: generally this type of sites have information content with illustrations with even some multiple choice questions, regarding experiments performed in laboratories. The contents are presented similarly to a book, that is, linearly. In hipertext, although the student is requested to click several times in order to advance, he may cognitively remain passive.

• **with partial interaction**: most sites denominated virtual labs are in this category. Usually, these sites present theoretical contents and experiments that can be visualized. However, the visual part of the experiment does not allow the user to have control over the variables, that is, the experiment is depicted (animation or video), but the student can not change the parameters of the experiment, visualizing always the same action. Some of these sites use resources to present the students impossible phenomena to be visualized (example given; the movement of atoms, magnetic fields vectors, etc).

• **with total interaction**: the most recent virtual labs are in this category. Its main characteristics are, beside presenting illustrations, contents and quizzes about a certain subject, to allow the students to interact with the virtual lab through the insertion of values or modification of components of the virtual lab (example given: alteration of temperature and consequently alteration of the experiment output). Most of these experiments use Java or Flash technology. [1]

1.3 The Proposed System

The following steps and methodology of installation and system configuration is proposed:

- Step 1: Draw the system and make the necessary contacts to achieve the goals.

- Step 2: Implement and test the network infrastructure (to be developed after the agreement of several universities and institutes).

- Step 3: Install and configure the several interface software with the different virtual labs, starting with the installation of the labview webserver's. There are many applications and experiments that do not require additional external hardware as all processes may be simulated in the Labview environment, not requiring other physical equipments.

- Step 4: Develop the ASP or PHP to build an application to manage the Access to the virtual labs.

- Step 5: Launch a limited number of virtual labs and experiments in a test server to test and evaluate the system, and make the first surveys to the several participants.

- Step 6: Corrections of errors detected in Step 5..

- Step 7: Creation of an online learning system based on web 2.0 learning allowing the students to independently and with autonomy have access to all the information needed to complete the experiments, to have access to synchronous tools as chats, video-conferences to have support from their teachers. In an initial phase this system will be implemented in a pilot server. Forums and mailing lists may also be used.

- Step 8: Production of e-learning contents based on videos and where different proposed experiments will be shown by teachers.

- Step 9: Integration of the e-learning contents on a search and consultation system that may be used by all connected to the network.

- Step 10: Start-up of the system based on a test server supplying an online tuition of its use.

With this proposal, teachers will be able to use the system as a complement to their tuition maximizing the learning process, as all types of information regarding a certain subject will be available on this environment, being present as hipertext, animations, videos, virtual Labs and simulations. These materials will be organized in a constructivist and collaboration perspective, aiming the effectiveness of the students' learning.

On the distance courses perspective, its access from different universities and institutes cooperating as partners will enrich the resources and knowledge, which in turn will allow students to access a vast set of techniques and methodologies to construct their customized knowledge.

1.4 Advantages of the System

For this type of virtual labs application, the target population are university students and vocational training students from universities and institutes making part of the network.

Nowadays, being a university student is a different concept from some years ago. ERASMUS and other European collaboration programs greatly improved student's mobility.

In this framework, its common that students have to deliver assignments at different universities to obtain the necessary equivalencies or credits. It is in this type of situations that distance learning plays the most important role as well, allowing students to deliver their assignments online.

In case some of these assignments are practical the problem increases. The solution is sometimes to perform them in virtual labs, through the Internet.

This will be possible if a server network exists based on several universities, allowing students to Schedule time and space on the server to accomplish the tasks from the assignments wherever they are, as long as an Internet Access is possible.

A great advantage of this system is that students may allocate space late at night, as they do not need to have physical Access to the campus or the lab and its materials. Logistics constraints regarding classrooms, labs and materials also disappear.

Other obvious advantage is the sharing of means among the universities and institutes allowing students from an Institute or university to use resources from other institutes / universities.

It is therefore possible to rationalize means, that is, if two universities need to acquire two lab systems, it is possible to acquire only one of the systems, being all students able to Access the system through the Internet, from their universities, at home, from campus, etc.

In order to achieve this, it is necessary to create the infrastructures so that students with a login and password may Access the virtual web, choose the virtual lab to use and the experiment they need to practice.

It is possible to include enterprises in this project, because they can rent it's equipments to the consortium of the Virtual University and receive profits from that rental process.

Also if the enterprise is distributed by several countries or regions it is sufficient to have a single equipment because, using the internet connections all the section of the enterprise can use this use this equipment and make all the works and experiences necessaries for his activity.

It's also positive to the university because in very specific equipment the universities could also use the devices of the enterprise, paying the utilization time, but it's not necessary to the university acquiring very expensive equipments.

1.5 Actions taken by teachers and students in EURONET LAB

A login, forms and database must be created using ASP or PHP that allows students to:

- Schedule an experiment in a certain lab;

- Verify available labs and in which universities or institutes are located;

- Verify the experiments they have done, their grade and comments from their teachers;

- Read or review pedagogical contents that support the different experiments.

The teachers should be able to:

- Send pedagogical contents;

- Review contents and materials;

- Evaluate the students' Works;

- Communicate with the students using email, chat, video-conference in order to give orientations and clarify subjects.

It will be also necessary to create a knowledge-base or LMS or CMS among the network to allow accurate searches of information and technical-pedagogical support materials.

In a constructivist environment it is desirable that the student is the center of the learning process and that he has control over this process. Cunningham derives some goals of a learning constructivist environment, from the following theoretical thoughts: Allow the student to decide which topics to explore, beside the methodologies and strategies of study in order to solve problems; to offer multiple representations of problems and phenomena studied, allowing the participants to evaluate alternative solutions and test their decisions; to embed the learning in realistic and relevant contexts closer to reality; to place the teacher in a position of consultant that helps students organize their goals and learning paths; to embed learning in social experiences that reflect collaboration among teacher-student and students-students; to encourage the meta-learning.

In constructivism, the reality is built by the student, based on his experiences. In order to have a constructivist environment it is fundamental that the teacher designs knowledge according to Piaget, that is, all and any cognitive development will be efficient, if based on a strong interaction between the subject and object.

According to the constructivism theory, one of the first conditions is that the environment allows a strong interaction between the student and the learning object. This interaction must integrate the object of study to the reality of the subject in order to stimulate and motivate him, allowing new situations to be adapted to the existent cognitive structures and therefore favoring its development.

The collaboration learning mediated by technology is today a reality. The learning environment in order to be a cooperative one, counts with the presence of several components among them the teacher and group of students.

These environments contribute to enrich the learning process generating interactions and not only creating learning paths. The debate must be privileged, innovations suggested and Technologies presented that may influence the learning process. The student will be centered in the process being able to decide and manage his learning. [2]

2. INTEGRATION WITH SCORM

In the current state of the art feature in any e-learning must be designed and formatted according to SCORM 2004, otherwise the whole is to lose its portability, scalability and integration with all LMS that is integrated, that is not be part of a course that is available on a e-learning platform.

That is why these v-labs experiences must be built on the form of SCO, "Sharable Content Object", as this makes it possible to send and receive these items as

well built all the information required by the SCORM standard from which it can detach, registration actions of the student while performing the experiment, time spent, number of attempts made, number of wrong actions, number of correct actions, number of revisions of previous results, etc. For all this to work properly this system should be based on an LMS with SCORM API.

In the SCORM standard are defined three types of lessons:

- Completion Based

- Score Based

- Assessment Only

"Completion based" lessons only serve to provide theoretical information for students, the student is getting credit for the pages that will open, these credits can be assigned globally to have accessed lesson or attributable page by page.

"Score-based" lessons consist of several pages of content and interactive exercises, as well as assessments. The system by tracking the actions of the student by assigning Javascript functions will point to their actions throughout the session by analyzing in detail all the steps along with the lesson.

Assessment only lessons consist of quizzes or tests that usually appear in the training process to occur after one or more lessons based or score based completion, these are direct output of data to the scorm package pre-defined by the standard. When this system is implemented must first be tested by one-scorm wrapper before you use to verify that all outputs are being produced to the API correctly.

For the above seems to us that the right thing is to include these V-labs in the last two types of lessons scorm to guarantee their full interoperability with the LMS support system [3] [4] [5].

All v-labs are also implemented as RLO (Reusable Learning Object) in order to be integrated with other LMS [6].

3. CONCLUSIONS

To put this system in full service state it became necessary to first do a research about the "state of the art" then reached the conclusion that ultimately there is very little written on this topic.

In fact what we find is that there are a series of virtual-labs loose and without relation between them and without being integrated into any LMS support. Students are limited to comply in any way on their own, work which is offered and are without any monitoring or feedback from their teachers. It is precisely this state of things, that we propose to correct so that there an effective interaction and feedback between teachers and students that following experiences in v-labs, and we aim to provide an effective administrative and

credible administrative web support so that students work is validated.

Another situation to consider is that all the v-labs and experiments created, shall be constructed in SCORM format, to allow a perfect integration and interaction with various LMS without having problems of communication and reuse in various environments of e-learning, one Since when designed and constructed, should be RLO's (Reutilizable Learning Objects), so that they can integrate any LMS communicating with him through the parameters defined in the SCORM.

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