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Web Based Teaching and Learning: Two Swiss Examples

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ABSTRACT

The Internet, the Web and the multimedia technologies have modified the teaching and the learning environments. The teachers can use their own teaching materials and various kinds of didactic resource exist today. There are too many different teaching material formats. It is a pity that teachers use too much time and energy to edit their learning content. However, the similar learning content can shared with the others. In order to reuse and integrate all the resource, many distance learning standard come with the tide of fashion. To change the traditional university organization Virtual and Macro University are born. This paper describes two different examples of Web based teaching. First example, named "Cybermath", has been developed by the author and it is a remedial course of mathematics that introduces the basis of this discipline. Second example is a program developed by the Swiss Confederation, named Swiss Virtual Campus (SVC). It supports new information and communication technology in higher education, using the Internet.

1 INTRODUCTION

The Web and the multimedia can help to modify the our teaching methods. The term multimedia describes a number of dedicated media appliances, from digital VCRs and interactive television, to advanced wireless devices, to public television screens. Multimedia technologies have many applications and they include entertainment, education and advertising. The meaning of multimedia will continue to expand as technology evolves and new applications are invented. We can use multimedia technologies in the educational field in different ways [1, 2, 3]. For example, in support to the traditional educational methods [4, 5, 6, 7], and to help the distance education [8, 9] to create a constructivist learning environment [10, 11]. This paper, which describes a Swiss overview that involves multimedia solutions in the teaching path, has been organised as follow: section 2 introduces "Cybermath" that is a hypermedia course of Mathematics developed for the students that attend the Academy of Architecture (Università della Svizzera italiana, Switzerland). Section 3 describes the "Swiss Virtual Campus", a program of the Swiss Confederation, that supports new information technologies in higher education. Section 4 is dedicated to the conclusions, and section 5 contains the references.

2 CYBERMATH: HYPERMEDIA MODULES TO INTRODUCE THE MATHEMATICS

The project Cybermath (Cyber Mathematics) has been developed by the author at the Academy of Architecture of Mendrisio (Università della Svizzera italiana). It is an example of the distance education using the Internet and the World Wide Web to build a learning environment.

The students that attend the Academy Architecture of Mendrisio come from different countries (e.g., Australia, China, Japan, South America, USA, and Korea) and different kinds of High Schools (technical schools, artistic schools, etc.). For these reasons, Cybermath intends to propose a propaedeutic course of Mathematics to introduce some particular subjects because. Cybermath is oriented:

- to reach a good grounding in mathematics;
- to help the students to overcome the strong dislike for the mathematical though.

This is not possible using only the traditional lectures, for example a remedial course some week before the course of mathematics, because many students come from different countries and they arrive in Mendrisio on time only to attend the traditional courses.

Other reason to develop an electronic support to the mathematics is the presence of this subject in four different undergraduate courses in our faculty (first, second, third, and fourth year).

This project intends to develop an effective-based learning environment that provides synchronous and asynchronous education to learners who are physically remote.

The aims of this project are the following:

- to develop a learning environment to introduce the fundamental of Mathematics;
- to permit to the students to overcome the problems of the different background before the beginning of the academic year;
- to support the students to reach a good grounding in Mathematics;
- to help the students to overcome the strong dislike for the mathematics using a medium, the computer, which has a good communicative impact.

Cybermath learning environment is in agreement with other didactic projects which involve the use of the Internet and the World Wide Web inside an educational project. In fact, modern educational networks support a set of general-purpose elementary network services that provide some essential communication facilities to end users. Our learning environment provides the student registration, the hypermedia lessons, the course materials, the tests online, some active links to other Internet sites dedicated to the Mathematics. Cybermath Learning Environment is shown in the figure 1.

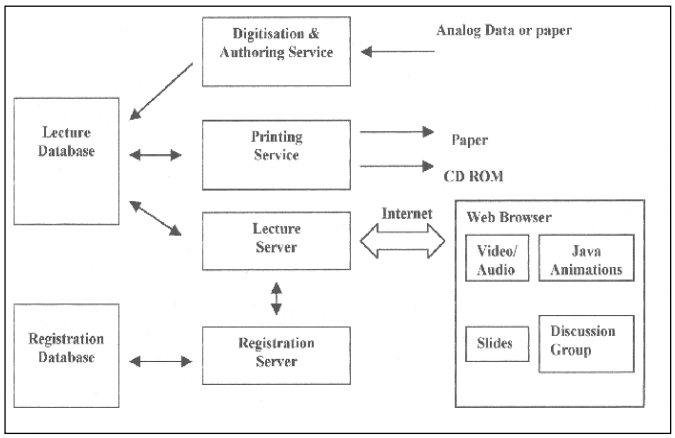
The project has the following characteristics:

- the synchronous use of the hypermedia modules, in university, with the presence of the tutors;
- the asynchronous use of the hypermedia online modules (e.g., students can study at home using e-mail);
- FAQ (Frequently Asked Questions) area,
- Forum and Video Conference (to contact the tutors and to orientate themselves inside this educational environment);
- the use of the virtual reality online The Virtual Reality environment to simulate some particular geometric objects (for example, the platonic solids, the polyhedra, the geodesic domes).
- the use of the different media to increase the educational impact (animation, vocal comments, text);
- to prepare the students to use the new media inside a continuos training;
- the capability to adapt the students' learning rate.

We have established the following didactic objectives [9]:

- To know and to apply the fundamental of the Algebra (to be able to solve: polynomials and exponents, radical expressions, addition and subtraction of radicals multiplication and division of radicals negative and fractional exponents the algebraic fractions, etc.);

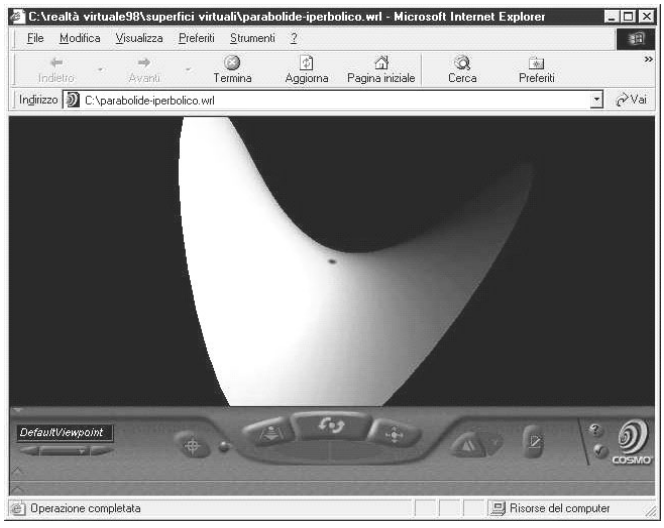
Figure 1 Cybermath's Learning Environment.



- To know and to apply the fundamental of the Analytical Geometry (to be able to draw and solve: points on a number line and co-ordinate plane, linear functions, slopes, x and y intercepts, graphing lines, equations of lines, graphs of parabola, hyperbole, ellipse, surfaces, etc);
- To solve some typical problem of the Analytical Geometry (e.g., to find the tangent to the parabola, hyperbole, ellipse; to determine the equation of these curves, and so forth).
- To know and to apply the fundamental of the Trigonometry (the sine, the cosine, the tangent, the cotangent of an angle and their interconnections with the right-angled triangle. To be able to apply the sine's theorem, the Carnot's theorem, etc.).
- To know and to apply the fundamental of the Mathematical Analysis (the concepts of limit, derivative, integral and their applications).
- To know the interconnections between the Mathematics and the real world (e.g., the mathematical applications in the architecture, in the arts, and in the life science);
- To prepare the students to use the new media inside a continuos training.

The students can adapt the learning rate to their time availability and cultural background, and they can study the fundamental of Mathematics using the Internet as a medium to receive the knowledge, and then self-verify their knowledge level by solving practical exercises and answering a series of questions. In this way the students can study at home (e.g., before the traditional course) using the hypermedia modules as a remedial course (asynchronous mode). Inside the project,

Figure 2 A hyperbolic paraboloid created using VRML.



we have also used the Virtual Reality, because this technology can offer a series of advantages [12, 13, 14]. For example:

- learning efficacy,
- learning interactivity.

Other important educational objective is to train the students to integrate the hypermedia solutions in their learning processes and in their vocational training.

Figure 2 shows a hyperbolic paraboloid, created using the Virtual Reality Modeling Language (VRML), that is present in the module dedicated to the surfaces in architecture and design.

3 THE SWISS VIRTUAL CAMPUS

The Swiss Virtual Campus (SVC) is an important program of the Swiss Confederation to support new information and communication technology in higher education under the 1999 Swiss Federal Law on University Development (Web site: http://www.virtualcampus.ch). It is part of a process based on promoting the Information Society in Switzerland, in particular in the higher education, to take advantage of the opportunities now available through the new communication and information technology. In this respect the program hopes to provide students with a virtual mobility that will enable them to play an active role in the learning processes and follow high-quality courses on their computer monitors. The principal goal of the program is to develop accessible teaching modules through the Internet for basic and specialised study programs, particularly for subjects that attract large numbers of students. The Swiss Virtual Campus has three main aims:

- Improving the quality of student learning processes and strengthening interactive teaching by broadening university teaching into a range of available courses for both on campus and corresponding students.
- The strengthening of collaboration between the universities.
- The development of high-quality teaching materials and methods.

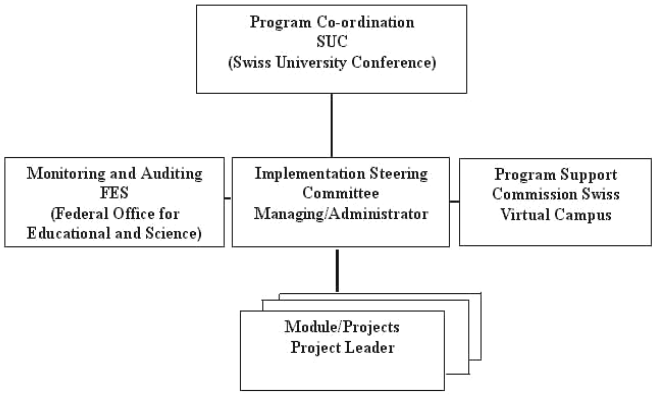
In the first step, the period 2000-2003, the Swiss Virtual Campus has involved 50 projects in the following fields:

- Art and Humanities (7 projects).
- Economics, Finance and Law (4 projects).
- Educational Support (4 projects).
- Engineering, Mathematics and Computer Science (9 projects).
- Environmental and Life Sciences (9 projects).
- Management and Business Administration (6 projects).
- Medicine (11 projects).

The organisation of the Swiss Virtual Campus is shown in the figure 3.

Our university (Università della Svizzera italiana, University of Lugano) is involved in two Swiss Virtual Campus projects in the period 2000-2003. In the first project, named SWISSLING, our university is the Project Leader (the co-ordinator is the professor Eddo Rigotti). The objective of SWISSLING is to co-ordinate the study of linguistics in Switzerland's three major language regions. It is designed as an introductory course for first- and second-year students of humanities (linguistics, communication sciences, languages and literature). The course is organised in 12 modules, to take account of the considerable differences in the structure and duration of linguistic studies at Swiss universities. Each module corresponds to a basic theme addressed in linguistics, such as phonetics, syntax and text analysis. The second project is named I-Structures - Interactive Structural Analysis by Graphical Methods. It intends to realise a hypermedia course to introduce the structural calculus. This project offers some interactive learning modules for courses in basic statics and structures. I-Structures emphasizes on the graphical representations and the intuitive understanding of the behaviour of structures. A new software allows students to experiment with the effects produced by changes in structure and applied loads. Our faculties

Figure 3 The organisation of the Swiss Virtual Campus.



involved in this project are the Academy of Architecture (referee professor Massimo Laffranchi) and the Faculty of Communication Sciences (referee professor Edo Poglia).

4 CONCLUSIONS

Multimedia technologies can help to create new ways for teaching and learning, in different kind of schools and in different cultures. This is in agreement with other research studies [15, 16]. The Swiss Virtual Campus (SVC) promotes learning over the Internet at university level. Students are no longer tied to a programme of lectures with set times and locations; they can acquire knowledge whenever and wherever they choose.

The effectiveness of the learning environments based on multimedia technologies depends on the equilibrium between technology and pedagogy. Technology must be subsumed under a pedagogic program, whose ultimate goal is to develop the capacity of students to work together in a collaborative environment, using information and communication technologies. We have to consider that the typical student of the new millennium will be academically independent. He will be self-motivated with an inquiring nature. This student will be able to articulate questions and he will be better able to discuss academic subject matter than the students educated in today's traditional classroom environment. These important considerations can influence the change in the School and the University in the new millennium. Cybermath and the Swiss Virtual Campus are two projects in this direction.

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