An Internet project to achieve curricula harmonisation

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ABSTRACT. The increase of student mobility in Europe and in other countries, and the recent attempt to harmonise European curricula at the graduation and post-graduate levels lead towards an increasing co-operation among universities to develop educational modules with a common background (Ruffio, 2000). This paper describes a project developed in the framework of a European Thematic Network. The educational modules developed are installed in a WWW server and can be accessed by students and teachers. Results obtained through a pilot course in three different countries are presented and suggestions concerning course improvement are given in order to build a virtual university.

Key words: multimedia courses, computer-aided learning, curricula harmonisation.

RESUMO. Um projeto na Internet para obter uma harmonização dos curricula. O aumento da mobilidade de estudantes entre os países europeus e entre estes e outros outros, e as tentativas recentes de conseguir uma harmonização dos currículos no nível de graduação e mesmo de pós-graduação, conduziu a um aumento da cooperação entre universidades no desenvolvimento de cursos modulares com uma base comum. Esta comunicação tem por fim a apresentação de um projeto que foi desenvolvido no âmbito de uma rede temática europeia. Os módulos desenvolvidos foram instalados num servidor WWW, e podem ser consultados e utilizados por estudantes e professores. Descrevem-se os resultados obtidos num curso piloto efectuado em três países e apresentam-se sugestões para melhorar os cursos desenvolvidos, tendo como objectivo o desenvolvimento de uma universidade virtual.

Palavras-chave: cursos multimedia, ensino assistido por computador, harmonisação dos curricula.

The increasing mobility of students and teachers across Europe, which is spreading to other countries as well, requires the harmonisation of university curricula. European Programmes such as Erasmus (Ruffio, 2000), have supported the mobility of thousands of students. Figure 1, reports data concerning the mobility of physics students in the European Union. In most technical curricula students are strongly encouraged to spend at least one semester abroad. Some universities are engaged in tighter forms of co-operation delivering double diplomas¹, which has led to a local harmonisation of curricula. In fact, there is a common diploma project involving the universities of Utrecht (Netherlands), Montpellier (France), Coimbra (Portugal), Tampere (Finland) and Huddersfield (UK).

The benefits acquired by students from this experience are very important since a double diploma opens a wider employment market, not only in the European area but also in the rest of the world.

Figure 1. The Physics students’ mobility in Europe through Erasmus programme (From Socrates International Agency, 1993/1994)

Figure 1 presents student mobility in Europe through the Erasmus programme [see footnote]. The country codes used in this graph are the ones in

use by the European Commission and are detailed in Table 1.

Table 1. European country codes used in Figure 1 (From Socrates International Agency, 1993/1994)

<table>
<thead>
<tr>
<th>Code</th>
<th>Country</th>
<th>Code</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Austria</td>
<td>G</td>
<td>Greece</td>
</tr>
<tr>
<td>B</td>
<td>Belgium</td>
<td>I</td>
<td>Italy</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>IRL</td>
<td>Ireland</td>
</tr>
<tr>
<td>D</td>
<td>Germany</td>
<td>N</td>
<td>Norway</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>E</td>
<td>Spain</td>
<td>P</td>
<td>Portugal</td>
</tr>
<tr>
<td>F</td>
<td>France</td>
<td>S</td>
<td>Sweden</td>
</tr>
<tr>
<td>FIN</td>
<td>Finland</td>
<td>UK</td>
<td>United Kingdom</td>
</tr>
</tbody>
</table>

Students’ movement is not restricted to Europe. Besides migration to USA there is also currently a recent flux to the Asian Pacific Area, especially to Japan and Australia, as shown in Table 2.

Table 2. Students’ mobility in the world (data referring to 1995)

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Number of students</th>
<th>Increase from 1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>260,000</td>
<td>+ 80%</td>
</tr>
<tr>
<td>Japan</td>
<td>90,000</td>
<td>+ 100%</td>
</tr>
<tr>
<td>UK</td>
<td>48,000</td>
<td>+ 220%</td>
</tr>
<tr>
<td>Australia</td>
<td>19,000</td>
<td>+ 50%</td>
</tr>
<tr>
<td>Canada</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>7,000</td>
<td>+ 27%</td>
</tr>
</tbody>
</table>

In the case of Australia the flux of students has increased by 50% from 1985 to 1995, whereas in Japan this increase attains 220% in the same period.

Harmonisation of Curricula

In order to promote convergence between educational systems, some European countries adopted in the Sorbonne meeting in 1998 and in the Bologna meeting in 1999 a declaration for a common effort to obtain a curricular harmonisation. The proposal, commonly referred to as the “3-5-8 Model”, contemplates two main common levels, Bachelor and Master, corresponding more or less to the classical “undergraduate” and “post graduate” degrees used in most countries in the world. The Bologna convention also adopted a common regime of credits, designated by ECTS (European Credit Transfer System).

The implementation of this document is not easy owing to the different levels and curricular structures of higher education in Europe. One essential step is the definition of the basic knowledge that every engineer (or equivalent) has to know and be able to use.

Due to the wide accessibility of the Internet, a possible way to assure convergence is the following:

A- on a short term basis, in the design and implementation of Internet-based modules, whose content is defined by a group of partners of the same speciality working in close co-operation.

B- on a long term basis, by disseminating and assessing these modules in Europe.

With these objectives a project entitled Ineit-Mucon (INnovation for Education in Information Technology through MUltimedia and COmmunication Networks) in the framework of the Socrates programme was suggested with the aim of interconnecting courseware modules by using WWW technologies.

This interconnection will allow the end users (teachers and students) to get a wide view on educational resources that are normally sparse.

As far as the teachers are concerned it will allow the retrieval of a special module that can be used with the normal curriculum to enhance some aspects of the presentation in the class, while avoiding the burden of developing specific software themselves.

For the students these pieces of curriculum and pedagogical tools developed in several universities in Europe, easily available through the Internet, will act as pre-requisites. They allow the student to prepare him/herself to mobility exchange programs. The modules are available both in English and in some cases also in his/her native tongue.

Thus, the main objective of the Ineit-Mucon Thematic Network is to start the foundation of a Virtual University in the field of EIE (Electrical and Information Engineering) with a common curriculum around a core of competencies defined by several universities in Europe.

One important aspect of this development is the definition of the physics and mathematical bases, necessary to understand the applications within the various engineering domains.

Especially in physics the existence of these modules allows the display of dynamic phenomena, which facilitates the understanding. In some cases interactive simulations driven by the user are also available, allowing the students to deepen their understanding of a particular subject by modifying parameters and observing the end result.

Course development

The project has run on a three year period (+ 1 year for dissemination) as from September 1996.
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Thirty-five universities are included in the project. The various partners were shared into workgroups according to their speciality.

A common curriculum was agreed upon and the various partners from several universities in different countries started developing the basic concepts as well as the respective physics and mathematical bases.

During the first period, a survey of computer tools available and other existing equivalent products gave us the possibility to grasp the most convenient techniques to be used in order to present the pedagogical content of the packages.

The development of Java applets was decided as the most convenient, due to its compatibility with all the browsers.

Each of the courses developed in the Ineit-Mucon project is organised in such a way to provide a flexible, yet complete navigation scheme. This allows the use of each module either as a demonstration package in the classroom or as a study element for the students or learners who want to get knowledge in EIE (Electrical and Information Engineering) through Distance Learning applications into Life Long Learning structures. All the courses include the following elements [1]:
- Prerequisites
- Introduction
- Course’s main body
- Interactive exercises
- Simulation
- Self-assessment questionnaires for students
- Bibliography
- Glossary of terms
- Final Test

The existence of a common structure and flexible navigation as well as the option of search content available at each screen permit the easy interconnection of course modules developed in different countries. Most of the courses are in English in order to facilitate the exchange of information.

Concerning the Telecommunications course, during the navigation the user can switch from the introductory course on signal analysis developed by Lisbon (Portugal) site to the Nancy (France) site where a package on Fourier analysis has been developed.

In Figure 2 the screen structure used in the course is shown. The screen is divided into three frames. The bigger one is the main frame, where the content of the course is displayed. On the left the contents frame allows the user to perform navigation through the course, by accessing the different chapters of the course. The banner frame is located above the main frame and presents buttons that give easy access to information about the course (button About), Figures reference, bibliographical references (button Bibliography), to a glossary of technical and scientific terms used in the course and also allow text search (button Search). Another example is shown in Figure 3 where the banner frame is absent in order to provide a better visualisation of figures and annotations.

All the chapters in the courses can be retrieved independently, thereby allowing other teachers to build their own curricula from the available modules.

Other important objectives are:
- To provide tools for dialogues and exchanges (mail, newsgroups, and databases) between teachers themselves and also between teachers and learners, which should allow an improvement of the courses and a comparison of various pedagogical experiences.
- To allow a global assessment, which could help partners to compare students levels, in order also to get a whole view of the teaching in Europe in this domain

The various pieces of curriculum and pedagogical tools available are proposed in a web
server located at http://www.eaeeie.org/ineit-mucon/.

The home page of our site proposes some help available in six languages (Portuguese, English, French, Spanish, German, and Esperanto).

The structure of the server is distributed, the tools are proposed on the site where they were developed however some are also proposed in the native mother tongue.

Results

In the 4th year of the project, a complete evaluation of the tools is being done before a general dissemination takes place. The pedagogical tools are tested on some sets of students, preferably from other universities within this network.

A questionnaire was distributed to the students concerning the following aspects:
- facility to use (ergonomics),
- problems of connection,
- interests and difficulties of the courses in HTML,
- role of simulations,
- difficulties in using the English language,
- Suggestions for improvements.

A first dissemination has been developed by IST (Instituto Superior Técnico), the school of Engineering from Lisbon Technical University (Portugal), by Université Henri Poincaré Nancy 1 (France) and the Universität Ulm (Germany), (Thiriet et al., 1999 and Thiriet and Robert, 2000).

The remarks of the students were as follows:
- They are mostly in favour of using internet-based tools as a complement to classical lectures, either in a deductive or in an inductive manner,
- Concerning the text by itself, some mentioned the difficulty to read on a screen rather than on paper.
- 28% mentioned some difficulties for the connection (availability of machines within their institution, configurations of machines, problems of connection),
- Concerning the use of the English language, the students behave generally positively, arguing that it is interesting in the frame of their education and their future job to know the vocabulary in English.

Other actions of dissemination consist of:
- Presentation of the whole thematic network activity in our own institutions,
- Presentation of our thematic network activity in international conferences
- Writing of a booklet presenting our thematic network.

Discussion

As mentioned previously, the Ineit-Mucon Thematic Network is only a first step. We hope that it will start co-operation between higher education institutions, and contribute to the introduction of the latest innovations in education and learning in the framework of such a Virtual University in EIE (Electrical and Information Engineering).

A new project entitled Theiere (Thematic Harmonisation in Electrical and Information Engineering in Europe) was proposed to the Socrates 2 program, and accepted, which will continue the work, developed successfully in Ineit-Mucon. Further concern is the co-operation between the several partner institutions in order to contribute to the harmonisation of curricula at a European level, with the inclusion of a large number of eastern European universities and also some observers: Bogazici university in Istanbul (Turkey), university of Mariupol (Ukraine), and University Abdelmalek Saadi from Tangiers (Morocco)

The work developed within our thematic network can finally be seen as a first phase in the development of a virtual university in Engineering. This development is done in a strong partnership between several teachers and students throughout Europe.

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