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EUROPEAN LEVEL DEVELOPMENTS OF FLEXIBLE LEARNING MODELS WITHIN GEOGRAPHICAL INFORMATION SCIENCE (GIS) FOR VOCATIONAL TRAINING

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Leonardo da Vinci Community Vocational Training Action Programme's pilot project within Geographical Information Science (GIS), should be implemented over a three year period, 2002-2005. The main objectives of the project is to establish co-operation between European Universities and GIS user organisations and to develop modularised courses intended for Internet based learning, establish links of communications between the partners in the project in order to disseminate and share „best practises" in different teaching situations and for different types of students. The course modules to be developed, all together, will constitute a one-year programme within GIS. This project mainly targets full time students, private and civil service employees within the EU but also similar categories in non-EU countries. The course modules are supposed to be flexible both in time and in „tempo". However, synchronous group models will also be considered.

The outcomes of the project will be high level content, new net-based pedagogic method suited for accessing target groups of great diversity as regards pedagogic traditions, access to computers and bandwidth. Cooperation between the institutions will, certainly, give higher level courses than the individual institutions could possibly themselves.

1. Introduction

Within Geographical Information Science (GIS) are handling geographical data, both in the form of „digital maps" and as „attribute data". Attributes are e.g. tabular data connected to geometric features, like points, lines and surfaces, on a map, describing what type of feature an object represents and the characteristics of the object. A point could be a well, a line could be a road, a surface could be a cultivated field, etc. In most sectors of society, the use of GIS is currently increasing rapidly. The utility of being able to manage, analyse and visualise data using the graphic interface provided by the map has been recognised to improve efficiency for many organisations.

Informative data, linked on to geographical data, give society a unique tool for visualizing numerous situations in the geography, such as: a) *Physical planning*, b) *Tourist information (road information – choice of route for travel from one point to another and tourist site and hotel information),* c) *Environmental issues and finally* d) *Natural resources.*

Data is found in GIS databases and may be picked up by accredited persons or by public in general. It all depends on type of information – and the level of security and necessary protection. In the following we will give some examples on information available for public.

Depending on the purpose of the GIS analysis, the data needed are either available or have to be captured. If we want to use GIS as a simple „map making system", digital maps are often available and the user is able to create a layout that suits her/his demands. However, even if there are a lot of free data available over the Internet, it should be realised that one of the main obstacles connected to extended use of GIS is high costs. More specialised analysis, like modelling of environment effects in time and space relating to different sources of emission, require detailed, user-specific, data that have to be collected and entered by the individual user.

2. Objectives/ aims for the E-GIS project

The main objective with the E-GIS project is to establish a co-operation between European Universities and GIS user organisations and to develop modularised courses intended for internet based learning. Another objective is be to establish links of communications between the partners in the project to disseminate and share „best practises" in different teaching situations and for different types of students. This project mainly targets full time students, private and civil service employees within the EU but also similar categories in non-EU countries.

Main advantages of Internet-based learning, is increased accessibility, also for weak groups in society. Pilot tests in Sweden show that this form of learning suits full time employees very well. Another advantage is the possibility for attending courses at distant education institutions that may provide specific education not available at local institutions. Another obvious advantage by an intra-European co-operation is the sharing of best practise among the teaching institutions that will provide better quality for the students and constitute a basis for creative development of new course modules within special fields of competence not available everywhere.

The outcome of this project will be a network of co-operation between some of the most prominent GIS teaching institutions in Europe. This network would be used to develop a set of modular courses adding up to a half year full time studies in the field of GIS. The concept of using short modules will have several advantages to traditional one term university courses:

- Flexibility to choose only appropriate parts for students already professionally active,
- Spreading the modules over longer time span for full time employees,
- Full time student from different fields could top their exams with selected GIS competence,
- Modules could easily be adapted to fit specific training environments, e.g. third world countries, district civil service, etc.
- Standard-English modules could with relatively small effort be adapted to local languages.

The intended modules should comprise an introduction module and four add-on modules with different orientation. The modules should be produced as a base-version in English but the project should also include translation of the courses to the main European languages, e.g. French, German, Spanish. The course credits will be in the ECTS.

Another important outcome from the project will be net-based pedagogic models for conducting the modular courses in the most efficient manner.

3. Partners

The project partners are 10 institutions from 6 European countries (Fig 1):

- *Bulgaria:* **FRI** (Forest Research Institute, Sofia);
- *Lithuania*: **VGTU** (Vilnius Gediminas Technical University);
- *Netherlands*: **ITC** (International Institute for Geo-InformationScience and Earth Observation);
- *Norway:* **GUC** (Gjøvik University College), **NAS** (Nettskolen AS), **Geolok**;
- *Portugal:* **ICIST** (Institito Engenharia de Estrudas, Territorio e Construcao);
- *Sweden*: **LU** (Lund University), **ULI** (Swedish Development Council for Land Information), **LUVIT AB**.

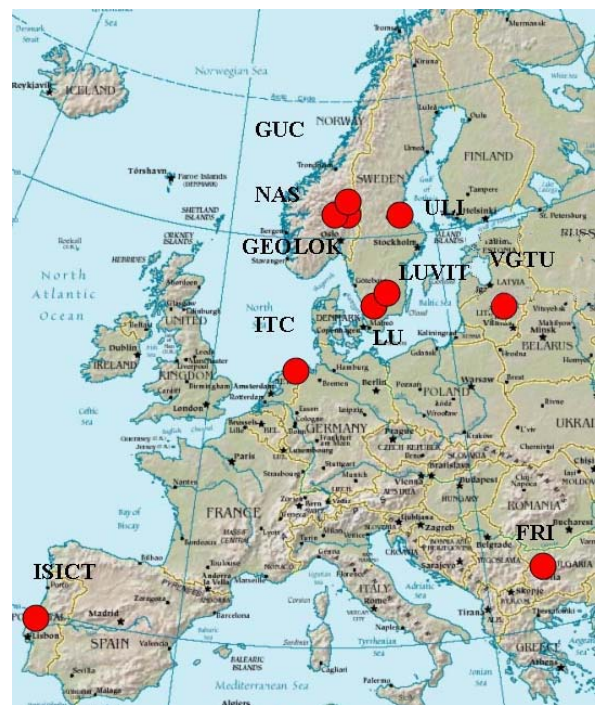Gjøvik University College is contractor and project coordinator.

Fig 1. Geography of the partners

4. Course content

The following eight course modules will be developed, all together constituting a one-year programme, 60 ECTC (Fig 2).

1. *Basic GIS* I (Basics for understanding GIS and be able to identify operations for solving GIS concepts**).**

2. Basic GIS II (Treats advanced GIS theory and discuss methods for advanced analysis).

3. Specification of GIS in an Organisation (Learn to identify a user/organisation's needs for geographical information and the implementation of it).

4.Physical Planning (Focus on the use of GIS in the process of establishing physical plans, and the public authorities' use of GIS as a decision support system)

5. Resource Planning (Introduce to the student to GIS as a planning tool for resource management)

6. Environmental Planning (The student will be used to handle environmental data in a GIS environment and discuss environmental data sources and data quality).
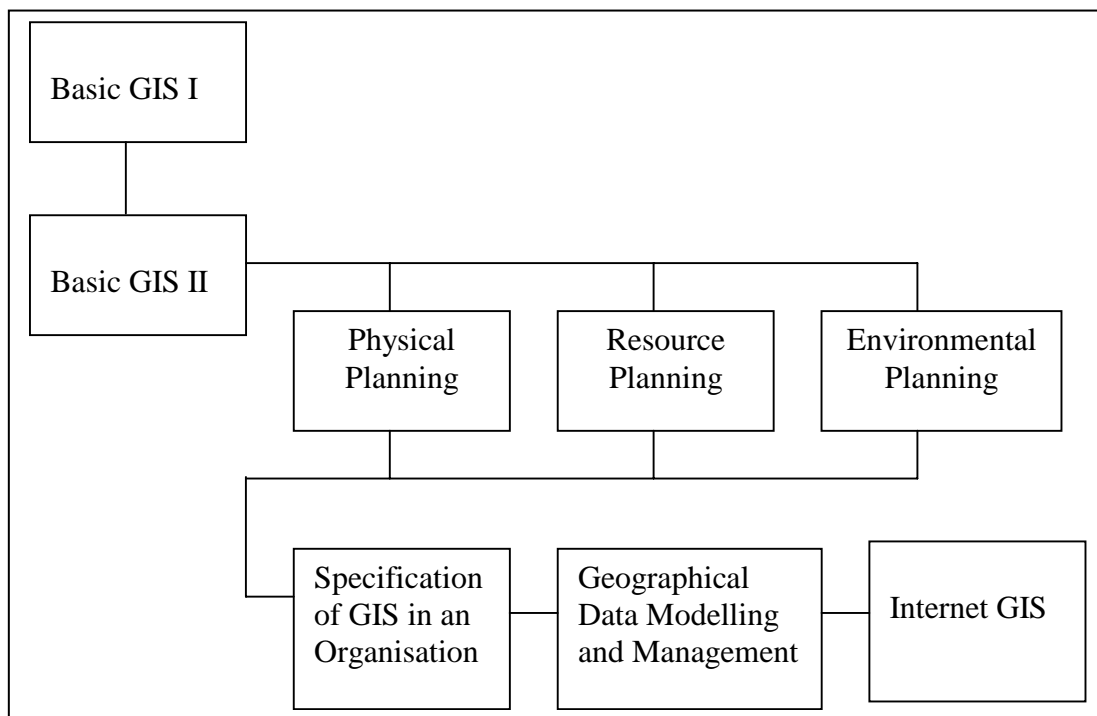
Fig 2. Course relationships and suggested paths

7. Geographical Data Modelling and Management (The students will be able to use conceptual schema languages to describe (simple) information models and how to convert the models into databases suitable for geographical data, how to manage the database, including the user access to databases).

8. Internet GIS (On completing the module the students have knowledge on how to visualise geographical data, both as traditional maps and as perspective views. The students will also have experience on how to distribute and use geographical data over Internet).

5. Pedagogic and technological challenges in the project

The implementation of the E-GIS modules are panned to be as flexible as possible for the user groups concerning pedagogic and technological solutions. Some of the users starts and finish when they want *(Individual learning path)*. Others will be working in synchronous groups starting and finishing simultaneously *(Joint learning path)*. These two different approaches require different pedagogic and technological planning. Both has advantages and disadvantages regarding necessary resources and communication models. At the moment, we are in the project process of finding pedagogic solutions for the implementation of „full freedom" and synchronous group solutions.

Individual learning paths give possibilities for greater flexibility. This will, possibly be an advantage with target groups spread over the continent. Individualization will require numerous resources for

implementation, in case each student should be supported individually. Most possibly, a kind of „self-correction" type of tasks could be basis for evaluation.

Joint learning path gives possibilities for the students to interact and exchange experiences through the course. One may establish student groups, net-discussions and student-to-student evaluation.

The „transport" of GIS information requires Internet connection with high capacity (broad-band). So it was decided to develop the special site (**www.e-gis.org**) for E-GIS project (Fig 3, 4, 5). Besides unequal access to broadband and even computers in some of the partner countries, there are technical challenges among the partners and target groups, how to access all these with the same information and the same goal for competence development. The modules developed in the E-GIS project, will be designed for many different user-groups implying that the demand on flexibility is extremely high. The partners will contribute with target groups comprising campus students and civil service employees. Some groups will be spread over Europe and some being concentrated in closer regions.

Students with a higher level of technical facilities will be able to use sophisticated e-learning tools, video streaming and on-line chatting while other students have to rely on written material and audio streaming. However, it has to be stressed that, independently of technical facilities, all students should be given learning material that are equal in terms of theoretical and practical contents.

LUVIT is choosed as the tool for developing the course modules in the E-GIS project.
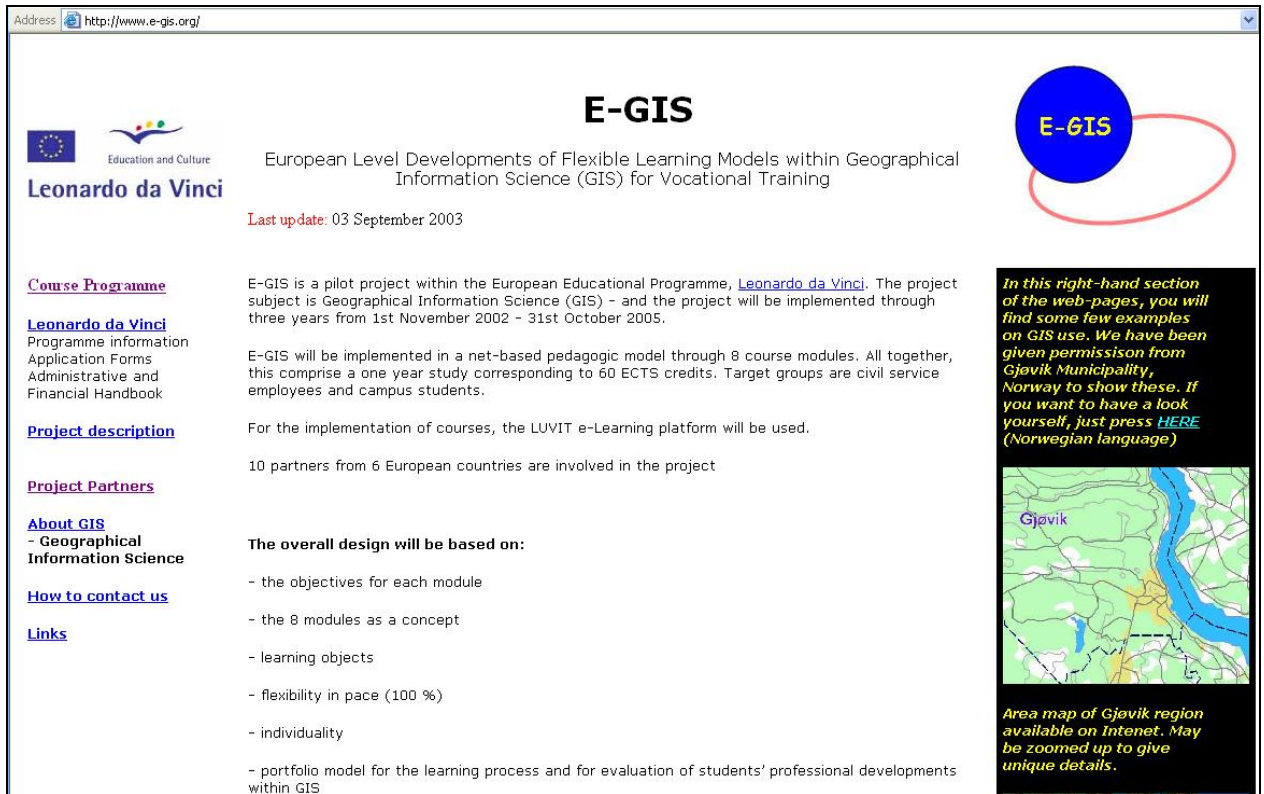
Fig 3. Main homepage of the E-GIS site

Fig 4. Homepage of the E-GIS course programmes

Fig 5. Homepage of the course GIS I

6. Expectations

The specific results of the project can be divided into three parts; 1) Development of GIS course material adapted to flexible learning methods based on ICT, 2) New methods of building up course modules for the adaptation to specific target groups, and 3) A strengthened international network concerning GIS, resulting in future close cooperation.

The main target groups for the courses will be ordinary students in higher education as well as professionals. The course material will be adjustable according to educational level, technical support and area of interest of the target group.

Continuous evaluation of theoretical as well as pedagogic content of the courses will assure broad applicability. All course material will be developed in printed form, on CD ROM and available in interactive form on Internet connected to e-learning systems. The cooperation between the universities will also provide possibilities to „share" experts and strengthen multidisciplinary international research and education within the European society.