Reuse and Sharing of e-Learning Materials Inside the EU

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Key words: e-Learning, curricula, education, geoinformation/GI

SUMMARY

The paper deals with the principles of organizational, conceptual, networking and business issues concerning the reuse and sharing of the existing learning materials in Spatial Information Management (SIM) among the universities. The paper demonstrates the theoretical issues through the eduGI (Reuse and Sharing of e-Learning Courses in GI Science) project and gives an example for an e-Learning material under the topic of the "Data acquisition and integration" course developed by the University of West Hungary, at the Faculty of Geoinformatics. The paper explains the idea how to (re)use existing resources by the exchange of e-Learning courses via Internet and it lists the benefits of such kind of action.

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1. INTRODUCTION

There are many efforts world wide in the creation of e-Learning modules and learning environments.(Farell 2001) Although e-Learning increases the efficiency of education, the investment of resources is not very effective, many developments are running in parallel. If we focus on the re-use of existing resources and the more effective use for future developments, e.g., updating teaching materials, we can utilize the *virtual mobility* with better efficiency. By the practice the adaptation of the existing learning materials usually means the adaptation to English language or using concepts and digital teaching materials of existing regular courses.

2. METHODOLOGICAL AND CONCEPTUAL ISSUES

2.1 Course development

2.1.1   Importance of the syllabus

The syllabus as a document with an outline and summary of topics to be covered in a course is a key factor for the success of any e-Learning course (Markus 2004) Within eduGI see also one example:
http://edugi.uni-muenster.de/eduGI/downloads/08/teaching_materials_UWH_data_acquisition_and_integration.zip).

 In the syllabus the following topics should be described:
- Contacts

> Giving the full name, photo, e-mail and other data of contact persons. Here the teacher, tutor and administrator positions should be distinguished.

- Goals

> This section introduces the aims, learning outcomes, skills, competences, the main topics, methods and principles of the course delivery. As an example, let's see a part from the "Goals" section of the "Data acquisition and integration" course:
> *"The course gives an overview about the data acquisition methods and the derived products in surveying, GPS technology, laser scanning, photogrammetry and remote sensing. The students will get knowledge about the up-to-date sensors, evaluation procedures emphasizing the connection and integration between the different methods.*
>
> *The course is separately dealing with the problem how to integrate the gained data and products into a GI system in order to give possibility to derive*

secondary data from the primary data sources. Upon completion of the course the students are expected to have knowledge in:

> *- the methods and sensors of data acquisition in surveying, GPS, laser scanning, photogrammetry and remote sensing,*
> *- the evaluation procedures and application areas of the derived products,*
> *- data integration procedure into a GI system."*

- Contents

Here the course content is described using the structure of "parts – modules – units" hierarchy and the explanation about the characteristics of the material is introduced here as well. It is useful if we try to group the modules into "Parts" by the logic of whether they targeting theoretical, practical or analytical skills. Here is as an example of the above mentioned course:

Part 1

Part 1 gives basic knowledge to help to understand Part 2 and Part 3 and it takes approx. 20 hours to go through.

Module 1	*The Basics of Positioning*
	Unit 1.01. The Position and its Characterization
	Unit 1.02. Reference Systems
	Unit 1.03. The Methods of Positioning

Part 2

Part 3 discusses the different data acquisition methods giving mainly theoretical knowledge with some practical examples. This part takes about 35 learning hours to go through.

Module 2	*Surveying*	
	Unit 2.01.	*Determination of Height*
	Unit 2.02.	*Distance Measurements*
	Unit 2.03.	*Angle Measurements*
	Unit 2.04.	*Data Processing*
Module 3	*Global Navigational Satellite System*	
	Unit 3.01.	*GNSS concepts and principles*
	Unit 3.02.	*GNSS components*
	Unit 3.03.	*GNSS measuring technologies*
Module 4	*Laser scanning*	
	Unit 4.01.	*Fundamentals of laser scanning*
	Unit 4.02.	*Sensor technology*
	Unit 4.03.	*Accuracy*
	Unit 4.04.	*Data processing*
Module 5	*Photogrammetry*	
	Unit 5.01.	*Basics*
	Unit 5.02.	*Orientation of images*
	Unit 5.03.	*Data acquisition methods*
	Unit 5.04.	*Digital photogrammetric workstations (DPWS)*

Module 6   Remote Sensing
Unit 6.01.   Physical Principles
Unit 6.02.   Imaging Systems (Sensors)
Unit 6.03.   Elements of digital image processing
Unit 6.04.   Applications of Remote Sensing

Part 3

Part 3 is more practical and the main concept is to explain how to integrate different data sources into a GI system considering the cost issues, capabilities and effectiveness of different systems.

Module 7   GIS in data integration
Unit 7.01.   Data integration in GIS
Unit 7.02.   Data capture in GIS
Unit 7.03.   Data integration - Derived products

As it is seen from the list, that the modules are divided into smaller parts called learning units. By this approach we give for the students a clear overview about the content and they can plan their activities in smaller portions, which is very useful if we consider that a typical e-Learning student has shorter time at once for a short period only and hence he/she prefers to acquire the learning material in small portions.

- Methods

Here we should list the key issues necessary for the successful completion of the course. Typically here is mentioned the methods of communication and exam, the expected workload, etc. Let's see one example for this part:

- Problem-oriented approach, theory and application areas
- Asynchronous part: what students do on their own, reading textbook, reading online materials, self-tests, homework
- Synchronous sessions (discussion of problems and tasks in 3 synchronous sessions)
- Email contact to teachers and tutors
- Student-student interaction via BlackBoard forum
- Written exam at the end of the course
- Students workload: 90 hours, equivalent to 3 ECTS credit points.

- Participants

In this section the primary target group as potential students together with the pre-requirements should be described exactly.

- Organization

This part mainly is about the time schedule, indicating the duration, the date of the synchronous sessions, the date of the final exam. Also here is mentioned the planned number of participants.

- Successful participation

> In this section the clear regulations for the successful completion of the course are given. Even the list of tasks together with the deadlines can be listed here.

- Course preparation

> Here are listed all the steps which are necessary to start the course. Typically it means that we should organize a test of synchronous session and provide (upload) the learning material to the e-Learning platform, or as an option we can provide some off-line materials (books).

- Literature

> This section contains the list of the required and recommended literature and other useful optional learning materials.

2.1.2   Course content

If we want to re-use and share the teaching material in an e-Learning environment we have to put some efforts on the conversion and update based on our existing material. Here we can meet the following tasks:

- Adaptation to other language (e.g. Hungarian-English).
- Conversion of plain texts into ppt presentations.
- Development of demo software for carrying out the practical tasks through Internet (for example a program for coordinate translation between different systems).
- For self assessment we need to work out tasks, assignments. When we think out the assignments we need to consider the amount of time planned for the given module, otherwise the students will not be able to complete each task.
- We need to plan the synchronous sessions and for this we have to prepare special interactive aids (e.g. video, interactive software usage tutorial, etc.)

3. ORGANIZATIONAL ISSUES

3.1 E-Learning platform

3.1.1   Available tools

An appropriate e-Learning platform for the given e-Learning course should be chosen carefully. Mainly there are two options. A platform can be developed using the available open source tools (e.g. MOODLE) or a license (e.g. Blackboard) should be purchased. Each choice has its own advantages and disadvantages. If a "in-house" way is chosen, there would be necessary to employ not only web masters but also programmers, or at least professionals who can utilize all the aspects of an open source environment, which is typically based on Linux logic. But on the other hand the system can be accommodated for the user's needs deeply (Markus 2001), (Katz 2002).

If the off-the-shelf version is chosen the operating institution needs only administrators who can operate the system and in this case only the built-in functions can be utilized.

On the other hand I need to add that these systems are well tested and the built-in functions are assuring a stable operation.

Usually an e-Learning platform should offer at least the following tools (see also Figure 1.):
- Communication with the students (e-mail, voice-mail, announcements)
- Discussion board
- Tools for synchronous sessions
- At the course delivery: handling of different file formats like html, ppt, pdf, doc, mp3, etc.
- The assessment facilities like test manager, upload of tasks.
- Course calendar
- Gradebook, course statistics

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Content Areas		**User Management**	
Syllabus	Assignments	List / Modify Users	Remove Users from Course
Course Documents	External Links	Batch Create Users	Manage Groups
		Enroll User	
Course Tools			
Announcements	Glossary Manager	**Assessment**	
Course Calendar	Messages	Test Manager	Gradebook
Staff Information	Content Collection	Survey Manager	Gradebook Views
Tasks	Course Portfolios	Pool Manager	Performance Dashboard
Send Email	Check Collection Links	Course Statistics	
Discussion Board	Copy Files to Collection		
Collaboration	Voice Announcements	**Help**	
Digital Dropbox	MyDropBox Suite (Safe Assignments)	Support	Contact System Administrator
		Manual	Quick Tutorials

Figure 1: Control panel of the Blackboard e-Learning platform

3.1.2 Synchronous sessions

The synchronous sessions are the central part of each e-Learning course. At these sessions the students have possibility to ask directly the tutor and it is a good possibility for the tutor to survey the common problems and the opinion of students as well. Here the tutor can explain some parts of the course which are too complicated to describe in off-line manner.

As it was experienced this method of teaching needs a lot of time from the tutor to be prepared for it. Not only because of the students can ask any aspect from the material, but also because of it needs a good practice from the tutor not to lose the main stream in the material, since the students usually ask about those issues which are not discussed in detail in the teaching material. Especially we should avoid those students who want to test the knowledge of the tutor, since it's boring for other on-line session participants who usually want to concentrate instead on the assignment issues.

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3.1.3   Final exam

The final exam of an e-Learning course is a sensitive part, since usually the students should be virtually collected in the same time. But in general there are mainly two options for the organization of the final exam. The exam can be organized in the frame of a synchronous session, which is very useful since the tutor can ask to form small groups during the exam asking them to solve more complex tasks. Also the tutor can help the students if they don't understand the task or they stuck somewhere in the practical task. The only negative aspect of this type of exam is that some students - who miss this synchronous session - are not able to pass the exam at all. In this case the tutor should consider the possibility to give a chance to take the exam off-line with the help of the local partner tutors of the student's institution.
The other effective method for the final exam is a test session which is open for a limited time (usually 24 hours). In this case each student can find a time window to complete the test. For those who has no time at all in the announced time-frame, the tutor can allow and assign for each student an individual date for the exam.

4. EXPERIENCES

In the eduGI project (EU eLearning Programme ref. EAC/23/05 DE 011.) eight European GI institutes use existing courses and adapt them to the requirements of the e-Learning course exchange. Each partner contributes one course, to be taught on a non-profit exchange basis with the partners. An e-Learning platform of ISEGI-UNL, Portugal is used. This platform has been successfully providing an e-Learning MSc Program in Geographic Information for more than three years. During a previous work in the ALFA project eduGI.LA (www.eduGI.net/eduGI.LA/) a prototype was developed for the e-Learning course exchange and evidenced feasibility. The organizational framework for execution and recognition of students' achievements was prepared by the cooperation of the eduGI.net consortium (www.eduGI.net).

4.1 Business plan aspects

4.1.1   Common points

A good business model is a crucial part of any e-Learning course (Brox-Riedemann-Kuhn 2006). The members of the eduGI consortium agreed on the standards of all courses by the following:
- English language
- Designed for execution with 30 students, 15 per receiving partner
- Designed for a students' workload of 90 hours
- Implemented on common e-Learning platform, see ISEGI/UNL (http://www.isegi.unl.pt/ensino/e-learning/default.asp)
- 13 synchronous sessions ("online-contact-session", 60 – 90 minutes)
- Courses focus on interactive components, e.g., practical software examples, practical problem solving, students' progress controls after each sub-module

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- Teaching, supervision, students contact, and final exams in the responsibility of the providing partner
- Quality assurance (criteria to be defined)
   - Two teachers of the two receiving institutes evaluate the course's quality before its execution, based on the course concepts
   - Students evaluate each course directly after its execution
   - Teachers of receiving institutes attend and evaluate at least 1 synchronous session during execution
   - Final evaluation report by teachers of receiving institutes
- Recognition of students' achievements.

The consortium members agreed on that the development of the European e-Learning environment is organized in the following phases:

1. Design (Organizational framework for project cooperation and virtual mobility, preparation of technical platform, raw-concepts of provided e-Learning courses, to be evaluated and decided on a project meeting).
2. Prototyping and testing (provision of e-Learning courses test versions, execution of courses, evaluation of execution, to be discussed and decided on a project meeting).
3. Implementation of e-Learning courses final versions, based on the test results, and exploitation plan .
4. Dissemination of results by publication of results and digital teaching materials, and execution of eight e-Learning workshops.

Its an important issue to mention that the e-Learning environment will be open to all GI institutions, which, in exchange, add teaching materials to the e-Learning platform. The use of teaching materials will be without charge; there might be a small fee for the maintenance of the platform. The copyright of teaching materials remains to the providing institution.

Important part of any business model is to determine the target groups. At the eduGI project the following groups are targeted:
- Teachers/trainers (higher education)
- Students
- Adult learners
- Persons with special needs
- Political decision-makers/administrative staff
- Education authorities
- Curriculum development specialists
- e-learning Industry
- The research community
- Institutes for Geographic Information
- Managers of non-GI institutes targeting the introduction of e-Learning.

4.1.2 Structure and content

The content of each course is organized in modules, and stored in a platform. The platform allows the storage of different types of materials including full courses and other less formal teaching materials. A complete course in the platform can integrate the following items: explanatory text; main text; exercises; data; questions for auto evaluation; project description; final exam, other materials including images and video, and a students' discussion forum. Each course is divided into modules. Each module is typically composed of a text, exercises, auto evaluation, questions (True false or multiple choice). For each module there are three on-line synchronous sessions where students can interact with tutors and have access to demonstrations, summaries and web links. Students have also access to chat within the platform as well as to forum for the program (see Figure 2.).
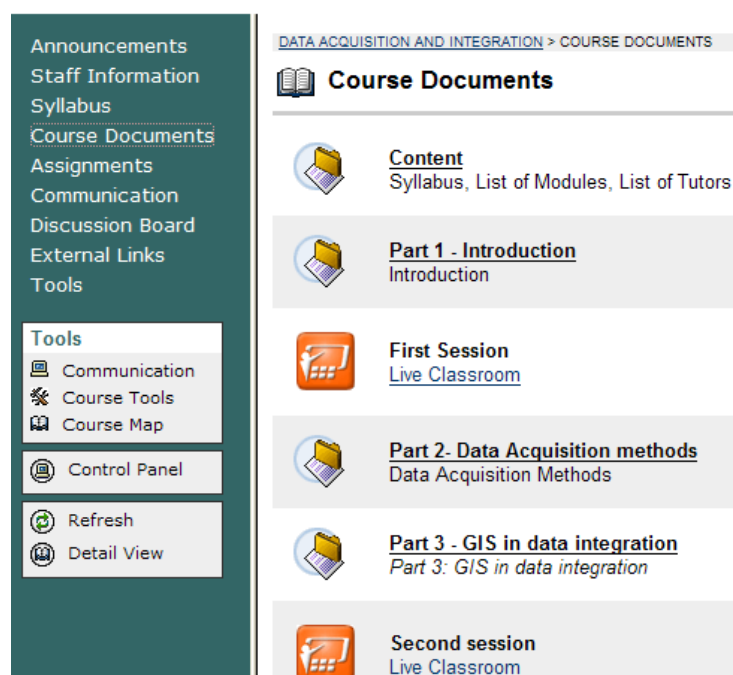
Figure 2: Course documents of eduGI course No. 4

5. CONCLUSIONS

The development and exchange of the following eight e-Learning courses is foreseen: Project management, GI standards, Advanced Geospatial data mining, Data acquisition and integration, Visualization, Geographic data bases (advanced), Virtual excursions in Earth Sciences, Data quality.

The vision is to exploit the organizational framework and the created e-Learning courses by the establishment of a common, virtual GI Master Program in Geoinformatics. The concept of sharing and reuse of resources by best-practice examples is being disseminated to non-GI communities.
Additional expected benefits:

-The quality of the existing teaching material will be improved further.
-There will be possibility for access to international know-how and new topics, that is normally not available for students by own resources.
-The virtual mobility of teachers and students can be improved.
-It contributes to the implementation of the Bologna process by international cooperation of European institutes, based on the existing networks.

The results of the eduGI project can be utilized in Working Groups of the curriculum development and e-Learning work plan at FIG Commission 2.

ACKNOWLEDGE

Providing university	Provided course
1. Ifgi, University of Münster, Germany	Project management
2. UniBw München, Germany	GI Standards
3. ISEGI-UNL, Portugal	GeoSpatial Data minig
4. University of West Hungary	Data acquisition and integration
5. ITC, Netherlands	Visualisation
6. Harokopio University, Greece	Geographic Data Bases (Advanced)
7. Uppsala University, Sweden	Virtual excursions in Earth Sciences
8. TU Vienna, Austria	Data quality

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BIOGRAPHICAL NOTES

Dr. **Tamas Jancso** gained his MSc degree in 1990 at the University of Geodesy and Cartography in Moscow at the Faculty of Aerial Surveying (with honored diploma). Working now as an associate professor and vice-dean at the Faculty of Geoinformatics of the University of West-Hungary at the Department of Photogrammetry and Remote Sensing. Thirteen years of experience in teaching of photogrammetry and photo-interpretation. Staff member in the formation of open and distance learning facilities at the faculty, co-author of two distance learning modules. He has experiences in using digital photogrammetric workstations. In 2006 he gained the Ph.D. degree in the topic of "Photogrammetric application of nonlinear models in geo-environmental sciences".

Prof. **Bela Markus** is a land surveyor, M.Sc., Ph.D., Professor of Geoinformatics and Dean of the Faculty of Geoinformatics, University of West Hungary. He has 35 years teaching experience in surveying, 20 years in teaching GIS and 15 years in development and organization of open, distance learning professional courses for land administration.
He has over hundred publications on various aspects of using computers in surveying, spatial information sciences and educational developments. He is actively involved in many national and international academic programmes, chairman of the National Committee of Association of Hungarian Surveyors and Cartographers, chairman of the Hungarian UNIGIS Course Board. He was the chair of the Working Group 2.4 Knowledge Transfer in Spatial Information Management (2002-2006) and currently chairing FIG Commision 2 – Professional Education and member of the Board of Directors of FIG Foundation. He is also member of the Executive Committee of EUROPACE (Leuven, Belgium).

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