

## International Exchange of E-Learning Courses

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### Abstract

After expiration of many internationally and nationally funded e-Learning projects, new models for e-Learning courses at low costs and high quality are needed. We suggest an international exchange of e-Learning courses including teaching personnel. This paper will present a prototypical setting of the eduGI.LA network (see [www.eduGI.net/eduGI.LA/](http://www.eduGI.net/eduGI.LA/)): Seven Latin-American and European GI institutes exchanged GI teaching materials; two partners executed two course modules in a virtual teaching session with Portuguese and German students. The prototype tested the feasibility and the effectiveness of our approach: i. The e-Learning platform is performing well and can be employed with low costs; ii. The content bases on existing courses, which requires low costs for adaptation to the common e-Learning environment, e.g., by translation from Portuguese to English; iii. Our model not only performs an exchange of courses but also of teachers via the internet, which results almost no effort for the receiving institutes; and iv. The course modules' execution was evaluated positively by students and teachers.

### Introduction

Many e-Learning projects evoked in the past years, e.g., GITTA – Swiss Virtual Campus (<http://www.geo.unizh.ch/virtualcampus/gitta/>), e-MapScholar (<http://edina.ac.uk/projects/mapscholar/about.shtml>), and the German project “GI-Multimedia for a new interdisciplinary course of studies” ([www.geoinformation.net](http://www.geoinformation.net)). These projects show the potential of e-Learning: improving quality of GI education and facilitating learning “whenever and wherever” students and professionals are able to. However, high-quality e-Learning evokes high costs by

- Developing interactive e-Learning modules instead of putting teaching materials on the web
- Ongoing updating of courses to the state-of-the-art
- Adapting external teaching material according to the teachers' specific needs.

In the recent five years, many e-Learning projects have been funded, nationally and European-wide. These projects provided lots of progress, but after the hype in these years resolving many funding opportunities, there are not many additional funding opportunities for e-Learning in sight. New business models for sustainable employment of e-Learning are needed.

We suggested an international cooperation and exchange of e-Learning courses for a more effective use of resources (Brox, 2003: Discussion Paper: Exchange of Internet-based GI Teaching Modules. AGILE 2003, Lyon, France, pp. 213-221. <http://agile2003.insa-lyon.fr/english/english.htm>). Our goal is create a new model of exchange of e-Learning courses, which reduces costs by using existing resources, and enhances quality by a networked cooperation of international partners. The cooperation of Latin-American and European partners in the ALFA project eduGI.LA ([www.eduGI.net/eduGI.LA/](http://www.eduGI.net/eduGI.LA/)) offered the opportunity to initiate and test a new way in exchanging e-Learning courses.

The following section will describe the eduGI.LA network and its approach of e-Learning cooperation. Afterwards, we will provide an overview on the employed e-Learning platform of ISEGI/UNL. The fourth section will describe the content of the prototypical setting as well as the execution of two course modules, and its evaluation. Finally, we will discuss the achieved results and provide an outlook on implementation of the prototypical setting.

## **E-Learning cooperation in eduGI.LA**

Seven Latin-American and European partners cooperate in the ALFA project eduGI.LA (IT Toluca, Mexico; INPE, Sao José, Brazil; UFPE, Recife, Brazil; U Concepción, Chile; UJI, Castellón, Spain; ISEGI/UNL, Lisbon, Portugal; ifgi, U Münster, Germany). The objectives are to set up an organizational framework for cooperation in GI Science education, and to execute mobility measures of students and teachers. In October 2003, the partners agreed on a common e-Learning environment. The final goal is that each partner provides one to two e-Learning courses in English language to the network.

The key idea is that each partner provides an existing course as an input, and teaches this course herself/himself. Thus, we target the following objectives:

- An exchangeable course is developed for low costs, e.g., by mere translation of a Portuguese e-Learning course to English, or by adaptation of a regular course with contact hours to e-Learning requirements.
- The e-Learning courses can be executed with low resources of teaching personnel, because a second execution of an existing course does not affect additional effort for course conception or preparation.
- The receiving institutes have almost no work with the e-Learning course, because the providing institute does students' attendance and exams. The adaptation of external teaching materials to her/his own needs omits.
- The network partners can provide new courses to their students, which they cannot provide by own resources, e.g., U Münster has no resources to teach the ISEGI/UNL topic of data mining.
- The students of the receiving institutes are taught by external teachers. Thus, they get a broader experience with different teaching cultures and methods.

EduGI.LA uses the e-Learning environment of ISEGI/UNL. For more than three years it successfully serves as a platform for the Portuguese GI Master program. The platform allows the storage of different types of materials including full courses and other less formal teaching materials, e.g., images and videos.

Each course is divided into modules. Each module is typically composed of teaching materials, exercises, auto evaluation, student-student interaction, and exams. Tutoring and exams will be executed by the institute that provides the course.

EduGI.LA implemented a prototype for a common e-Learning environment consisting of

- E-Learning platform
- Teaching materials of five course topics
- Two course modules (each including one synchronous session) in data mining, and digital cartography
- Execution and evaluation of two modules
- Links to free accessible teaching materials.

## **ISEGI/UNL e-Learning platform**

The e-Learning platform used makes available a number of tools, both synchronous and asynchronous. It is important to refer that the platform also provides tools to manage the students and their academic activities, such as the number of times the platform is accessed by each student, student performance and other statistical indicators. The synchronous tools include a "chat" facility and also an environment for carry out synchronous sessions emulating the environment of a classroom. The "chat" is a tool which is always available to students and which they use to exchange ideas, help each other and discussion among them. The synchronous session can be thought of as "virtual classes", they usually take 2 hours and are scheduled in the students timetables in the beginning of the semester. During the synchronous sessions the teacher has the possibility of using slide shows, launch software sites in the students computers, make software demonstrations and even hand over the control of the software to the students. Quizzes can also be used during these sessions; in this case the teacher launches a question to which the students must answer, the teacher will have access to a statistical report on the performance of the students.

The asynchronous tools encompass a forum, e-mail, online exam's to monitor the progression of the students, and the possibility of store and organize different types of materials which can be downloaded by students. These materials can include different types of files, from Word, Pdf or executable files provided by the teachers, which the students can download. In the forum students can kick off topics for discussion, and through this facility exchange ideas and see their questions and difficulties answered. The e-mail is the medium through which students are contacted. Students can use the e-mail to ask for indications from the instructors and work out problems and difficulties in the learning process. Additionally, there is the possibility of establishing appropriate service quality standards, for instance no e-mail should have a time period between reception and reply above 48 hours.

All the functionalities and facilities can be provided to the student at a self paced rhythm, additionally, the instructor can define the schedule for allowing access to the different materials (for instance the student should only have access to chapter 2 of the study manual after completing with success the online exam for chapter 1).

## **Results - E-Learning courses**

The eduGILLA e-Learning environment currently is a prototypical setting. The implementation is planned by a follow-up ALFA project. We target the extension of the prototype to seven complete courses.

Five partners provided teaching material, based on existing courses:

- IT Toluca, Mexico: Pattern recognition
- INPE, Sao José, Brazil: TerraLIB
- UFPE, Recife, Brazil: Software applications, e.g., cartographic engineering
- U Concepción, Chile: Spatial databases
- UJI, Castellón, Spain: Spatial Data Infrastructures.

A joint e-learning test session was held between the New University Lisbon and the University of Münster. Each side provided contents for a learning module: Data Mining for the Geosciences (Dr. Fernando Fernando Bação, Lisbon) and Symbolization in Digital Cartography (Prof. Dr. Werner Kuhn, Münster). The goal of the session was to evaluate the potential of the chosen platform to support e-learning in GIScience topics. The two teachers and a total of 21 students participated, 7 from Lisbon and 14 (registered in groups of two, as 7 students) from Münster. All participants were advanced students or researchers in GIScience. The combined session lasted for two hours.

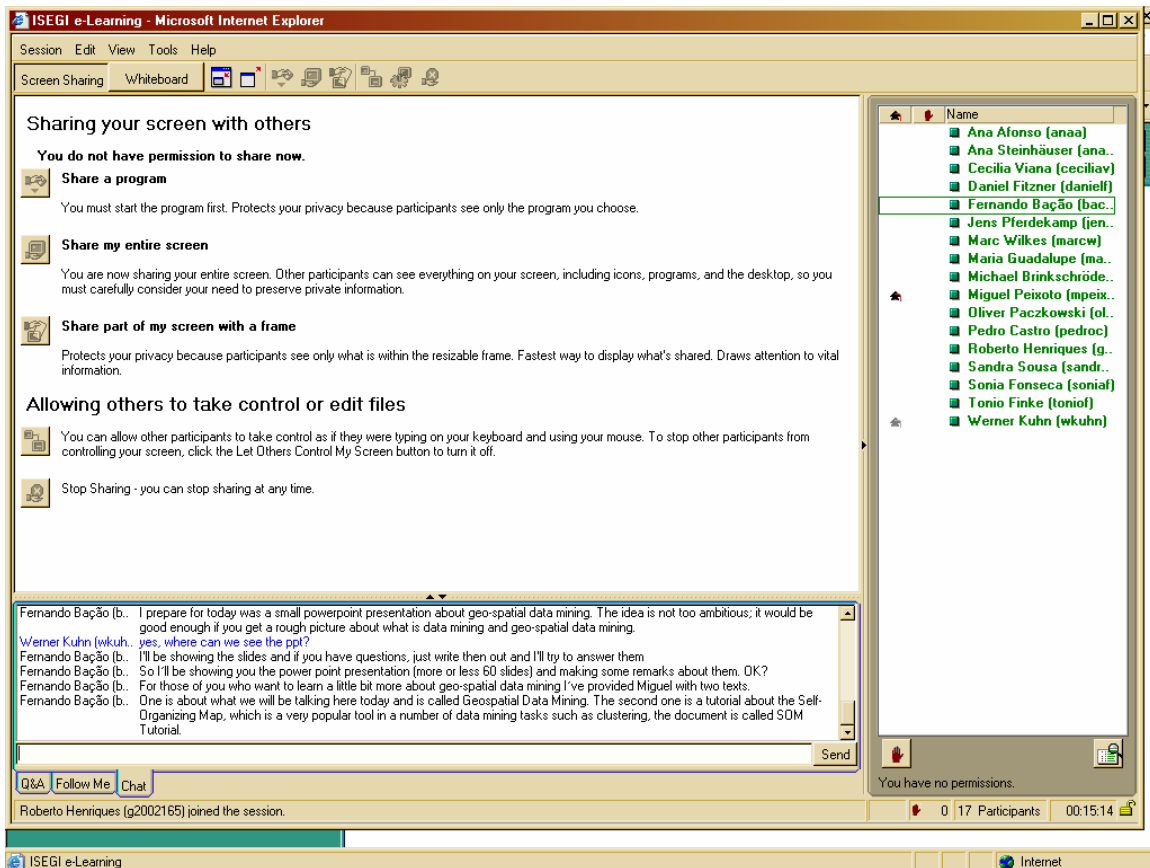
Due to the lack of available student time before the live session, no content or tool preparations were possible. Also, the participants did not have any previous experience with the platform. The preparatory learning situation was simulated by having participants who were at least partially familiar with the contents.

The following sections evaluate the execution from the teachers' and the students' perspectives.

### **Digital Cartography (provided by ifgi)**

The contents of the cartography module addressed the core theory for producing thematic maps: that of visual variables and their selection criteria. The course slides contained a complete description of an evaluation framework for selecting visual variables. An additional slide set contained further details for the special visual variable of color. Finally, a background text book chapter was scheduled to be available for students, but could not be transferred due to copyright limitations.

**Figure: Screen showing the ongoing session.**



The teacher experience with setting up and testing the platform can be summarized in the following points:

1. The *functionality* of the platform appears well thought-out and appropriate to the challenges of remote teaching, communication, and learning in a class-room setting. Splitting the functions into a whiteboard, chat, and question/answer panes helps to streamline the various communication channels and covers most of the needs. The broad range of functions was not fully exploited in our session; in particular, the possibility to use video and audio channels, was not used (for lack of installed equipment), but felt to be highly desirable.
2. The *usability* of the features and of the overall platform *in action* was deemed good (a rating of 4 on a scale of 5). Generally, functionality was self-explanatory, and became easy to use with brief hints from platform experts. The feature of sharing an application on the teacher's machine with all participants only worked partially, producing an empty application screen. In the short available time, it was not possible to determine the reason for this problem and how to fix it.
3. From the teacher's point of view, the apparent limitation of students to textual inputs seemed unfortunate. However, it is recognized that visual interaction would add significant complexity to the system.
4. As it is so often the case in using software, the *biggest usability problems* resulted not from the functionality or any other content-related features, but from the operating system environment and constraints on it. Setting up the browser environment to log on to a session proved to be a major hurdle. It is unfortunate that such tools are restricted to a single (Microsoft) internet browser and that they require particular versions of the Java Runtime Environment. Arranging all the necessary technical settings on class-room computers was only possible through major security compromises from the local system administrator. It may currently be an unsolvable dilemma that specialized functionality requires plug-in installations and that such installations are typically ruled out on class-room computers – but this limits the practicality of using such a platform significantly.
5. Interestingly, a student commented privately that some people could feel uneasy commenting and asking questions if their inputs were always labelled with their names. This may indeed be a *privacy issue*, in some cultural environments more than in others.

6. From a larger perspective, the experience of this test session clearly showed that the medium constrains the message. Slides that are made to be shown while a teacher talks are different from slides that are consumed offline and these are different again from slides that are accompanied by explanations in the chat area. The key didactic issue is how *the story* is distributed over the communication channels. At this very limited level of familiarity with the tool and the techniques, the story got lost and workflows or “thought-flows” tended to be interrupted. Students as well as teachers were often either waiting for input, or overwhelmed with it. Clearly, tools shape tasks, and teachers as well as students would adapt their behaviour to such a platform, smoothing the teaching and learning experiences.

### **Data mining (provided by ISEGI/UNL)**

The basic idea was to provide an introduction to the topic of data mining and geo-spatial data mining. This way the major driving forces of data mining were explained, definitions presented as well as the most relevant tools available. The second part was devoted to the presentation of geo-spatial data mining. Here the objective was to highlight the differences between data mining and geo-spatial data mining and emphasizing the special nature of the spatial data.

As the session was organized for students that didn't had any previous contact with the topic, the session was based in a powerpoint presentation. During the session the slideshow was presented along with explanations from the instructor. A particular aspect that should be taken into account is that unlike traditional classes in the context of e-Learning the slides must, as much as possible, be self-explanatory. During the session the students may ask questions and further elaboration on the points that are being explained in the slides.

Clearly, in order to have a successful session the instructor has to put a lot of effort and work on its preparation. The possibility of using different types of documents is one of the advantages that the teacher should use to make his point and motivate the students. It is not easy to make up for the in site presence, and different strategies should be used. One of the most important differences between e-Learning and the traditional presentation method is in the quickness of the interaction between students and teacher. In e-Learning interaction is much slower, and the teacher should be aware of that devising ways of making sure that students are concentrated and enjoying the class. Obviously, the possibility of video-conferencing can be a major catalyser in the teacher/student relation in e-Learning, nevertheless it will not dismiss the prerequisite of good preparation and the development of different types of media materials to use during the sessions. Finally, it is important to draw attention to the fundamental role of a good script. A detailed script of the session is essential for the success of the session. In this script the teacher can write the “story of the film he wants to present”, here the teacher writes most of his participation as well as the questions he intends to ask. A good script is central and it is the only tool that allows the teacher to maintain an adequate rhythm during the session.

### **Students' evaluation**

The evaluation questionnaires were filled in by 14 students of ifgi and 7 students of ISEGI/UNL.

The evaluation by 14 ifgi students provides the following results on a scale from 1 = very good to 5 = very bad:

- Course contents: 2,77
- Teacher: 2,38
- Interaction (student-student, student-teacher): 3,21

50 % of the ifgi students had no difficulties handling the synchronous session. The other 50 % mainly had difficulties with technical issues (slow response, access). Three students complained about lacking information for preparation. About 30 % of the students felt not familiar with the taught subject, and three students had difficulties with English language.

However, in the free text comments, many students emphasized their positive attitudes towards the new e-Learning tool (“nice tool”), given an improved preparation on the online session.. In addition, it was an appreciated experience to “talk” to foreign students.

By the Portuguese students, the contents were considered good and very good as far as geo-spatial data mining goes, and generally medium for the digital cartography session. This would be expected as the session of digital cartography was much shorter due to time constraints and the main objective was to allow the instructor to get familiar with the eLearning environment. The same type of classification was given to the topic interaction (student/student, student/teacher). About half of the participants reported difficulties during the session, mainly in terms of accessing the session and reading the information. This can be explained by the fact that all the participants had never had contact with the eLearning environment used, additionally, during the sessions all the available functionalities were used which adds

complexity to the usability. Finally, three participants reported problems due to unfamiliarity with the topic presented in the session.

## Conclusions and outlook

The eduGILA prototype validates

- feasibility,
- low costs,
- and high potential for students and teachers

of the international e-Learning environment.

We tested *feasibility* by the execution of two course modules. The e-Learning platform allowed the provision of teaching materials and the execution of virtual teaching sessions in English with German and Portuguese students. Although, for the ifgi students and teachers the tool was new, resulting some starting difficulties for implementation and handling the tool.

*Low costs* were achieved by re-use of existing GI modules. The eduGILA e-Learning environment bases on already existing resources of seven partners. The funding of the ALFA project for delivering content was 1.000 € per partner. This amount did not completely cover the costs, e.g., e-Learning platform and students' licences were provided by ISEGI/UNL without charging additional costs. But the amount confirms the low costs, at which the exchange of e-Learning units can be executed. There was almost no work for the institute that was receiving the course module, vs. the previous model of adapting external teaching material. In addition, our model will reduce costs for updating the courses. Each partner will only be responsible for one course that she/he will update anyway because each e-Learning course is also a regular course of the providing institute.

By the execution of an international online session, we saw a *high potential of the e-Learning environment for students and teachers*:

From the ifgi teacher's perspective, unfamiliar with the tool, the experience with the platform was pleasant and encouraged us to use this kind of technology in future courses. The support for problem-driven learning is probably one of the strongest advantages provided. If teachers and students are appropriately prepared, and the use of the technology is designed into the curriculum (or the individual course), great benefits can be reached by encouraging interactivity and enabling it across geographic boundaries.

Taking into consideration that no content or tool preparations were possible, we think the students' evaluation results are very promising. Complaints about these problems were justified. Nevertheless the tool, new to the students, was mostly evaluated from medium to good. Another positive hint for students' acceptance of the new tool was their detailed suggestions for improvements, e.g., communication by voice and video conferences.

For future work, we see the following benefits of the implementation of the prototypical setting described in this paper:

- Gain access to teaching topics and units that are not covered by the GI institutes' own staff, e.g., data mining
- Exchange teachers via e-Learning and thus importing external learning methodologies and cultures by the receiving institutes
- Integrate rapidly improving and changing knowledge, i.e., in technologies, because an institute is only responsible for updating one or two courses, not a complete program
- Promote e-Learning in GI Science
- Enhance internationalization by English language modules and common classes of international students
- Promote curriculum harmonization.

Future work will start with a re-design of the e-Learning environment, based an evaluation of the prototype. We foresee the implementation of the following courses:

- IT Toluca, Mexico: Spatial Statistics
- INPE, Sao José, Brazil: TerraLIB, Introduction to SPRING
- UFPE, Recife, Brazil: Cadastre
- U Concepción, Chile: Spatial Databases
- UJI, Castellón, Spain: Spatial Data Infrastructures.
- ISEGI/UNL, Lisbon, Portugal: Remote Sensing, further chapters of Geospatial Data Mining
- ifgi, U Münster, Germany: Digital Cartography.

A similar project also has been initiated with a consortium of eight European partners as a cooperation of AGILE Education Working group and eduGI.net. We foresee the provision and exchange of e-Learning courses in an European e-Learning environment.

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