

Training in Cartography: e-Learning Courses in Thematic Cartography

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Abstract

Interest and demand for cartography as well as for spatial information are increasing nowadays. Therefore, it is especially important to contribute to the dissemination of knowledge about these topics.

The first step to start free e-learning activities at the National Geographic Institute (IGN) in collaboration with the National Center of Geographical Information was made in 2006 in order to disseminate the knowledge of Geographical Sciences. The IGN has developed different courses: Geography for Secondary School, Geographical Information Systems, Spatial Data Infrastructures and Thematic Cartography.

This paper describes the e-learning courses on Thematic Cartography as an achievement aimed at promoting the use of thematic cartography and giving students necessary skills to make maps. These courses have been designed for professionals and students dealing with areas of knowledge related to mapping such as engineering, urban planning, economics, sociology, geography etc., in which it is of special interest to represent data through thematic maps.

Keywords: Cartography, e-learning, maps, IGN

1. OVERVIEW

These e-learning courses are conceived as an e-learning project and internet courses, imparting knowledge about thematic cartography to all kind of users.

There are two e-learning courses on Thematic Cartography organised twice a year (two editions): a Basic course (it has already been given five times) which explains, among other things, different types of maps (topographic and thematic ones), graphic semiology, the concepts of scale and map projections, techniques of thematic mapping, etc; and Advanced course (it will start in November 2010) which is focused on the principles of colour and labelling in cartography, exploratory analysis of spatial data, and geographic visualization.

These 40- hour e-learning free courses (designed for six weeks through a moodle platform of IGN) combine theory and practice, so each course is divided into modules with theory and different exercises provided with Arc Gis software (for the Basic and Advanced levels), and GeoDa and MATLab for Advanced level. In each edition 140 students can be supported simultaneously by four online tutors. The students are in majority Spanish (these course are only available in Spanish) but there are also students from different countries of LatinAmerica (for example; Mexico, Argentina, Peru, Chile, Uruguay, Paraguay, etc.)

These courses are part of the catalogue of e-learning courses that the National Geographic Institute (IGN) and the National Center of Geographical Information (CNIG) offer to public and users in general. This course is taught by the IGN/CNIG in collaboration with Polytechnic University of Madrid: concretely with the Geographic Information Technology Lab (LatinGEO).

2. TRAINING METHOD: E-LEARNING TECHNOLOGY

2.1. What is e-learning?

E-learning is a distance learning method that via electronic technologies provides web-based learning, computer-assisted learning, virtual classrooms and digital communication. As a rule, e-courses combine a variety of technological means and media.

Didactic materials include multimedia (such as hypertexts, images, videos, etc.) and the communication between students is realized through new communication technologies tools (email, foro, etc.).

The main characteristics of this method are the following:

- Flexible schedule for the students: an e-Learning student must have self-discipline to work with the material on a consistent and regular basis in order to acquire the knowledge, pass the assigned practices, and therefore the course. There are usually scheduled test due dates and assignments that must be carried out on time. It needs real self-discipline, as well as time management and organizational skills. This method will be a good choice for those students who have self- discipline and are well organized
- It allows to overcome the geographical barriers and time limitations: the students only need a computer and an internet connection to do the course.
- E-Learning uses a learning management system (LMS) such as Moodle. Using Moodle and a web browser (Internet explorer, Mozilla Firefox, etc.) .Students can log in from anywhere in the world to access to the didactic materials and interact with the tutor and the rest of the students.

All specific course information about contacting the tutor, expected work, and the deadlines for giving in assignments and taking tests will be found within the course site (notice board, forums, etc.)

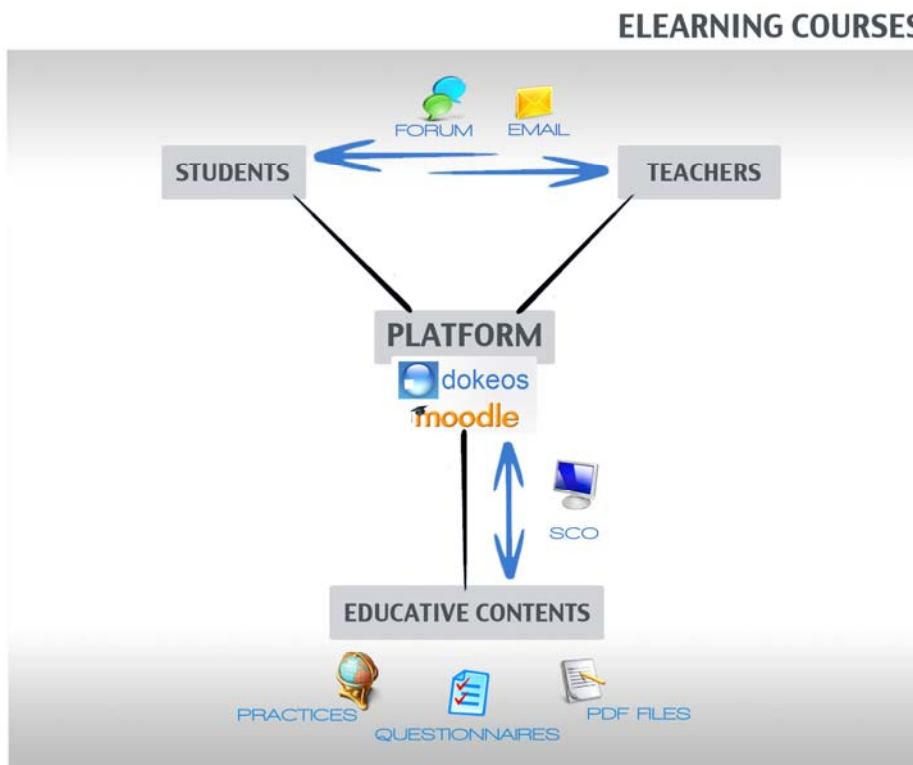


Figure 1. Components of elearning courses

The components of an e-learning course are:

- Virtual learning platform: a tool that allows to manage and present educational materials to students. This platform offers basic features such as course management, communication tools for the participants (email, chat, forums) and assessment tools. The general characteristics of the platforms are that they are means to present and modify the information in a dynamic way and are capable of integrating different resources: images, icons, videos, sounds, etc.

These platforms must be attractive and easy to understand for the user as this directly influences on the effectiveness, efficiency and satisfaction with the course.

There are different virtual platforms: free platforms (MOODLE, Doskeos, etc) and commercial platforms (WebCT, EduStance, etc.).

- Educational content: they are the key components of this type of education. It is very important to take into account the objectives of the course, so its design and all resources should answer these objectives.

All the contents of this environment must be specified as Learning Objects (LO) and be defined by means of a standard. The most frequently used is the standard SCORM. In this way resources (texts, images, videos, etc.) are grouped to form learning objects (the modules in which a course is structured) and to create a SCORM package.

2.2. Software platform used to teach the courses

The platform that the IGN and the CNIG use to teach their e-learning courses is Moodle (Modular Object-Oriented Dynamic Learning Environment).

It is a licensed free software platform. All those involved in e-learning also call it a Learning Management System (LMS). Moodle is designed to help educators create online courseware with opportunities for rich interaction. Moodle logs all activities including views and posts for all learning objects hosted in the system and provides reports and statistics to help the tutors to improve the quality of the course.

A student can access from the homepage of the course to its various components, which are illustrated in the following figure.

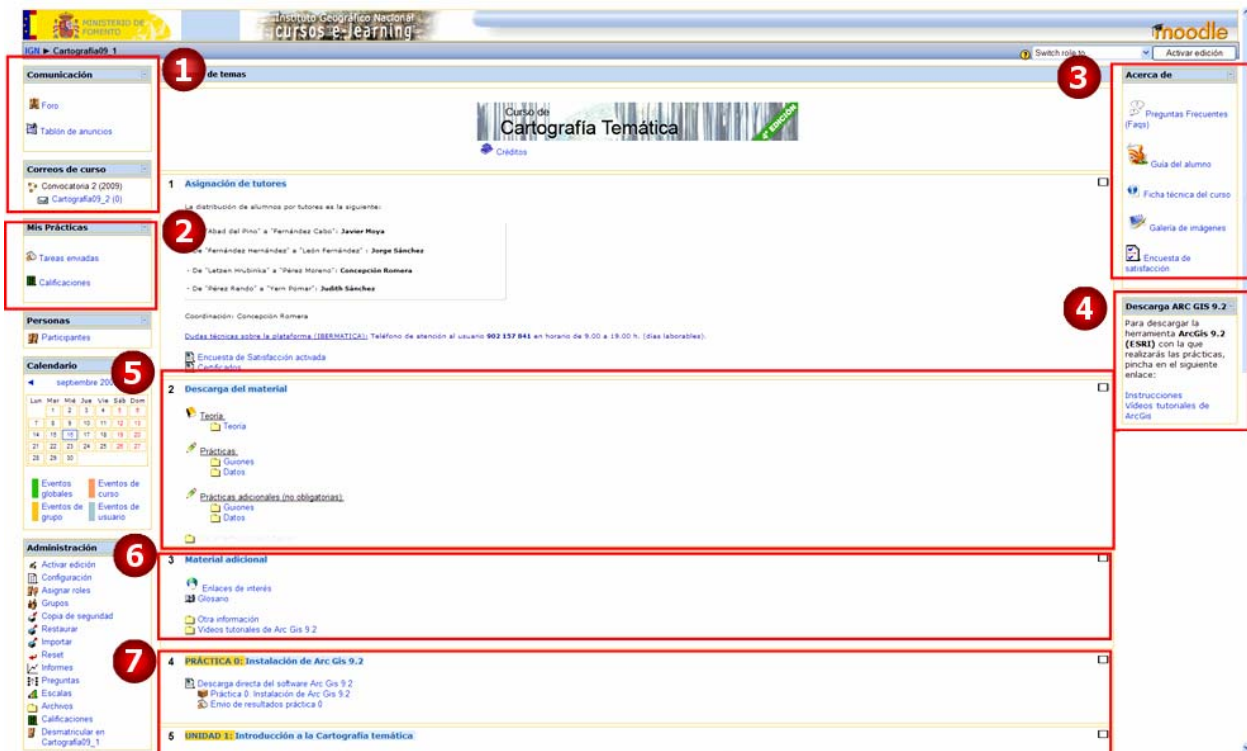


Figure2. Main screen of Thematic Cartography Course (basic level)

1. Communication tools: internal email, forum and notice board
2. Administration area where the students can send their works and know their grades
3. Headline: FAQs, student's guide, image gallery and course satisfaction survey
4. A software download section (basically intended to download the software ArcGIS used for practice and tutorial video about the use of ArcGIS).
5. Download section to print materials (theory and practices) and data download for practices.
6. Supporting materials (theory paper, practical data for practices, links, glossary)
7. The educational content of each unit. From here you can access the SCORM created for each unit that is divided into screens and follows this schedule:

- Background: mark the objectives to be achieved by completing the unit
- Theoretical contents
- Activities of self-evaluation and self-learning exercises
- Practical exercises
- Sending tasks practices

This structure is also followed in the advanced level course.

3. STRUCTURE AND CONTENT

3.1. Basic level

As mentioned before, the thematic cartography course (basic level) consists of nine units covering a broad range of themes such as: introduction to cartography, semiology, qualitative cartography, proportional symbol maps, coropleth maps, projections, diagrams and cartography composition, isoline maps and thematic combinations.

The smallest building block is a unit. As it is common elsewhere, this course consists of lectures and hands-on exercises. Exercises are currently based on ArcMap, a component of ESRI's ArcGIS software package.

About half the students enter the course with no prior knowledge of cartography or geographic information systems.

Evaluation of exercises is based on a combination of specific factors and general principles. A list of essential elements of a good stand-alone map layout is posted on the course website, while the assignment sheets for each exercise describe the use of cartographic techniques. For example, the students are required to include a title, their names, and a source note on every map, while a specific exercise might describe different methods for scaling proportional circles (technique) along with some advice about ensuring a good map layout ("don't let your circles get too large or they will overlap too much"). Students are penalized in their final marks for omitting essential elements or for misusing the assigned technique or type of symbol.

Numerous examples of good and bad maps using a variety of techniques and employing individual techniques in a variety of ways are presented in the course.

The end result is that most students finish the course with confidence in their abilities to create maps. This is not to say that this course prepares professional cartographers, but this method does increase students' enthusiasm for mapping, and makes them eager to better their maps.

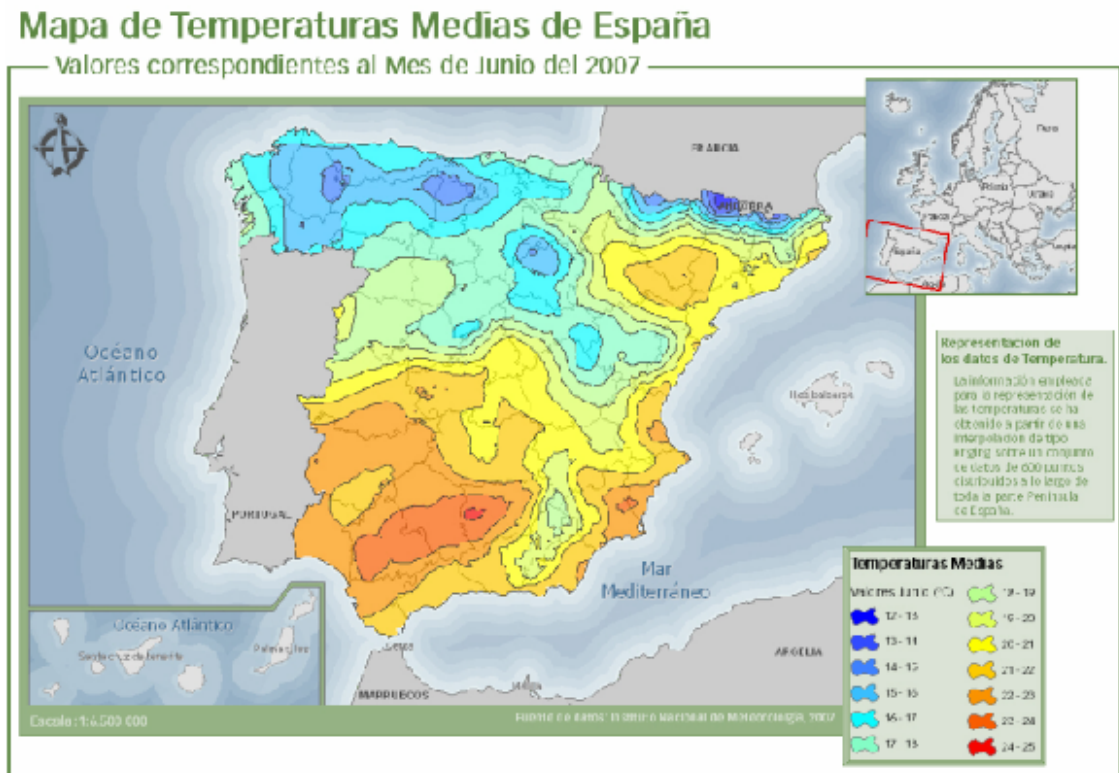


Figure 3. Map of averages temperatures in Spain made by a student using isolines

With the spread of geographic information systems, the vast majority of people who make maps today have little or no cartographic training; thus, one of the goals of this course is to improve the quality of maps produced by people who will make maps as part of their future careers, without actually becoming cartographers or completing further cartographic training.

After successful completion of this course students should:

- be able to select an appropriate map projection, based on location and shape of the area to be mapped and its map use;
- have knowledge of the basic principles of cartographic design (alternative thematic representations, classification methods, choice of colors, map legend design, map layout);
- be able to define a suitable map representation and map design for mapping a given geographic phenomenon in an efficient way;
- have obtained the necessary skills to make a well-designed map product using cartographic software.

2.2. Advanced level

The advanced course on thematic cartography consists of three modules covering a broad range of themes. Each of the three modules has a fixed number of lessons depending on the size of the content to be presented. Figure 4 gives an overview of the themes of each module.

As well as in the basic course the unit is the smallest building block.

Module I. Semiology, color and labelling for map design Unit 1. Visual variables Unit 2. Guidelines for the use of color Unit 3. Labelling in cartography	Module II. Exploratory analysis of spatial data Unit 1. Basic descriptive statistics Unit 2. Data exploration Unit 3. Grid-based statistics, point sets and distance statistics. Unit 4. Spatial autocorrelation Unit 5. Regression methods	Module III. Geographic visualization Unit 1. Multimedia cartography Unit 2. Visualization of cartography in 3D. Virtual reality
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Figure 4. Contents of the Advanced Course on Thematic Cartography

This course also has exercises. The exercises are based on Arc Gis software, GeoDa and MATLAB.

4. CONCLUSION

The e-learning courses “Thematic cartography” provides a good overview of different techniques to make thematic maps. With the help of a tutor the students acquire the knowledge of making maps.

The success of these e-learning courses is due to the high qualified level of online tutors, the quality of the materials and practices.

5. REFERENCES

- Instituto Geográfico Nacional (2008): “Cursos e-learning” <http://go-learning.net/IGN/>
- MOODLE (2008): <http://www.moodle.org/>