New ways of teaching geomatics courses in forestry: Online delivery

by Brigitte Leblon^{1,2}, Armand LaRocque¹, Glen A. Jordan¹ and María Luz Gil³

ABSTRACT

Lectures and supervised laboratory sessions are the classical methods of teaching geomatics (GISscience, photo-interpretation and remote sensing) courses. This paper describes a new teaching method that uses multimedia and Internet technology in offering self-paced, web-based courses. Advantages and disadvantages of each method are presented.

Key words: teaching, remote sensing, GISscience, photo-interpretation Internet, multimedia.

RÉSUMÉ

La méthode classique pour enseigner la géomatique (SIG, photo-interprétation, télédétection) se fait via des cours magistraux et des sessions de laboratoire supervisées. L'article présente une nouvelle méthode d'enseignement qui utilise la technologie multimédia et Internet via des cours en ligne sur Internet. Les avantages et inconvénients de chaque méthode sont présentés.

Mots-clés : enseignement, télédétection, SIGs, photo-interprétation, Internet, multimédia.

Brigitte Leblon

Armand LaRocque

Glen A. Jordan

María Luz Gil

Introduction

With development of the digital world and of new satellite sensors, there is currently an increasing demand for geomatics training, namely in remote sensing, GISscience and photo-interpretation. Traditionally, courses in these areas have been taught at the university level, mainly in geography and forestry departments, with theoretical material presented in the classroom, and practical applications delivered through supervised laboratory exercises. With development of Internet, multimedia and teaching software technology, it is now possible to teach remote sensing, GIS and photo-interpretation over the Internet through self-paced and web-based online courses. Since 1996, several online geomatics courses have been developed at the Faculty of Forestry and Environmental Management, University of New Brunswick (UNB), Fredericton (Canada) (Table 1). Each course is different from free online tutorials because it has theoretical quizzes, practi-

cal exercises and an exam. It also differs from software on-line helps and tutorials because it has a full explanation of theoretical concepts used in the software.

In this paper the new teaching method is described and assessed using examples taken from an online course in digital image processing, developed by the corresponding author. The course, FOR 4313 Digital Image Processing in Remote Sensing, has been offered since 1997 in both French and English, and is now also offered in Spanish. It is currently part of two academic programs at UNB: the *Bachelor of Science in Forestry* program offered at the Faculty of Forestry and Environmental Management, and the continuing education *Open Access Learning Program* (OALP) offered through the UNB College of Extended Learning. The latter is a self-paced, guided, independent study program, designed to offer UNB courses and services to individuals wishing to continue their formal education, but who currently are not served by

¹Faculty of Forestry and Environmental Management, University of New Brunswick, P.O. Box 44555, Fredericton, New Brunswick E3B 6C2.

²Corresponding author. E-mail: bleblon@unb.ca

³Universidad Santiago de Compostela, Departamento de Ingeniería Agroforestal, Spain

Table 1. List of geomatics courses offered as online courses at the Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton^a

Level	Number	Title	Area	Language	Course developers
High School	FOR 1285	Introduction to GIS in forestry (ArcView 3)	GIS	English	Jordan 1998
Undergraduate	FOR 2285	GIS in forestry I (ArcGIS)	GIS	English	Jordan 2005
	FOR 2286	GIS in Forestry II (spatial analysis and modelling)	GIS	English	Jordan 2007
	FOR 3303	Photogrammetry, photo-interpretation and remote sensing in forestry	Photo-Interpretation/ Remote Sensing	English	Leblon and LaRocque 1999
	FE 3306	Photo-interpretation for engineers	Photo-Interpretation	English/French	Leblon and LaRocque 2003
	FOR 4286	Géomatique avec ArcGIS	GIS	French	LaRocque and Leblon 2004
	FOR 4303	Optical, thermal infrared and radar remote sensing	Remote Sensing	English/French	Leblon 2000
	FOR 4304	RADARSAT-2 and polarimetric SAR images	Remote Sensing	English/French/ Spanish	Leblon 2008 Gil 2008
	FOR 4313	Digital image processing in remote sensing	Remote Sensing	English/French/ Spanish	Leblon 1999 Gil 2005
Graduate	FOR 6283	Spatial analysis and modelling	GIS	English	Jordan 2005
	FOR 6284	Advanced ArcGIS in forestry	GIS	English	Jordan 2007
	FOR 6286	Géomatique avec ArcGIS	GIS	French	LaRocque and Leblon 2004
	FOR 6302	Advanced studies in optical, thermal infrared and radar remote sensing	Remote Sensing	English/French	Leblon 2000
	FOR 6304	Advanced studies in RADARSAT-2 and polarimetric SAR images	Remote Sensing	English/French/ Spanish	Leblon 2008 Gil 2008
	FOR 6313	Advanced studies in digital image processing in remote sensing	Remote Sensing	English/French/ Spanish	Leblon 1999 Gil 2005

^aDetails of course contents are available at <http://extend.unb.ca/oalp/courses/>

conventional classroom-based courses. It is delivered through the Blackboard teaching platform. The image processing software taught through the practical course exercises is a professional one made by a Canadian company, PCI Geomatics.

Online Method

Online course material is the only source of course information for students taking FOR 4313. The course is not delivered through scheduled lectures and laboratory sessions. It comprises 11 chapters. While it is recommended that students complete one online chapter a week, i.e., theoretical quiz and practical laboratory exercise, some students can finish the course in one month, completing two or three chapters per week.

When entering into the course via Blackboard, the course home page is displayed. It has the following icons:

1. The “*Syllabus*” icon links to the course syllabus that describes course objectives, outline, modus operandi, and grading scheme.
2. Chapter and laboratory course material is accessible through the “*All the Chapters*” and “*All the Labs*” icons, respectively.
3. If students have questions or comments about the course, they may use the “*Questions?Comments?*” icon, where e-mails may be sent to the entire virtual class (including the instructor). Peer-teaching can then occur as in classrooms.
4. The “*Glossary*” icon gives access to the “Glossary of remote sensing terms” from the Canadian Centre of Remote Sens-

ing, which is available in both French (http://ccrs.nrcan.gc.ca/glossary/index_f.php) and English (http://ccrs.nrcan.gc.ca/glossary/index_e.php).

Practical laboratories make use of professional image processing software, GEOMATICA, developed by PCI Geomatics. Students are supposed to know usage of ArcGIS 9 as GIS software, hence FOR 2285 is a prerequisite for FOR 4313. Images and GIS layers used in the practical exercises can be downloaded from an online accessible database (<http://www.unbf.ca/forestry/woodlot/Inventory91.html>) through the *UNB Woodlot* icon. Additional data can be downloaded directly from the course home page. For example, the image used in the course is the full LANDSAT-TM image over Fredericton in GEOMATICA format, which is downloadable through the “*fred.pix*” icon, while the UNB Woodlot portion of this image is downloadable through the *UNB Woodlot* icon. Laboratory reports have to be handled through e-mail to the instructor or through the course page assignment tool of Blackboard.

Each of the theoretical and practical parts has specific learning objectives that allow its positioning in the whole course outline. While laboratory reports require manual marking, theoretical quizzes are automatically graded. Indeed,

theoretical quizzes consist of multiple choice or matching-type questions that include feedback for incorrect responses. However, answering questions is not straightforward, as they usually require students to perform some computations or some procedures using course data and software. Quizzes can be reached using the “*Assessment*” tool of the Blackboard system. The exam is designed as a theoretical quiz. Finally, besides ongoing e-mail contact with students, student progress can be tracked using the Blackboard system.

Comparison of Classical and Online Methods

Online teaching offers advantages over the classical method (Table 2). Major advantages are related to course preparedness and flexibility in terms of timing, language and audience. For example, half the current FOR4313 class are undergraduate students located in New Brunswick, but the other half are graduate students and continuing education students located in Ontario, Québec, Newfoundland, Alberta, Yukon, Belgium, France, Japan, Taiwan, USA and Australia. Also, with the online approach and its less time-consuming marking procedure, the instructor can more easily detect weak students and dedicate more time to them. This allows strong students to proceed on their own. Further, illustrations presented

Table 2. Comparison of classical and online teaching methods^a

Criterion	Classical method	Online method
Interactions	Face-to-face	E-mail and tracking system
Learning schedule	Time tabled	According to student's own schedule
Student progression	Depends on the classmates	At their own speed
Teaching language	Single	Multiple
Audience	Classroom	Worldwide
Student groups	Single	Multiple
Course preparedness	Can be poor	Well prepared, structured, organized
Course preparation time	Less time-consuming	Time-consuming
Instructor time dedicated to weak students	Low, because time is shared with strong students, and more time is needed for marking	High, because strong students can go on their own, and less time is needed for marking
Student attitude	Tendency to be passive	Active learning experience, development of autonomic skills
Course content	Limited	Unlimited, because of possible linkages to other web-based contents
Illustrations	Static	Animated
Field laboratory	Possible	Not possible
Quiz questions	All types possible	Only some types possible (short answer, matching, calculation, multiple, choice)
Class material	Chalk, blackboard, room	Teaching platform (BlackBoard), web browser

^aBold-case items are considered as being an advantage.

throughout an online course can be easily animated, which can make their messages more understandable. Online courses can also readily provide background information to the learners through linkages to relevant web-based pages. Such advantages do not exist with classroom teaching. Main disadvantages relate to preparation time, impossibility of field teaching, lack of face-to-face interactions, limited types of quiz questions, and costs associated with online technology (teaching platform, web browser). Discussions are now underway in an effort to combine all these courses into an online certificate.

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