

# EXPERIENCE-BASED LEARNING AND E-LEARNING: A PERFECT COMBINATION

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## ABSTRACT:

The discussion on the changing nature of the surveying profession has been a key issue for more than a decade. University and training institutions have been looking for new ways to respond to these changes. E-learning is playing a key role in the professional education of surveyors and future land professionals.

E-learning is also part of the education strategy of the International Institute for Geo-information Science and Earth Observation (ITC), Enschede, The Netherlands. E-learning has been introduced successfully in distance education and in distance MSc supervision. However activities to promote the use of e-learning in face-to-face courses at ITC have been disappointing, except for one course: the Natural Resource Management Module. This module differs from all other courses at ITC, in the fact that it is based on experience-based learning principles. Through its interactive and reflective nature the NRM Module is constantly adapting to new realities and changing directions in the professional field, and new educational tools and techniques, including e-learning, are easily taken up and integrated. Online communication and collaboration tools and the use of a virtual learning environment have proven to support in an unexpected way the learning process in the NRM Module. The analysis of personal experiences with moderating for many years the NRM Module shows that experience-based learning and e-learning are a perfect combination.

## 1. INTRODUCTION

### 1.1 Changing surveying profession

The discussion on the changing nature of the surveying profession has been a key issue for more than a decade among the members of the International Federation of Surveyors (FIG). Many experts in the field have expressed their concerns, analyzed the issue and developed new insights on the nature of the surveying profession and practice (Enemark, 2002; Mahoney et al, 2007, Osskó, 2008, Newnham, 2009).

Developments in ICT have had a huge effect on the profession (Markus, 2008). New technologies and new opportunities have enabled surveyors to broaden their skills and competencies. The number of competencies in which surveyors might claim to be proficient now number over 200 (Mahoney et al, 2007). It has created a growing need for continuous changes in education and an increasing demand for continuing professional development (Markus, 2008).

Enemark (2007) summarizes the major key international trends in the surveying education as follows:

- Management skills, versus specialist skills
- Project organized education, versus subject based education
- Virtual academy, versus classroom lecture courses
- Lifelong learning, versus vocational training

Fairly (2009), advocating a clear, concise surveying profile for the future, distinguishes two major changes taking place across Australia and the EU: internationalization and interoperability. Surveyors of today work in an increasingly global market and the profession has grown rapidly beyond cadastral surveying, with increasing application of surveying and mapping technologies in other sectors.

### 1.2. Educational responses

University and training institutions have been looking for new ways to respond to these trends in the surveying profession and the challenges they represent. Curricula have been developed based on new educational approaches and tools, like problem-based learning (Enemark, 2002, 2004, 2007, Álvarez et al, 2006), outcome-based learning (Lam & Chan, 2007), blended-learning (Stavova et al, 2007), experiential learning (Grover 2008, Culliver 2008), business models (Markus 2008, Culliver, 2008), studium fundamentale (Sternberg and Krebs, 2008), Crossroads (Stempel, 2007).

Lifelong learning has become a buzz-word and a well established concept for continuous professional development of staff engaged in surveying institutions and other land professionals (Osskó, 2008). The Bologna Process and exchange programs such as ERASMUS have opened up educational borders in Europe. Mutual recognition of surveying qualifications will open up international benefits to the surveying community (Fairlie, 2009).

E-learning methods and tools have been introduced and are now playing an increasing role in professional education.

## 2. E-LEARNING

### 2.1 E-learning and FIG

E-learning is one of the main themes in FIG Commission 2 - Professional Education (Markus, 2008). The commission is working on the development of an FIG publication on e-Learning in surveying to bring together the experiences and viewpoints within FIG on the role of e-learning in surveying education (Markus and Groenendijk, 2009)

Markus (2008) defines e-learning as follows: "... e-learning is a learning process created by interaction with digitally delivered content, network-based services and tutoring support. This definition focuses on the revolutionary impact of network-enabled technology. Adding more details on methodology: e-learning is any technologically mediated learning using computers whether from a distance or in face to face classroom setting (computer assisted learning), it is a shift from traditional education or training to ICT-based personalized, flexible, individual, self-organized, collaborative learning based on a community of learners, teachers, facilitators, experts etc."

Central in this definition are to aspects of e-learning:

- E-learning as computer assisted learning
- E-learning as a pedagogy for student-centred and collaborative learning

### 2.2 E-learning at ITC

At the International Institute for Geo-information Science and Earth Observation (ITC) e-learning has been promoted since 2001. In order to cope with the changing demands for education in the field of geo-information science and earth observation, two basic strategic have been developed: decentralisation of education and part-time education. In both strategies distance education and e-learning are seen as valuable and indispensable instruments.

The first project on distance education and e-learning (2001-2004) mainly focussed on the introduction of a digital learning environment and its implementation in the ITC's education processes. A second e-learning project (2005 – 2008) placed much emphasis on the development of multi-usable courseware and distance education courses. The activities of this project group are organized in six working packages (Box 1).

Central in the activities of the project e-learning at ITC is the development of multi-usable courseware. The term "multi-usable courseware" is used at ITC to refer to (digital) learning materials that are suitable for use in different teaching modalities such as face-to-face education, distance education and joint courses. Verkroost (2009) describes in more detail the experiences with multi-usable courseware and the re-use of courseware in different teaching settings.

### The six working packages of the project e-learning (2005-2008)

1. Courseware development for Distance Education Courses
2. E-support to joint courses
3. Supervision of thesis at a distance
4. E-learning in F2F courses at ITC
5. Staff development
6. Coordination of Distance Education and E-learning

Box 1. Working packages of ITC's project e-learning

### 2.3 E-learning and face-to-face teaching

While most of the working packages were successful in their implementation, working package 4, e-learning in face-to-face courses at ITC, experienced major difficulties in achieving its goals. The concept of multi-usable courseware in curriculum working groups at ITC is non-existent and the use of e-learning got very little support from lecturers engaged in classroom teaching. One module however has integrated e-learning methods and tools quite naturally and successfully in its programme: the introductory module of the Master of Science Degree and Postgraduate Diploma Course in Geo-information Science and Earth Observation for Natural Resources Management. The Natural Resource Management Module, the so-called NRM Module, differs from all other courses at ITC, in the fact that it is based on experience-based learning principles.

## 3. EXPERIENCE-BASED LEARNING

### 3.1 Definition

Experience-based or experiential learning is defined as the process whereby knowledge is created through the transformation of experience (Kolb, 1984).

The knowledge and the professional experiences of the students are seen as an important source of learning. Students learn from systematic reflection on what they do individually and inside a training group

### 3.2 Experience-based learning and the NRM Module

The NRM Module has a history dating back to 1993. At that time ITC was offering several separate courses in the field of natural resource management. The management of the institute recognised the importance of a multi-disciplinary approach towards natural resource management and how could this be better promoted than in a common introductory module for these courses?

In this module also basic professional and academic skills such as critical thinking, independent learning, presentation and communication skills, reading and writing skills are considered to be essential learning objectives.

Considering the aim and objectives of the module and the particular target group, the Spiral Model of Learning methodology (FMD Consultants, 1993) was selected for this module. This student-centred training methodology is based on the principles of experiential learning and is in particular applicable for adult education.

Most of the training is based on exchange, analysis and systematization of students' experiences. This means starting with the student and working with the experiences they gained in their organisation and actual working situation, and in a training setting.

In the Spiral Model of Learning the education process is organised in a six-stage cycle involving six adaptive learning modes – initial expectation and readiness, description of experiences, diagnosis and reflection, conceptualisation, experimentation and practice, and integration and action planning. Each of these stages requiring a series of individual or group exercises.

### 3.3 The Spiral Model of Learning

In the following paragraphs the different steps of the Spiral Model of Learning are explained and illustrated with practical examples of learning exercises from the Natural Resource Management Module.

**3.3.1 Initial expectation and readiness:** The learning process starts with the expectations of the students about the course. These are presented and compared with course objectives, and differences are discussed to reach a shared learning perspective. The training process is clarified for a clear and shared understanding of how learning is organised.

To stimulate favourable learning conditions, emphasis is on developing an open atmosphere of mutual respect, trust and commitment within the group. Students are stimulated to play an active role in the learning process: e.g. students are responsible for the daily reporting, and animation and socialising.

**3.3.2 Description of students' experiences:** In this step the present knowledge and experiences of students within their working context is analyzed and systematized. Students are stimulated to describe their knowledge and experiences through a series individual and group exercises:

- To express their knowledge and ideas
- To reflect their working experience and practice
- To reflect on their regular working behaviour or attitude
- To describe their working or institutional context

A central part of learning is that individual experiences are being expressed, discussed and compiled for further brainstorming in the group (fig. 2). Various exercises are developed to explore students' perceptions on Natural Resources and Natural Resources Management. This is followed by a series of progressive exercises analysing working experiences.



Figure 2. Students of NRM Module 1, 2006, discussing success and failure factors in their professional work.

**3.3.3 Diagnosis and reflection on experiences:** Students systematically compare their a priori ideas of their situations with the emerging picture of actual practices and conditions under which these practices develop. Such a comparison leads to the identification of gaps between their actual (what they really do) and desired situations (what they think they do). It enables the students to evaluate their role in the past and motivates for further learning.

Based on the diagnosis of students' experiences, gained in the earlier steps, the key issues and problems in Natural Resource Management are identified. This is a crucial step in the learning process as these issues will further guide the continuation of the learning process.

In 1993 the following key issues in natural resource management were identified by the students: Participation, Multi-disciplinarily, Sustainability and Spatial variability; in 2008 one of these issues is still relevant, sustainability, but others have been replaced by more actual concerns in their professional practice: like Competition and Conflicts, and NRM in the International Context.

**3.3.4 Conceptualisation and analysis:** Only at this stage new theories and experiences from external sources are being offered to the students in the form of special lectures, reading assignments, reflective exercises, internet searches, or videos. The key issues identified in earlier stages are now further studied.

The main elements for a framework for a multi-disciplinary approach in NRM are developed, the emphasis of which on the role of geo-information in NRM. Central to the approach is the interconnection between the key issues identified. This will create a new understanding of the role of surveying and geo-information within NRM. The continuation of the course fits into this initial conceptual framework of NRM developed based on the experiences and realities of the students.

**3.3.5 Analysis, experimentation and practice:** The students gain more insight experiment the concepts and developed approach during a fieldtrip. Under field conditions they validate their new insights and approach, which contributes to further learning and consolidation of concepts. Trained skills in earlier modules are applied and gained insights are being tested.

At this stage students have developed an independent working attitude, are competent to guide and work in teams, and feel confident to bring in their ideas and concepts. Students are responsible for the planning, organization and reporting of a one-day fieldtrip.

**3.3.6 Integration and action planning:** The concepts and approaches developed in the introductory module serve as a framework for the remaining part of the course. Regular moments of reflection on the learning progress throughout the course are organized in which the learning experiences of the students are integrated in this overall framework.

At the final stage of the course, students prepare themselves for the implementation of the developed framework in their own working situation: the training spiral is becoming a full cycle.

#### 4. EXPERIENCE-BASED LEARNING AND E-LEARNING

The structure and basic exercises of the NRM Modules have remained more or less unchanged during the years. Nevertheless, through its interactive and reflective nature, the NRM Module is constantly adapting to new realities and changing directions in the professional field. Not only the content of the module is subject to changes, also new educational tools and techniques, including e-learning, are easily taken up and integrated (Groenendijk, 2009).

Blackboard has been introduced for all courses at ITC in 2001. In fact this supported very much the learning activities in the NRM Module, in particular through its communication and collaboration functionalities such as group pages, discussion boards, home pages and announcement board.

Throughout the module students become more confident to take responsibility for the learning process. Students bring in their computer skills to organise their working groups, to develop interactive presentations and creative ways of reporting. This has resulted in the introduction of unexpected digital tools which turns out to support the learning much better than the original methods used in the exercise.

<b>The e-change in the Natural Resource Management Course Some examples</b>		
<b>Learning object</b>	<b>Learning methods</b>	
	<b>1993</b>	<b>2008</b>
Students introductions	Pair-wise interviewing and world map	Presentations with Google Earth and You Tube; Students create own homepage in Bb
Daily Reporting	Hand-written reports; compiled at the end by secretary	Interactive Power Point presentations; uploaded in group pages in Bb; Discussion board in Bb; Wiki for interactive and progressive glossary development
Rules of learning	Group rules on written sheet.	Group rules on printed poster including pictures of group members; Poster exposed in the class for entire course.
Students' institutional working background and NRM	Based on (annual) reports of organisations (if available)	Use of student's organisation website for detailed information and country case studies
Information skills	Introduction in the library	Digital library training Use of digital library
Introduction Sustainability	The Nuts Game, experience-based learning game	Still the Nuts Game, but also Online quiz Your Ecological Footprint ( <a href="http://www.footprintnetwork.org/">http://www.footprintnetwork.org/</a> )
Various exercises involving critical reading on identified NRM Issues	Use of copies of articles; handouts	Use Blackboard and internet library searches; Websites of major international organisations FAO, WB, UNEP
Resources, Actors and Objectives	Analysis based on sketch maps	Sketch maps combined with Google Maps
Field excursion planning and implementation	Topographic maps, aerial photographs	Application of ArcGIS; GPS and PDA for planning and recording; digital cameras
Field excursion reporting	Oral presentations by each group	Diversity of reporting modes: Presentation (PowerPoint), article local/NGO magazine; Poster; GPS Nature Walk for use by NGO

Table 3. Overview of e-change in the NRM Module, 1973 and 2008.

Successful tools are integrated in the course and used in the next courses. Examples of these innovations introduced by students: use of You Tube during student introduction, Wiki for Glossary development, and the Nature Walk as a form of reporting making use of Google Earth. The overview in Table 3 is an attempt to show how e-learning tools have become part of the learning methods and enriched the learning process.

E-learning and the virtual learning environment, in this case Blackboard, have increased dramatically the available number of educational tools and training challenges. And it seems as if they were developed to support experiential learning and particular in the NRM Module.

## 5. CONCLUSION

The Spiral Model of Learning approach applied in the NRM Module at ITC has been particularly developed for training of adult and mid-career professionals from mainly developing countries. It has proven to be an excellent educational approach to train surveying professionals with different working and cultural backgrounds.

Experience-based learning, and as applied in this case, the Spiral Model of Learning, promotes lifelong learning and fits the concept of continuing professional development. Each new individual training effort can be considered a loop in the spiral model of lifelong learning.

The typical nature of the experiential learning approach makes each module or course a new adventure. Changing realities in the professional field are brought in by the students and become the basis for further learning and developing the module or course.

E-learning and the virtual learning environment, in this case Blackboard, have increased dramatically the available number of educational tools and training challenges. Discussion boards, Wikis, Blogs, You Tube, Google Earth are typical examples for such tools and it seems as if they were developed to support experiential learning.

Online communication and collaboration tools and the use of a virtual learning environment, Blackboard, have supported in an unexpected way the learning process in the NRM Module. Based on my experiences as a course facilitator of the NRM Module for many years I can only conclude: experience-based learning and e-learning are a perfect combination.

If e-learning is expected to play a mayor role in face-to-face teaching at ITC, and other surveying training institutions, then it is recommended to further explore the potential of an experience-based pedagogy for new curricula to be developed.

## 6. REFERENCES

Álvarez, M.F., M. Fernández Martínez, J.R. Rodríguez-Pérez, E. Sanz Ablanado (2006). Problem Based Learning (PBL) and e-learning in Geodetic Engineering, Cartography and Surveying education in the European Higher Education Area

(EHEA) frame. A case study in the University of León (Spain). Proceedings XXIII FIG Congress Shaping the Change, 8-13 October, 2006, Munich, Germany.

Frank Culliver (2008). Training the Generations for Business Success. Proceedings FIG Working Week Integrating Generations, 14-19 June 2008, Stockholm, Sweden

Enemark, S. (2002). International Trends in Surveying Education. Proceedings FIG XXII International Congress, 19-26 April, Washington, D.C. USA.

Enemark, S. (2004). Building competences of the Future. Designing and Implementing a New Curriculum in Surveying at Aalborg University, Denmark. Proceedings 3rd FIG Regional Conference, 3-7 October 2004, Jakarta, Indonesia.

Enemark, S. (2007). Promoting the interaction between education, research and professional practice. Proceedings FIG Commission 2 - Symposium, Scientia est Potentia - Knowledge is Power, 7-9 June 2007, Czech Technical University, Prague, Czech Republic.

Fairlie, K. (2009). Navigating the global consciousness: a young surveyor's future. Proceedings FIG Working Week, Surveyors key role in accelerated development, 3-8 May 2009, Eilat, Israel.

FMD Consultants (1992). The Spiral Model of Learning Training Methodology. Working Document.

Groenendijk, E.M.C. (2009). Experience - based learning in the geo-information sciences: 15 years of nuts game. Proceedings FIG International workshop, Navigating the future of surveying education, 26 – 28 February 2009, Vienna, Austria.

Grover, R. (2008). Developing Quality Training Approaches for Effective Property Tax Administration. Proceedings FIG International Workshop Sharing Good Practices: E-learning in Surveying, Geo-information Sciences and Land Administration, 11-13 June 2008, Enschede, The Netherlands.

Kolb, D. A. (1984). Experiential Learning. Experience as the source of learning and development. New Jersey, Prentice-Hall, Inc.

Lam, S. Y. W. and A. P. C. Chan (2007). Sustainable Curriculum for Geomatics Higher Education. Proceedings FIG Commission 2 - Symposium Scientia est Potentia - Knowledge is Power., 7-9 June 2007, Czech Technical University, Prague, Czech Republic.

Mahoney R., F. Plimmer, J. Hannah and J. Kavanagh (2007). Where are we heading? The crisis in surveying education and a changing profession. Proceedings FIG Working Week 2007, Strategic Integration of Surveying Services, 13-17 May 2007, Hong Kong, China,

Markus, B. (2008). Thinking about e-Learning. Proceedings FIG International Workshop. Sharing Good Practices: E-learning in Surveying, Geo-information Sciences and Land

Administration, 11-13 June 2008, ITC, Enschede, The Netherlands

Newnham, L. (2007). Surveyors – land professionals, adventurers, pioneers and now entrepreneurs? Proceedings FIG Working Week, Strategic integration of surveying services, 13-17 May 2007, Hong Kong, China,.

Osskó, A. (2008). The importance of changes in land surveyors' education. Proceedings FIG International Workshop. Sharing Good Practices: E-learning in Surveying, Geo-information Sciences and Land Administration, 11-13 June 2008, ITC, Enschede, The Netherlands.

Šťávoř Z., V. Pechanec and V. Voženílek (2007). A blended Learning Course for Thematic Cartography, pg. 155 – 165. Proceedings FIG Commission 2 – Symposium Scientia est Potentia – Knowledge is Power, 7-9 June 2007, Czech Technical University, Prague, Czech Republic

Sternberg, H. and C. Krebs (2008). New perspectives for Geomatics Bachelor and Master Education at the HafenCity University Hamburg. Proceedings FIG Working Week. Integrating Generations, 14-19 June 2008, Stockholm, Sweden.

Verkroost, M.J. (2009). From multi-usable courseware to a multi-usable pedagogy. Proceedings ISPRS Workshop Commission VI/2 V12, E-learning Tools, Techniques and Applications, 17-19 June, 2009, Potsdam, Germany.