

Problem-Based Learning and e-Learning in Geodetic Engineering, Cartography and Surveying education in the European Higher Education Area frame

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PBL and e-Learning in Geodetic Engineering, Cartography and Surveying education in the EHEA frame

- Introduction
- Goals
- Material and methods
- Results and discussion
- Conclusions

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INTRODUCTION

EUROPEAN HIGHER EDUCATION AREA (EHEA)

- Introduction: Lifelong learning, Active participation
- Goals: Academic and professional profiles, Generic and specific abilities, Learning-based knowledge organization
- Material & Methods
- Results & Discussion
- Conclusions

INFORMATION SOCIETY

- Amount of information
- Internet and new technologies
- Changing labor market

PROBLEM-BASED LEARNING + E-LEARNING

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INTRODUCTION

PBL

"Problem-based learning is a method of group learning that uses true-to-life problems as a stimulus for students to develop problem-solving skills and to acquire domain knowledge" (McGrath, 2002)

e-LEARNING

"E-learning is the use of Internet to access learning materials; to interact with the content, instructor and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning and to grow from the learning experience" (Ally, 2004)

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GOALS

PBL and e-Learning

- Describing PBL implementation and e-Learning environment in Geodetic Engineering, Cartography and Surveying education
- Evaluating the method and comparing it to the other courses based on more passive-learning methods

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MATERIAL

(1) Course description

	GIS	Cartography
Semester	2 nd	4 th
Hours	45	60
Students	57	21
Objectives	GIS concepts, techniques and methods. GIS software. Data processing general strategies.	Workflow for mapping. Map types and cartographic techniques. Map element analysis and layout.
Evaluation criteria (% final mark)	Test (30%)	Test (10%)
	Computer's lab exam (60%)	Maps presentation (70%)
	Assigned tasks (10%)	Assigned tasks (20%)

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MATERIAL

(2) PBL implementation: GIS course

Introduction	Introductory Problem	<u>Can you read spatial information?</u>
Goals	Objectives	Differentiating cartographic elements in a map, interpreting marginal information, measuring distance and slope, determining UTM and geographic coordinates.
Material & Methods	Materials	1: 25.000 Topographic map. Objectives (available at the e-learning platform). References (e-learning platform).
Results & Discussion	Output	Digital text document, uploaded through the e-learning platform.
Conclusions	Group	Individual.
	Dates	Start: 8 th March. Deadline: 29 th March.
	Meetings	Goals meeting: 8 th March. In-progress meeting: 20 th March. Evaluation results: 7 th June. Feedback Meeting: 8 th June.
	Evaluation criteria	Answers completeness.

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MATERIAL

(2) PBL implementation: Cartography course

Introduction	Problem	<u>Mapping reference and thematic maps</u>
Goals	Objectives	Learning thematic and reference mapping concepts and applying them.
Material & Methods	Materials	Vector topographic file, orthophotograph, thematic layers information text files (e-learning platform)
Results & Discussion	Outputs	1:10.000 reference map for the area assigned to each group Digital Terrain Model, slope thematic map and land use map with hydrologic information. Report including decision justifications
Conclusions	Group	2 students/group (9 groups)
	Dates	Start: 13 th March. Deadline: 30 th May.
	Meetings	Goals meeting: 13 th March. Review meeting I and II (3 rd May and 29 th May) Preliminary evaluation (map presentation) and feedback meeting: 7 th June. Definitive evaluation and feedback meeting: 9 th June.
	Evaluation criteria	Map layouts (four) and report. Multimedia map presentation to the class and discussion of results

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MATERIAL

(3) e-learning implementation

Introduction

Goals

Material & Methods

Results & Discussion

Conclusions

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MATERIAL

(4) Evaluation tool: surveys

Survey	Issue	Introductory question	Type
EEME1	AI	Thinking about the methodology applied in this course, <i>rank the importance given</i> to the following aspects (1 to 5)	Scalar
EEME2	AI, EC, LE, GE	Thinking about this method, <i>rank your agreement</i> to the following statements (1 to 5)	
EEME3	LE	Evaluate the <i>improvement achieved</i> for these skills with this methodology and the <i>utility in your future career</i> (1 to 5)	Semantic differentials
EEMSD	AI, EC, LE, GE	<i>The methodology applied was...</i> (indicate how close you are to each adjective) (1 to 5*)	
COLLES	e-learning	<i>Compare ideal experience with real one</i> (1 to 5*)	Scalar

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METHODS

Evaluation: statistical analysis

- Introduction
- Goals
- Material & Methods
- Results & Discussion
- Conclusions

1. PBL vs. traditional approach
 - Sample comparison
 - U-Mann Whitney test (95% confidence level)
 - Error plots
2. e-Learning
 - Average values (six scales)

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RESULTS & DISCUSSION

(1) Error plots for Actual implementation (EEME1)

VAR	Item
V201	Know-how
V204	Oral reports
V205	Group work
V206	Student participation
V207	Regular class attendance
V210	PBL
V211	Student-teacher communication
V212	Frequent evaluation
V213	Resources use
V214	Connection to professional future
V215	Test exams
V216	Use of new technologies

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RESULTS

(2) Error plots for surveyed items

Test	Item
EEMDS	EC Emotional Component
	AI Actual Implementation
	LE Learning Effects
GE Generalization	
EEMZ	AI Actual Implementation
	LE Learning Effects
IMP Improvement	

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RESULTS

(3) e-Learning

Number of accesses (average)

COLLES survey results

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CONCLUSIONS

1. Generic and specific abilities, skills at *learning to learn*, and the basis for a *lifelong learning* are improved by PBL and e-learning more than with traditional methods.
2. Students become experienced in applying the theoretical elements from the lectures to practical problem solving.
3. Students find PBL & e-L more interesting, challenging and enjoyable.

This approach is highly recommended

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