

## A STUDY OF A BLENDED DIDACTIC APPROACH TO TEACHER PROFESSIONAL DEVELOPMENT IN GEOGRAPHY

Apostolos Paraskevas<sup>a</sup>, Nikos Lambrinos<sup>b</sup>, Dimitris Psillos<sup>c</sup>

<sup>a</sup>*Aristotle University of Thessaloniki, School of Education, Department of Primary Education, Thessaloniki, GR-54124, Greece, [aparaske@eled.auth.gr](mailto:aparaske@eled.auth.gr)*

<sup>b</sup>*Aristotle University of Thessaloniki, School of Education, Department of Primary Education, Thessaloniki, GR-54124, Greece, [labrinos@eled.auth.gr](mailto:labrinos@eled.auth.gr)*

<sup>c</sup>*Aristotle University of Thessaloniki, School of Education, Department of Primary Education, Thessaloniki, GR-54124, Greece, [psillos@eled.auth.gr](mailto:psillos@eled.auth.gr)*

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### Abstract

In this paper we study a blended didactic approach that was implemented by Primary School teachers in the field of Geography. The didactic approach aimed to implement a new training method and examine factors which affected collaboration between teachers. The cognitive area used was geographic coordinates and map construction, as well the production of teaching-learning plans on the subject of instrument orientation for pupils. The approach included lectures, web-based courses, fieldwork activities and investigation of parameters that affect collaboration via asynchronous dialogues.

The results showed that the blended didactic approach which we planned, tested and implemented constitutes an innovative proposal for teacher training in Primary Education, relating to both knowledge improvement in the field of geographic coordinates and map construction, as well as promoting active involvement and interaction among participants which may facilitate sustainable collaboration among in-service teachers.

*Keywords:* Geography, web-based learning, collaborative learning

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### 1. INTRODUCTION

In recent decades, school Geography has been the subject of much research (Katsikis 2004: 523-530). In primary education in many countries, Geography as a school subject is, as a rule, incorporated within a

broader subject and is not well established (Katsikis 2004: 523-530). In Greece, for

example, elements of Geography exist in the subject “Study of the Environment”, which is taught up to the 4<sup>th</sup> grade, while as an autonomous subject it is taught in the 5<sup>th</sup> and 6<sup>th</sup> grades (11 to 12 years old) (Katsikis

2004: 523-530). Geography is taught usually only by chalk and talk in the classroom, whereas it is educationally desirable to involve students in outdoor activities as well. Rellou and Lambrinos (2004: 547-554) argue that the school Geography curriculum in Greece should give teachers the possibility of organizing outdoor activities (field work), as happens in the UK, the USA and many other countries (Lambrinos 1999: 40-46; Geography Education Standards Project 1994). Rellou and Lambrinos (2008) focus on some similarities and differences between the European geography curricula (and consequently the Greek geography curriculum) and US geography standards: a) They both employ themes to acquire knowledge and skills, b) European countries use local and regional geography, focusing mainly on the national region, to approach skills, while the USA uses (mainly) places from all over the States. c) in Europe there is a wide interdisciplinary use of geography, while in the USA, geography is associated mainly with the environment; and d) Europeans focus on different European cultures to understand geography.

The Greek National Geography Curriculum emphasises: a) observation of the environment in which the children live, b) working from children's first-hand experiences, c) energetic learning and d) constant use of maps.

As regards teachers' views on the subject of Geography, one study showed that, while they consider this subject as useful, 48% of them say that they do not like it, do not want to teach it and would prefer to teach other subjects (Klonari 2004: 603-610). Student opinion, by contrast, differs from that of their teachers, as they like Geography (Lambrinos *et al.* 2002: 102-108).

Possible explanations for teachers' negative attitudes include:

- Knowledge insufficiency
- Bad experiences as students (learning by heart, subject taught by non-geographers or teachers not specialised in Geography)
- Lack of suitable teaching material that would make the lecture more attractive
- Lack of time for preparation according to the requirements of the Geography curriculum.

Most teachers in Greece ask for new teaching approaches that will support their educational needs in Geography education. These teachers feel constrained by the current content of the Geography curriculum, which must be taught to a tight timetable (Lambrinos 2002: 549-555). Intensive seminars and meetings on Geography teaching may change their attitudes and ideas concerning Geography (Klonari 2004: 603-610). Recently, researchers have suggested and investigated flexible methods for improving teacher education. These include face-to-face meetings, distance methods using new technologies, and blended or mixed models including a combination of face-to-face and distance methods. The term "blended or mixed model" describes approaches that combine activities that take place in traditional teaching places (rooms, laboratories) with distance synchronous or asynchronous web-based activities (Bliuc *et al.* 2007, Dziuban, Hartman & Moskal 2004, Ginns, & Ellis, 2007, Hamburg, Cernian and Thij 2002; Liotsos *et al.* 2007, Liotsos & Dimitriadis, 2007). Research has shown that students who participated in blended courses improved their knowledge and understanding, had good results in final exams, and showed greater satisfaction with this method as compared to the traditional way of teaching (Singh 2003: 51-54;

Garrison and Kanuka 2004: 95-105). One of the factors investigated that may contribute to improved training was collaborative learning. The term “collaborative learning” describes a situation in which particular forms of interaction that will trigger learning mechanisms are expected to occur, but with no guarantee that the expected interactions will actually occur (Dillenbourg 1999: 1-19). In the past few years many web-based training programmes have been implemented in which, *inter alia*, the role, interaction and active involvement of discussion teams have been investigated. (Avouris, Komis 2003: 341-351). Nowadays, this kind of training programme focuses mainly on digital mapping using GIS. Teachers and students or groups of students use an Internet platform to access learning materials. The communication between students and/or teachers and tutors is based on discussion forums where the students can post their opinions about the project or ask questions on how to solve problems (Szablowska-Midor, Kozak and Widacki 2006). In some countries there are also national projects, such as the Schools Mapping Project developed by the Durham County Council in the UK, a web-enabled GIS project in which in 2003 more than 300 schools participated (Fargher, 2006). Although collaborative learning is expanding in teacher training, we note that research done in the field showed that collaboration between participants is not easy and cannot be taken for granted (Hansen and Spada 2006: 229-235). In this context we designed a blended didactic approach for an in-service primary teachers course aiming at active participant involvement and the improvement of their content knowledge in the topic of geographic coordinates. This was the first example of an innovative application of this kind involving fieldwork and in-class and

web-based activities (blended didactic approach). The questions investigated in the present work were:

1) Did the teachers who followed a blended didactic approach in a distance training programme improve their knowledge of how to make a map and use geographic coordinates?

2) Did the blended didactic approach lead to the active involvement and interaction of the participating teachers in collaborating in map-making and using geographic coordinates?

## 2. METHOD

### 2.1. The sample

During the 2007 spring semester we implemented a blended didactic approach with a sample of 22 primary education teachers who attended an in-service university course on “Didactics in Geography”. That course was part of their two year in-service training programme at the Department of Primary Education, School of Education, Aristotle University of Thessaloniki.

### 2.2. The didactic approach

The Geography content included the following subjects:

- Place localization
- Azimuth (or bearing)
- Distance measurement in the field
- Scale and Making a sketch map based on field measurements.

The didactic approach applied comprised:

- Three lectures on map-making and orientation with or without the use of a compass.

- Two days of fieldwork on Chortiatis, a mountainous area near the city of Thessaloniki, North Greece.

- One 3-hour workshop on the web-based learning environment, (BSCW, Basic Support for Collaborative Work, [<http://helios.eled.auth.gr>], freeware software for academic use). In the same session the teachers completed the on-line registration procedure.

- One 3-hour workshop on collaboration methods which took part after a long discussion with the students on their experience on collaborative learning in the class. The workshop included ways of implementing collaborative courses, scientific knowledge for collaboration and ways of organising and evaluating collaboration activities.

- Teachers' distance collaboration, based on a web-based learning environment using asynchronous dialogues, to produce learning materials for pupils on orientation using map and compass.

- Evaluation of the tools used and parts of the didactic approach.

On the first day of fieldwork activity, the teachers attended a session on the subjects they were going to be dealing on the second

training day, which was fixed for one week later. They then worked in pairs on the following subjects:

- Compass description
- How to find the north with and without compass
- Finding your position on a map with or without compass

- Differences between real and horizontal distance
- Azimuth (or bearing)
- Finding points on a map based on geographic coordinates.

The teachers were introduced to the fieldwork area through a map. The approach to the subject was based mainly on demonstrating the use of a compass in combination with map reading and map interpretation. On the second day they were given three points with specific geographic coordinates to locate on a printed map and were asked to go from the first point to the second following any direction. They also had to locate on their map any other points they used in order to get from the first point to the second, and show the new direction. The teachers thus learned how to use a map and compass to find their way.

The final map showed the route they followed from the first point to the second (Fig.1).

Finally, the participants were asked to make a lesson plan they would employ for teaching Primary School pupils how to use a map and compass in the field in one or two teaching hours.

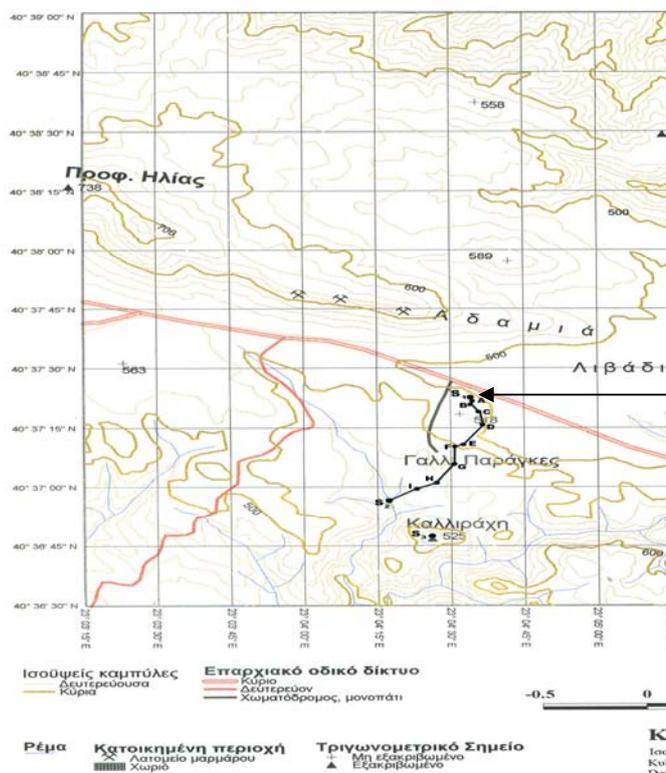




Fig. 1. Final map showing the direction the teachers followed in order to go from the first point to the second.

### 3. INSTRUMENTS

#### 3.1. Questionnaire

Content improvement was evaluated using a pre- & post- questionnaire of eleven (11) multiple choice questions plus a quantitative analysis of the lesson plans produced. Thus, the first question investigated declarative type knowledge with regard to the recognition of geographic coordinates. Questions 2 and 3 were designed to confirm possession of the declarative knowledge of the first question and minimise accidental answers. Question 4, which asked for the respondent's opinion on how difficult a concept geographic coordinates is, shows

the level of declarative knowledge and the value of the instructions given prior to the application.

Research has shown that teachers who have not satisfactorily mastered the content

subject encounter difficulties in classroom teaching and often hold ideas similar to those of their students (Wandersee *et al.* 1994, 177-210). With questions 5 to 7 we tested declarative knowledge of azimuth, its practical implementation and how it can be plotted in practice. Questions 8 and 9 investigated teachers' knowledge concerning the tools that are needed to measure distances and also the practical use of distance measurement in daily life. Finally, questions 10 and 11 investigated teachers' knowledge of scale, and especially how to choose and implement the right scale. We note that teachers filled out the initial and final questionnaires (pre & post), in a face-to-face procedure, before and after the blended didactic approach was implemented, at the Laboratory of Educational Technology. For the statistical analysis of pre & post questionnaires we used SPSS ver.14.00. We used the non-parametric Mann-Whitney U test, ( $\alpha = 0.05$ ), because it was considered to be the most suitable method for our sample size (22 teachers).

### 3.2. Lesson plans

The second tool for evaluating the teachers' content knowledge was their lesson plans. The planned lesson materials concerned the topic "use of compass and map in practice", were aimed at primary age pupils and could be carried out in one or two school classes (45 minutes). These plans were checked by two independent researchers and compared for common categories across all plans. Six important dimensions for lesson planning were identified:

1. Linkage to the curriculum
2. Appropriateness of objectives
3. Use of scientific terms
4. Selection of appropriate teaching material
5. Teaching method implemented
6. Evaluation tasks

A qualitative analysis was implemented after identification of the six dimensions. In case of disagreement between the two researchers there was extensive discussion until a consensus was achieved.

### 3.3. Teachers' web-based asynchronous dialogues

There is currently intense interest in on-line learning and in particular with the role that on-line discussion groups can play in promoting interactivity and collaboration among learners. The use of computers to enable communication (synchronous or asynchronous) between learners separated by time and distance is one of the fastest growing uses of technology in education (Bates, 1995). Asynchronous communication in particular affords extra advantages in terms of promoting reflective thinking and, more practically, offering increased flexibility of time and place of learning (e.g. Bates, 1995, Harasim *et al.*,

1995). As well as allowing flexibility, on-line or off-line discussion groups can help reduce the isolation of distance learning and play an important role in the social aspects of learning (Harasim *et al.*, 1995, Mason & Weller, 2000). In this paper, in order to identify teachers' interactions in a distance methodology and study their active involvement, we carried out a quantitative analysis of their asynchronous written computer-based dialogues using the widely applied Henri model (1992, 117-136; 1993). The computer-based written dialogues used asynchronously via the web-based learning environment, (BSCW) were recorded and stored for use as evaluation data. This method was chosen because it provided, among other others (i.e. Murphy 2004), a framework that allowed us to study the level of participation and interaction in the discussion group, as well as to analyse the content of messages according to a cognitive view of learning (McKenzie and Murphy 2000, 239-257). According to Henri's model, there are three types of interaction: explicit interactions, implied interactions and independent statements. "Explicit interactions" are written messages that are either a response to a question posed or a commentary on someone else's message. "Implied interactions" are responses to or commentaries on a prior message, but with no specific indication of the message to which the contribution refers. "Independent statements" are messages that contain new ideas, unrelated to others that have been previously expressed in the on-line discussion. Henri's model recognizes teacher participation level through the recording of messages exchanged during their distance collaboration, particularly by the number and type of messages and the time when they were exchanged. The type of participation included messages concerning content, administrative, technical and social

aspects. In the data collection process the computer-based written dialogues of each team that were kept as text in the web-based learning environment (BSCW) were downloaded, saved and printed. The dialogues were then separated into units (message units). Each message unit was translated as a paragraph that revealed an idea and was coded according to its importance, with unique characterizations. Then it was categorised into the five axes of Henri's model: participation, social, interaction, cognitive, and metacognitive. In order to achieve evaluation reliability, a second researcher repeated the above procedure. Cases of disagreement were discussed between the two researchers in order to elicit the character of the message most accurately. The variables used in order to encode the messages into each of the five axes of the model are presented below.

### 3.4. Participation

The participation axis includes measurements of level, structure and type of participation in the electronic discussion via the dialogues. The level of participation was indicated by the number of messages, the length of each message, the time dissemination and the negotiation subject. The type of participation can be coded in messages reported as:

- Administrative messages (A)
- Technical (T)
- Social (S)
- Messages with regard to content (C)

### 3.5. Social

The social axis is recognized in messages that reveal self social expression (i.e., personal introduction), or an expression of sociability directed towards others (e.g. asking about others' well-being).

### 3.6. Interaction

The interaction axis can contain:

- Explicit interactions, either in response to a question posed (DR) or a commentary on someone else's message (DC).
- Implied interactions, defined as including a response to (IR), or commentary on (IC) a prior message, but without indicating specifically to which message the contribution referred.
- Independent statements (IS), which are messages that contain new ideas not connected to others previously expressed in the discussion forum.

### 3.7. Cognitive

The cognitive axis is based on taxonomy of cognitive processes and skills thought to reflect the nature of the learning process (Henri 1993). This classification outlines five levels of critical thinking:

- Elementary clarification (EC), that is defined as presentation of a problem and its parts.
- In-depth clarification (IDC), that is defined as in-depth treatment and comprehension of a problem.
- Inference (I), evidence of inductive and deductive reasoning.
- Judgment (J), making a judgment or summing up.
- Strategies (STR), proposing what is needed to implement a solution.

### 3.8. Metacognitive

Metacognitive knowledge refers to declarative knowledge about the person (P), (what is known about the person as a 'cognitive being'); the task (TAS), (appreciation of the task and information

available); and the strategies used (STRA), (how a cognitive task is successfully completed). Expression of metacognitive skills reflects knowing how to assess one's knowledge, skills and strategies (evaluation-SE), predict and organize what is needed to complete a cognitive task (planning-PL); initiate and supervise progress toward reaching one's objectives (regulation-RE); and recognize and understand one's feelings and thoughts about the task (self-awareness-SAW).

These assessment tools are summarily tabulated below (Table 1).

Table 1.  
Assessment tools

## 4. RESEARCH FINDINGS

### 4.1. Knowledge Improvement

For the pre & post questionnaires the answers were recorded the percentage of correct and incorrect answers were calculated, and then a statistical analysis was applied using the statistical software package SPSS ver.14.00.

- The null hypothesis ( $H_0$ ) was that there is no content improvement after the didactic approach.
- The alternative hypothesis ( $H_1$ ) was that there is content improvement after the didactic approach.

In this paper we present as an example the data analysis of the third question, with which we investigated whether teachers had comprehended the plotting of geographic coordinates. The results show that in the pre-questionnaire 17 out of 20 answered that they knew how to plot them, while in the post-questionnaire this number had risen to

19. This is an increase of 10%, showing a statistically important difference

(Asymp.Sig. (2-tailed) = 0,03), according to the Mann and Whitney U-test.

We implemented the same procedure with the remaining questions, and the results are presented in Table 2. The questions that presented statistically important differences appear in **bold**.

Table 2 shows that the initial hypothesis is confirmed in questions 1,2,4,10,11 (no difference existed before and after the didactic approach and teachers did not improve their content knowledge). In questions 3,5,6,7,8,9, the initial hypothesis

ASSESSMENT→ TOOLS RESEARCH AXES ↓	(PRE-POST) QUESTIONNAI RES	WRITTEN ASYNCHRONOUS WEB-BASED DIALOGUES	QUALITATIVE ANALYSIS ON TEACHING LESSON PLANS
KNOWLEDGE IMPROVEMENT	X		X
TEACHER'S ACTIVE INVOLVEMENT & INTERACTION		X	

is rejected and the statistical difference is confirmed, revealing that knowledge improvement has been achieved.

### 4.2. Lesson plans

Analysis of lesson plans (Table 3) shows that all eleven teams produced lesson plans that largely fulfilled the six dimensions. We note that the lesson plans of 2 groups (2,3) fulfilled 6 out of 6 dimensions, 4 groups (1,4,7,11) fulfilled 5 out of 6 dimensions, 4 groups (5,6,8,10) fulfilled 4 out of 6, and 1 group (9) fulfilled 3 out of 6 dimensions. These results suggest that they comprehended the material taught to a significant degree.

Table 2  
Table of the results of the pre & post questionnaires.

Groups	Connection to the curriculum	Appropriateness of objectives	Use of scientific terms	Selection of appropriate teaching material	Teaching method implemented	Evaluation tasks
1 <sup>st</sup>		X	X	X	X	X
2 <sup>nd</sup>	X	X	X	X	X	X
3 <sup>rd</sup>	X	X	X	X	X	X
4 <sup>th</sup>		X	X	X	X	X
5 <sup>th</sup>		X	X	X		X
6 <sup>th</sup>		X	X	X		X
7 <sup>th</sup>		X	X	X	X	X
8 <sup>th</sup>		X	X	X		X
9 <sup>th</sup>		X	X	X		
10 <sup>th</sup>	X	X	X	X		
11 <sup>th</sup>		X	X	X	X	X

Table 3  
The axes of evaluation of final lesson plans

QUESTIONNAIRE	PRE TEST %	POST TEST %	DIFFERENCE %	STATISTICAL SIGNIFICANCE <0,05
Question 1	85	70	-15	0.262
Question 2	85	100	15	0.075
<b>Question 3</b>	<b>85</b>	<b>95</b>	<b>10</b>	<b>0.037</b>
Question 4	90	90	0	0.298
<b>Question 5</b>	<b>75</b>	<b>95</b>	<b>20</b>	<b>0.009</b>
<b>Question 6</b>	<b>40</b>	<b>95</b>	<b>55</b>	<b>0.001</b>
<b>Question 7</b>	<b>45</b>	<b>80</b>	<b>35</b>	<b>0.009</b>
<b>Question 8</b>	<b>10</b>	<b>85</b>	<b>75</b>	<b>0.000</b>
<b>Question 9</b>	<b>50</b>	<b>80</b>	<b>30</b>	<b>0.050</b>
Question 10	40	55	15	0.118
Question 11	70	55	-15	0.333

#### 4.3. Teachers' active involvement and interaction

Analysis of the data according to the five axes of Henri's model yielded the following results (Table 4).

From a total of 22 teachers (11 teams), we found 207 messages, 18.8 per team on average, that could be assigned to the participation axis, 369 messages (average 33.5 per team), were assigned to the social axis and 124 messages (average 11.2 per team) were assigned to the interaction axis. Finally, 460 messages (average 41.8 per team) were coded to the cognitive axis and 22 messages (average 2 per team) to the metacognitive axis.

#### 4.4. Participation Axis

With regard to the participation axis, the 11 teams sent a total of 207 messages. These

Table 4

Table of results according to Henri's model (1993)

#### 4.6. Interaction axis

With regard to the interaction axis, the 11 teams recorded a total of 124 messages coded as explicit interactions; there were no messages in the other two categories.

#### 4.7. Cognitive axis

With regard to the centralized cognitive axis (Table 5), 69 messages were coded as basic clarification, 14 as in-depth clarification, 3 as inference, 276 as judgments and 98 as strategy.

#### 4.8. Metacognitive axis

messages contained 1004 paragraphs and 2910 lines.

#### 4.5. Social axis

The social axis, included questions or comments submitted between teachers and coded as administrative, technological, social, or questions of content. The 11 teams sent 2 administrative-type messages, 9 technical, 77 social and 281 content-oriented.

With regard to the metacognitive axis, there were 5 messages coded as personal, 1 as strategy, 9 as skills evaluation, 1 as planning and 6 as self-awareness.

### 5. DISCUSSION

In this paper we study the effects of a blended didactic approach addressed to in-service Primary School teachers in the topic of geographic coordinates and map construction. We implemented this didactic approach in order to explore whether it worked as a flexible training method for in-service Primary School teachers in Greece,

	PARTICIPATION	SOCIAL	INTERACTION	COGNITIVE DIMENSION	METACOGNITIVE DIMENSION
N=22					
TOTAL MESSAGES	207	369	124	460	22
AVERAGE PER GROUP	18.8	33.5	11.2	41.8	2

who teach all subjects, including Geography. The questionnaire contained questions on geographic coordinates (1-4), direction/bearing (azimuth, Questions 5-9) and mapping (10-11). Data analysis showed that in six out of eleven questions, teachers improved their knowledge as regards the scientific content, while there was a positive, although not statistically significant, improvement in another two, no change in one and a negative change in the two remaining questions. Concretely, with regard to coordinates there was no statistical difference in Questions 1-4 in pre-post testing, apart from Question 3. The **Table 5**: Cognitive axis results

the field. Azimuth was taught as a concept on the first day and applied in the field on day two, one week later. There were no differences in Questions 10-11, on mapping field work, possibly because there was no straightforward connection between the questions and the fieldwork. It seems that the participants already had sufficient knowledge before engaging in the field work, to make the map. We consider that the observed statistical differences relate to the way in which the teachers approached topics that were new to them. Qualitative analysis of participants' knowledge application in their lesson plans showed that ten out of

statistically significant difference in Question 3 (plotting geographic coordinates), may have been due to the fact that the method implemented was the opposite to the one that teachers had been taught in the laboratory (in the field they were trying to locate a point from its coordinates, while in the lab they were given a point and asked to find its coordinates); this forced them to work differently from the way they had been taught. Questions 5-9 also showed statistical differences, possibly because the topic (azimuth) was unknown to the participants before its implementation in

eleven groups fulfilled most of the six dimensions (Table 3) relating to the preparation of teaching addressed to pupils. All groups constructed appropriate objectives, employed the relevant scientific terms correctly, and selected suitable materials. We note that the dimension that appeared least in the lesson plans was a linkage with the existing curriculum. Given the quality of the plans, however, this may show a creative approach to the topic which overcomes existing curricular constraints. In effect, such results provided evidence of geography knowledge understanding as a prerequisite for handling it effectively in a professional context.

With regard to active teacher involvement

	ELEMENTARY CLARIFICATION	IN-DEPTH CLARIFICATION	INFERENCE	JUDGEMENT	STRATEGY
	(EC)	(IDC)	(I)	(J)	(STR)
GROUP					
1	7	1		7	8
2	10	1	1	45	9
3	5	1	1	4	6
4	8	5		62	21
5	3	2		8	3
6	2	1		44	12
7	8	2	1	24	10
8	6	1		21	6
9	17			8	6
10	1			18	15
11	2			35	2

and interaction, data analysis from Henri's model (1992) showed that participants interacted with each other and were actively involved in the web-based dialogues that took place via the web-based environment. Specifically, active involvement was evidenced quantitatively by the remarkable number of exchanged messages (576) characterized as belonging to the axes of participation and self social expression. Moreover, active involvement improved qualitatively in the self social expression axis, where 281 messages were characterized as content-based, showing that teachers actively discussed content issues, an area far more significant than technical or administrative issues. Quantitative recognition was reflected by the messages coded to the interaction axis, with a recorded total of 124 messages exchanged. Moreover, qualitative data analysis in the cognitive and metacognitive axis showed that participants' dialogues contained in-depth clarifications of their ideas, reasoning and planning proposals, which showed good comprehension of the topic. We consider that in the opposite case, i.e. if they had not comprehended the topic of the interactions, there would be far less discussion or even no participation in such dialogues. Taking into account the limited sample, as well as that our findings relate to a geography topic, we suggest that more research, focusing on the effects of such a blended course in larger samples and with different topics, is necessary. Within these limitations it appears that the blended didactic approach which we planned, tested and implemented constitutes an innovative proposal for teacher training in Primary Education, relating to both knowledge improvement in the field of geographic coordinates and map construction, as well as promoting active involvement and interaction among

participants which may facilitate sustainable collaboration among in-service teachers.

## **6. CONCLUSIONS**

Three important issues are mentioned in this article: a) a blended didactic approach, b) fieldwork along with lecturing and c) web use in collaboration. These issues were combined in order to form an innovative proposal for teacher training.

- A blended didactic approach that was implemented by Primary School teachers in the field of Geography. We chose geography because it is a discipline that can be taught not only in a class but in the field also. The combination of these two along with the web based collaboration we expected to be very interesting and innovative compared to other studies mentioned above. The innovation is mainly in the way that the teachers treated their lack of geography knowledge or their questions on the discussed geography topics. They finally managed to overcome their "technology fear" by using the web for collaboration.

- The fieldwork was part of the geography course. The teachers who attended the training program had to participate in ten geography sessions (one per week) and two fieldwork activities at the end of the semester of the second year of the training. The teachers had to deliver an essay which, in this case, was focused on the fieldwork. The whole training program, which lasts for two years, is certificated by the end of the second year.

- The outcomes seem successful because the "blended" nature of the course assisted the teachers to improve their knowledge in map making and orientation through their participation and collaboration. The web-based environment helped and

provoked them to collaborate in order to produce learning materials for their students.

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