

EVALUATION OF A MULTIMEDIA EDUCATIONAL TOOL FOR GEOGRAPHY IN ELEMENTARY SCHOOLS

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Abstract

This paper describes the procedure of design, development and evaluation of a multimedia application “E’ class Geography of Elementary Schools” that supports Geography teaching. The application was presented to and evaluated by both students and teachers of elementary classes of Greek schools by using it and completing questionnaires. The results indicated that students as well as their teachers were positive about incorporating such educational applications in their lessons, and also that the resulting application was both user friendly and usable, covering the educational goals of Geography.

Introduction

Information and Communication Technologies (ICT) constitute the catalyst for many changes in education (Chai, Ling Koh, Tsai, & Tan, 2011). The use of ICT should be driven by educational and learning needs, rather than technology. The need to shift the philosophy of the education system, the methods of teaching, the role of the teacher, the relationship between student and teacher, as well as the actual content of the analytic program is imperative.

As ICT weaves itself into the activities of primary schools, it brings about changes in learning and teaching activities, in curriculum, and in interpersonal relationships in the learning environment, and it is reciprocally affected by the very changes it causes. Therefore, the integration of ICT in schools must focus on the whole configuration of events, activities, contents, and interpersonal processes taking place in the context that ICT is used. Depending on the expected learning outcomes and activities, ICT plays different roles in the learning environment. In this paper, we examine the opportunities ICT provides for teaching and learning in primary schools with respect to enhancing learning outcomes in supporting the teaching of Geography with the use of a multimedia educational tool. As it is stated in Luu and Freeman (2011), the way in which students are using computers in schools, towards attaining learning outcomes, may have a stronger effect on scientific literacy than how often computers are accessed.

Educational software tries to utilize the potentials both informatics and communication offer, in order to create a rich, attractive and provocative learning environment (Symans, 2000). This will encourage analytical, positive and creative learning for students who live in the digital age (Ainley, Enger, & Searle, 2008).

Theoretical Background

The introduction and integration of ICT in teaching and learning is one of the major challenges of education systems today. The aim is to prepare children of all ages for an increasing complex and technological world by improving the educational quality and cognitive standards of the pupils in addition to support teachers in their everyday classroom. Both students and teachers should familiarize how to use and exploit within the learning process. It is now accepted that the new conditions of the "Information Society" demonstrate the need for reforming the education system in all developed countries to meet the challenges of modern society. The new technologies of information and communication technologies have evolved significantly in recent years. This development is primarily related to the human - machine interface, the Internet and multimedia that are accompanied with innovative software.

At the same time, the evolution of the introduction and integration of Informatics into the educational system has been quite fast over the last thirty years. There were, however, different approaches and multiple considerations regarding the situation of Information and Communication Technologies in Education. The different approaches combine several parameters which are related with the:

- Curriculum
- Level of education
- Teaching and cognitive goals
- Economic, political and social contexts
- Period of insertion
- Level of technological development
- Development of ICT

As a result, ICT can contribute to the improvement and reorientation of the learning process in a direction where learning will become active and students may be encouraged to:

- Experiment
- Look, discover and enjoy the knowledge
- Learn to cooperate, be methodical and take initiatives
- Set goals, argue, think and speak freely
- Cultivate their skills and talents
- Love learning

ICT in Greek Education

The introduction of Informatics in Greek Education began at the Technical - Vocational Schools and Unified Multidisciplinary Lyceums during the period 1983-1985. At High Schools the first approach was made at 1992 and since 1998 in the General Lyceum. In recent years, new technologies are emerging in Primary Education with the introduction of an indicative curriculum while schools are equipped with computers in the context of enlargement the school hours (full day mode).

In the 90's, specifically in 1997, the Greek Government launched an ambitious program of ICT introduction, under the name of "Odysseia." This program vouched to use computer and network technologies to produce radical changes in the Greek educational system (i.e., "to cultivate the faculty of critical thinking and change the practices of teaching, learning and communication in the Greek schools",

<http://odysseia.cti.gr/English/ODYSSEIANEW/about.htm>).

Informatics in primary education was introduced by the 2002-2003 school year as follows: (a) as an autonomous discipline entitled "Information Technology" program of full day schools (Ministry of Education, 2002) and taught by specialist Computer teachers, (b) by creating educational software for supporting the teaching of various courses of the curriculum (Ministry of Education-Pedagogical Institute, 2003). This policy is achieving the goals of the dominant European discourse on new technologies, according to which "the most advanced uses of ICT for educational purposes are in primary education" (European Commission, 2000, p.11). The overall purpose of Informatics Curriculum for Primary Education was originally designed in 1997 by the Pedagogic Institute and specialized in more teaching objectives and methodology of the 2003 Cross- thematic Curriculum Framework for Compulsory Education (DEPPS) (Komis, 2005). The most significant effort to introduce ICT in the two lower levels of Greek education was during the years 2000-2005 through the Information Society. This effort primarily was focused on the development of technological infrastructure in schools, training of teachers (Vosniadou, 2006) and production of educational software. At the end of 2000, primary schools that used computers approached only 1%, but this percentage at the end of 2005 amounted to 72%, while small-capacity school laboratories were created. Also the rate of students: computers has already reached 10:1 from the 133: 1 to 20:1, respectively, for primary and secondary education before 2000 (Panagiotakopoulos, 2009).

Teachers and Educational Software

The majority of teachers today are far from being familiar with computers. Informatics has penetrated in all areas of our lives, so its use and its generalization to the educational process is standard. Soon, the educational software will be established as an additional educational tool. The need for training of teachers is imperative. During the period 2002-2008 (Projects: Information Society) ICT training programs were designed and operated for more than 100,000 teachers. The familiarization of teachers with the basic skills in using the computers was largely achieved.

Traditionally, teachers construct by themselves primarily their educational tools. Notes, slides, video clips and sound recordings, experiments, etc., used by the teachers in the classroom are created by themselves. Teachers write even the books and other teaching materials. But at the process of the production of educational software, things seem to be different. Due to the specific technical nature of this work the production is made by people with foreign educational practices. It is possible for the participation of teachers, in certain stages of production, but that does not change the overall conclusion. So we can see that the construction of a tool aimed at teaching goes beyond

physical bodies. This may have the effect, that on the one hand, teachers do not embrace such a powerful educational tool, on the other hand, the produced educational software does not have the figures, which only the effective teachers conquer with their experiences and with which they manage to adjust their lessons depending on the circumstances.

Nevertheless, there is an educational software produced and evaluated with strict standards and can support the educational process constructively. Its use is another challenge for the teacher. From 2008 a new ambitious effort has began regarding the teacher education. It focuses on the use of technology in educational practice. Teachers trained by specialty, know the educational software related to the subject and learn how to integrate it in the learning process.

Overview of the Multimedia Educational Tool for Elementary Class Students

The resulting multimedia application “E’ class Geography of Elementary Schools” is a software tool addressed in elementary students of the Greek fifth grade class. It is proposed to be used in order to become one additional channel of teaching in the course of Geography. The selection of content and especially the structure of software is mainly based on the curriculum of the Ministry of Education and specifically in the students’ textbook and notebook. More specifically, the application is designed to function alongside with the textbook and is expected to be used to support teaching and promote the central points of each educational unit.

A basic concern is the implementation of an application that will give the opportunity for further training of children in a cognitive object to the introduction of new teaching methods and perspectives used in the context of the integration of new information technologies in Primary Schools.

As instruments to be used there are text, images, video and sounds associated with each section of the textbook to improve teaching practice and therefore increase students’ performance.

The type of educational software can provide: environment-driven instruction, exercise drill and practice, multimedia presentation content, and closed type of software, which can be used for repetition and supportive teaching and drill and practice.

The resulting educational software, "E’ class Geography of Elementary Schools, " is based on the theory of behaviourism that is appropriate for young children, as it requires processing little information. The application covers drill and practice issues. In particular, it will provide a question from a chapter and the student will be asked to prepare the query and answer. The application will appraise the answer and notify the student whether the answer is correct or wrong. Then the student is presented with a new question.

Specifically, the educational software aims:

- at a friendlier, more attractive, richer and multifaceted presentation of material
- at the experiential approach of learning
- at the activation of the student (student actor) through creative activities, experimentation and exploration
- to condense many lengthy text messages to audiovisual content with great information
- to reduce the time spent by the student
- to promote collaborative and personalized learning (students in joint activities learn to cooperate and every student individually can follow at their own pace of learning).

Designing the Multimedia Educational Tool

The main concept followed in the designing course of the educational software was the software itself to be an affordable and enjoyable teaching aid in the study of students regarding the course of Geography.

Regarding the pedagogic concept, the software was created to exploit the technology and to provide guidance to the student, providing activities with specific goals. Furthermore the application was designed to provide interactions, responding to the student moves while in parallel evaluating the student's answer. Moreover the navigation was designed and implemented to be as simple as possible for them. For this purpose a linear navigation structure was selected. Figure 1 illustrates the structure followed during the system's creation in order to minimize the possibility of a student to be disoriented and to easily move successfully from one section to another.



Figure 1. Linear navigation structure.

The resulting system belongs to the “closed type software” and its basic operations are illustrated in Figure 2.

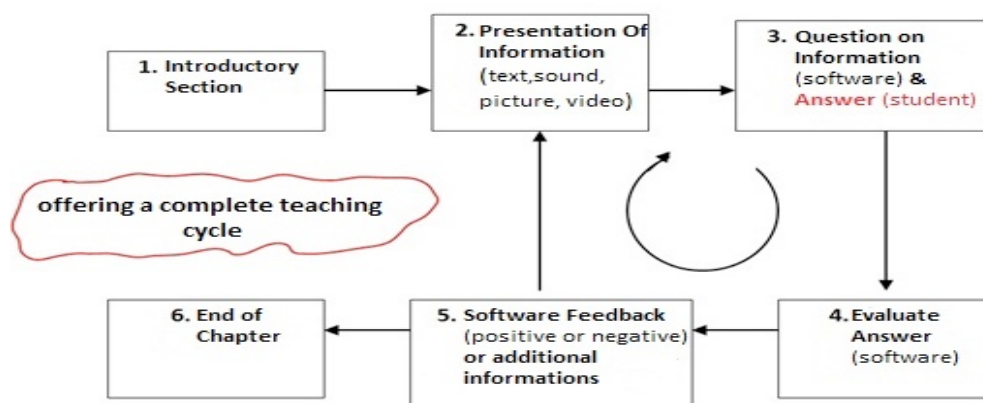


Figure 2. Closed type software diagram.

The context as well as the structure of the software was based on the schoolbook and on the curriculum of the Greek Ministry of Education (<http://www.minedu.gov.gr/>). It includes a set of twenty questions (20) from selected chapters of the book of Geography and according to the workbook. Essentially, the exercise of the corresponding workbook is transferred at the computer screen. Various questions are addressed to the student in order to elaborate and answer successfully. Each student may attempt up to three (3) times to find the right answers. If a student fails, then the correct answer is displayed and the student continues on the next activity. Depending on the attempt we have established three score levels: (a) first successful attempt (100 points), (b) second successful attempt (75 points), (c) third successful attempt (50 points), (d) failure/skip activity (0 points) while respective messages are displayed on the screen.

Activities were categorized into five (5) types: (a) Acrostics, (b) True or False, (c) Drag and Drop, (d) Fill the Gaps and (e) Ticking the Correct. Each type incorporates five (5) questions of the various chapters. Text, images, sound, video and animation have been incorporated in the software in order to make the presentation more attractive and more efficient.

User Interface

During the development of the user interface of the application, great importance to the design of the interface (user interface) was given, since this is the intermediary element in student - computer interaction. The interface is the medium that enables the interactive communication between the user and the system, causing all the features and the overall functionality to depend on it. Therefore the design of the interface, as mentioned above, plays a crucial role in the success of an educational program. The interface of the application "E' class Geography of Elementary Schools" was designed aiming at two main axes. The first one was to attract the attention of the student but without letting the attractiveness of the interface to act negatively towards the content.

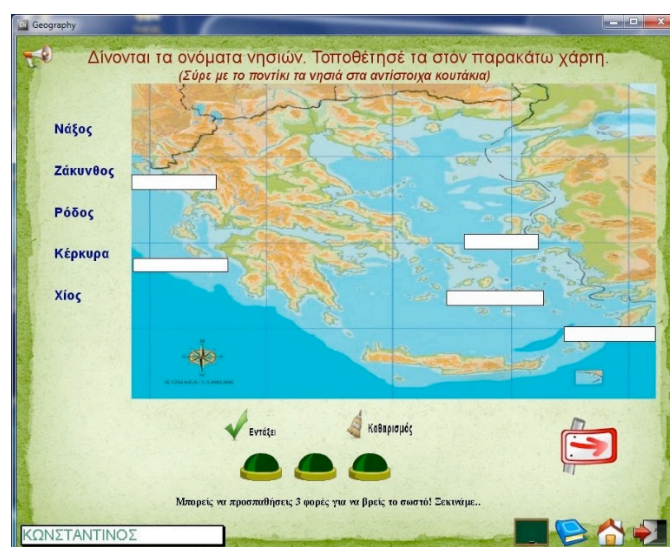


Figure 3. Students using the educational application.

A second axis was to achieve the minimum requirement of the application regarding effort, time learning and remembrance. The use and the functionality of the application had to be extremely simple due to the young age of the community addressed. The student does not need to spend time to learn the handling of the application, but to work in a simple way without having to memorize procedures so as not to be disoriented or be repelled by the application. This is based on the principle that it is easier to recognize than recall something.

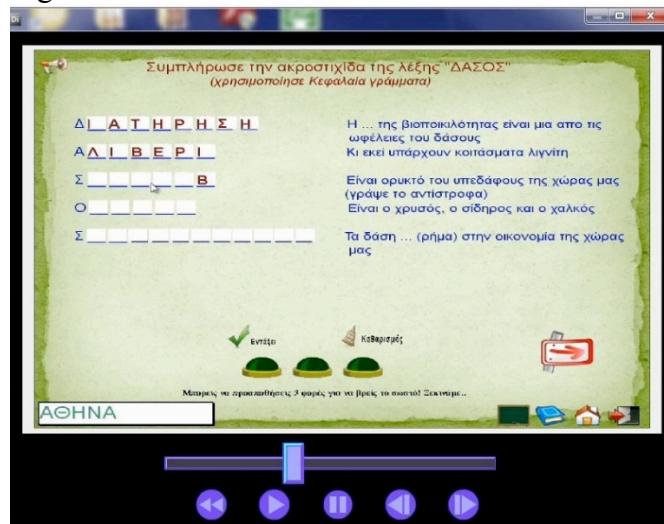


Figure 4. Students taking a test.

The resulting application was developed through Adobe Director 11.5 multimedia application development environment, with a dynamic and interactive way, providing important activities to the students in a way to develop critical thinking. Adobe Director 11.5 software helped us to create a more robust, compelling, and highly interactive multimedia application. Figures 3 and 4 illustrate results of students using the educational application.

Evaluation

The resulting system was presented to and evaluated by both students and teachers of E' class Elementary of the 11th and 12th Elementary School of the city of Tripoli, through the completion of questionnaires. It is worth noting that research in both schools was held at the end of the school year, at the time of Geography course and the application was adapted and implemented within an hour of instruction.

Methodology - Participants and Procedure

A quantitative research was conducted with the use of self-supplemented scale questionnaires incorporating closed questions for the students and close/open questions for the teachers. For our research, we used 24 questions for students:

- three (3) exploratory questions
- nine (9) questions regarding navigation
- three (3) questions regarding user interface
- five (5) questions regarding technical support and update processes
- four (4) questions regarding evaluation of learning

For the teachers, 50 questions were created, based on two categories, namely Social Acceptability and Practical Acceptability as illustrated in Figure 5.

- Social Acceptability: two (2) questions

Finally, forty-eight (48) questions (47 closed and 1 open), divided as follows:

- seven (7) questions regarding evaluation of content
- four (4) questions regarding pedagogical factors
- four (4) questions regarding interface design factors
- eight (8) questions regarding navigation
- five (5) questions regarding control and feedback
- nine (9) questions regarding user interface
- five (5) questions regarding usability
- five (5) questions regarding evaluation of learning
- one (1) open type question

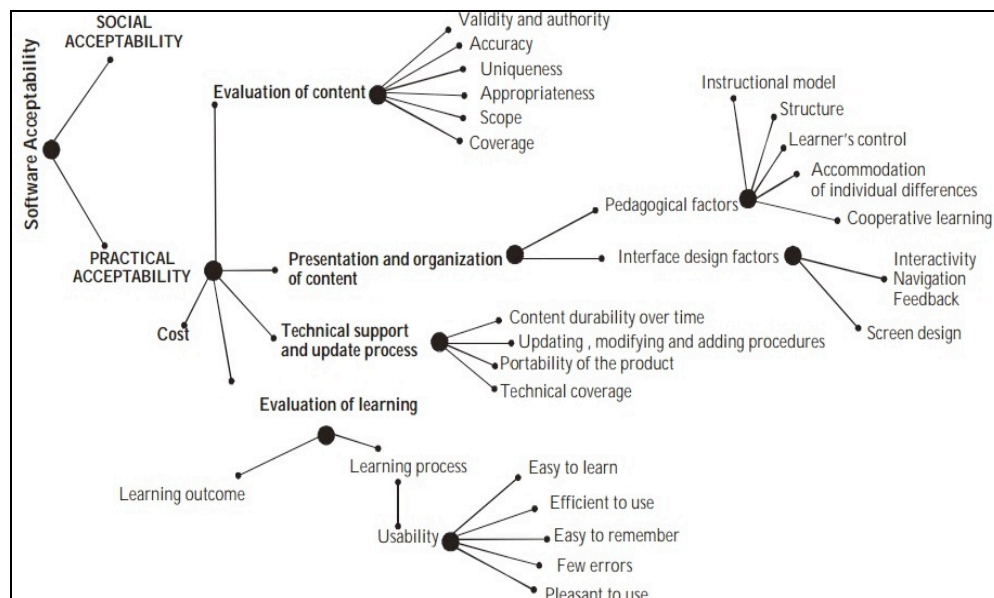


Figure 5. Diagram of the evaluation framework.

All items included in the questionnaire were fixed alternative, with a four and five-point scaled format including in some cases a 'non-applicable' point (0) as well as a rating scale of Yes/No.

The questionnaires were completed by 58 students and 15 teachers from the elementary schools. Students answered the same day of the survey at the end of the teaching period. Their teachers completed the questionnaires within three days after experimenting with the educational software individually.

Evaluation Results

In assessing the application usage of the software from the students, it was observed that they easily and very quickly became familiar with the software, its features and its functionalities. Their interest was undiminished during the whole period of their interaction with the educational application. The system gave them a degree of autonomy and they were able to cope well in cognitive content without being bored by an overly simplistic content, or frustrated by a

difficult content. A healthy competition was developed due to scoring creating an attractive environment. Tables 1, 2 and 3 illustrate indicative questions and answers from the students' questionnaire.

Table 1

Questions and Students' Answers 1

	YES	NO
Do you have a computer in your home?	88%	12%
	YES	NO
Are you familiar with such applications?	50%	50%

Table 2

Questions and Students' Answers 2

	QUITE EASY	EASY	RATHER DIFFICULT
How did you like the teaching of the course through the computer?	48%	52%	0%

Table 3

Questions and Students' Answers 3

	YES	NO
Have you been taught a course like this before?	41%	59%
Do you understand what to do in each activity?	100%	0%
Do you understand how to move from one activity to another?	100%	0%
Would you 'play' again with the application at your home?	88%	12%
Would you like more courses to be performed with this way?	90%	10%
Do you believe that the application will help you understand in a better way the course of Geography?	97%	3%

Finally, we quote the full text of some teachers' comments according to the last open-ended question in the questionnaire, "In the following lines, write your impressions (positive or negative) of your experience using the software."

- "Remarkable, but it was difficult for me because I had no relevant experience. Until now, the lesson was conducted using only the book. The students were interested and considered the application original."

- "Positive impressions and the program is very easy to be used."
- "Very good. There are no adequate facilities in our school."
- "The school is not properly equipped for using this application in the classroom."
- "The students are more familiar with the usage of computers and are happy to work in the lesson with them. Also, providing information in the form of game keeps the interest and attention of students at high levels. The classrooms, however, have lack of projectors and computers and it is difficult these applications to be adopted."
- "The educational process is very enjoyable for both the teacher and the student, holding steady interest of the student throughout the duration of the teaching hour."
- "Very useful application for the course of Geography. Students learn and assimilate more easily any information. Unfortunately Elementary Schools do not have the appropriate facilities."

Conclusions

In this paper an educational application targeted to elementary schools has been presented. This tool can be used as a learning software environment for elementary class students and their teachers. Analysing the system's evaluation results gave us strong evidence that both students and their instructors appreciated its functionalities. Multimedia content in learning courses has been found quite friendly and also profitable for all potential learners.

It is in our future plans to improve the system's capabilities by extending the system's interface to mobile devices, such as smartphones and tablet PCs. In this way, users will further benefit from time and place independence during interacting with it.

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