

# The Design of a Pilot Interactive Multimedia Learning System, Its Implementation and Its Evaluation through a Social Network

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**Abstract.** This study deals with the design and application of an interactive multimedia learning system catered according to students learning needs. It has been created for the Information and Communication Technologies subject in the department of Food Technology of Alexander Technological Educational Institute of Thessaloniki. A learning system can be a very effective one if it is catered according to the students needs. An important aspect that has been overlooked so far, and should be included in such software applications, is their queries and comments during its use by them. This process assists to the improvement of the educational software and to the students learning process too. During the application of this educational software the students were setting their queries and comments on a Social network and according to them the required modification performed on time and according to their needs.

**Keywords:** interactive multimedia learning systems, social networks, higher education, information and communication technologies, blended learning

## 1 Introduction

Nowadays, Information and Communication Technologies (ICT's) are used in all educational levels and the application of interactive multimedia has been accepted as a very powerful tool for instruction and training processes. Results from researches and studies demonstrate that there is an improvement of student learning performance through their use (quicker and faster) [1],[2].

In most cases, students in Higher Education are coming with different background knowledge especially in core subjects like mathematics, physics, chemistry, information and communication technologies etc. [3]. Interactive multimedia systems combine media of communication like text and graphics, sounds, animations etc. and they can form a link between curricula and real world situations. Through these systems the learner selects, organises and integrates the learning material. Selection deals with the connection between image and text corresponding subjects. Organisation deals with the linking of word subject to verbal subject which in turns is connected with the corresponding image subject. Finally, integration deals with the interrelationship event-verbal-visual and events-cases [4]. In a study performed for the use of interactive

multimedia in Physical Therapy Education results indicated that such learning systems can have a positive impact on learning approaches [5].

It is widely accepted that teaching the basic ICTs skills increase ICT knowledge for understanding and interpreting their basic operation. During 2000 the National Technology Education Association writes: "Students who study technology learn about the technological world that inventors, engineers and other innovators have created" [6]. It is important for all students to interpret the logic and functional mechanisms of "everyday" technology and for their specialization it is vital to gain the ability to solve technological problems through the application of ICTs. These approaches have to be followed in Higher Education too because students without understanding the functional ICTs' mechanism are feeling less familiar and not confident with ICTs' functions and operations [7]. During 2000 the International Technology Education Association supported that ICTs subjects in Higher Education undergraduate courses have to include processes that demonstrate technology advancement and uses in the real world. Consequently, students in undergraduate courses have to be encouraged through a number of processes or activities to use their thinking skills during the learning of the ICTs subject and also to give to students the chance to work out innovating problems in a technological way [8]. Students in Higher Education have to gain during their studies: a) knowledge of group dynamics, b) flexibility to work in teams, c) ability to lead, d) competence to problem-solving and e) to communicate effectively.

ICTs subject is part of the curriculum in the department of Food Technology in Alexander Technological Educational Institute of Thessaloniki. This subject includes ICTs basics and how ICTs can facilitate or to be used in their specialization. It is well known that effective learning comes when there is a link between new subject introduction and the required subject's background knowledge. Consequently, for the lecturer, it is important to apply prior to the beginning of a teaching- learning course, some pre-tests in order to organize the teaching modules according to the class needs. These pre-tests assist to the module organization, to the setting of the required learning techniques and to the way of how critical thinking approaches can be introduced to them [9]. Through this process educators can set a well defined instruction plan and the predictable didactic strategies for the fulfillment of students' requirements and needs [10].

This study presents a multimedia learning system for the ICTs subject where its evaluation took place from the students (end-users) through their queries and comments uploaded to a social network. Through this approach the educators were able to check its impact and to improve it through the modification of its "missing" or "misunderstanding" or "unclear" parts.

## **2 The design and operation of the interactive multimedia learning system**

In traditional classes where face-to-face teaching is taking place different teachers that are teaching common subjects is impossible to give exactly the same lectures for these subjects. Also, it is very rare for a lecturer to give exactly in the same form or to repeat exactly the same content when there is repeating of the same lecture [11].

Interactive multimedia technology platforms can support advanced learning and training forms as they provide a high degree of interactivity in various types due to their provision to infrastructure solutions. Consequently, an interactive educational multimedia system based on ICTs learning and training demonstrates its benefits through its supporting architectures for multimodal, interactive learning and training approaches. Studies and researches performed in this area pointed out that the enhancement of the information recall can be achieved through the re-presentation of information on graphic modes and also that the individuals learn, retain and transfer information according to the principles of: a) multimedia, b) modality, c) redundancy, d) coherence, e) signaling, f) contiguity and g) segmentation [12], [13], [14].

ICTs learning, like all other subjects, need an interpretation and understanding of its fundamental concepts combined with the required skills of a real world environment. Last year this Web-based interactive multimedia learning system has been applied in undergraduate ICT students.

Social Networks can be used in classrooms in different ways. The students and the lecturers can input their own subjects and materials contents and consequently they can be used as collaborative tools. The type of comments or questions that the students were able to leave in this social network were used as leading means for the system's improvements, context implementation and usability of software.

The created Social Network was a bounded one (private and restricted social networking). The software that was used for its creation was Ning. Ning provides broadcasts, forum discussions, blog posts, private messages and profile comments. The feature that differentiates Ning from the other known ones like Facebook or MySpace is that its users have the ability to create for a particular subject their own custom social network according to their needs or interests. Ning lets its creators to determine the site's appearance and functionality and to define if the site is a public or a private one.

This Social Network was only set for the academic staff and students of the Food Technology ICT subject. The students were able to post their queries and comments on subject's and coursework content and the lecturers were able to check the weak points of this learning system.

The whole implementation part was divided in four phases:

**Phase 1.** Division of the syllabus in its distinct parts: Basic meanings, Computer basics, Hardware, Software, Networks, Health, Food Technology Applications etc. Definition of subject's required background knowledge components according to the pre-tests' results.

**Phase 2.** Creation of the subject's required multimedia components and preparation of the problems –assessments for the students.

**Phase 3.** Creation of the Ning Social Network.

The concept diagram of the interactive multimedia learning system is in Figure 1.

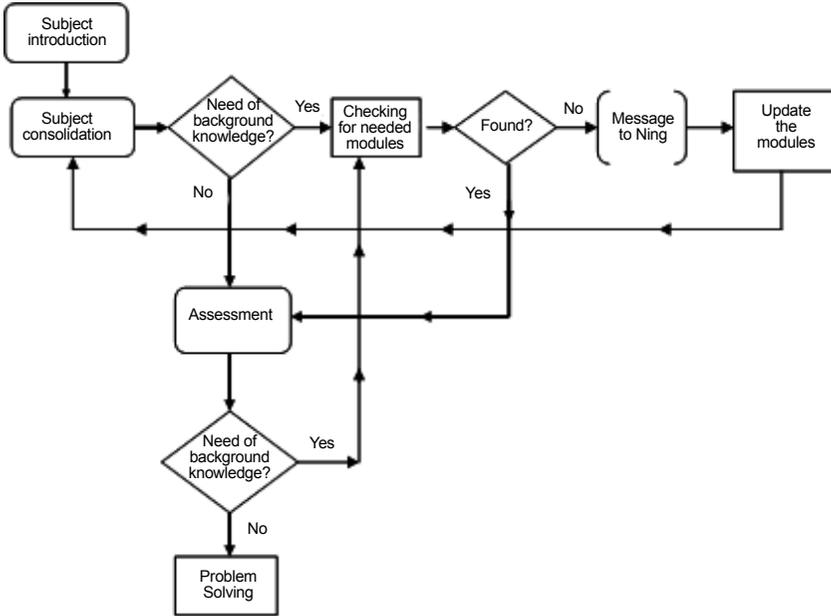


Fig. 1. Learning system concept diagram.

The learning approach was based on blended learning. The procedure for the learning process was: learning-consolidation-testing. Learning was dealing with the introduction of the subject from the lecturer. Consolidation was dealing with the appearance of the introduced subject in multimedia form. Testing was based on solving a problem from the real world. For the real world problems there was a list of the prerequisite subject module(s). In the case where extra background knowledge was needed from the student there was a search mechanism for the tracing of the needed module. In the case where there was a need for additional material or explanations by the student then the student had to leave a message to Ning Social Network. Real world problems were used because they let students to improve their critical thinking skills and to analyse and to solve complex cases [15].

### 3 The System Description

The system architecture in ICTs subject is based on Web technology and its features were dealing with the structure of the student's access to its educational content and with the students' guidance. The learning content was a set of stored modules and these modules were stood for the "pure" subject modules and the background ones. These modules contained a collection of stored media resources that appeared to the learner in a number of views. In such learning environments the existing multimedia delivery systems allow the learner to access content resources and to interact with content in the most appropriate and educationally mode. The basic architecture system elements are module content with spoken and written words, sound, animations, pictures, photographs and

active objects. Also there were delivery media players and infrastructures like Adobe viewer, animation player, server functionality etc. The system operation architecture is in Figure 2.

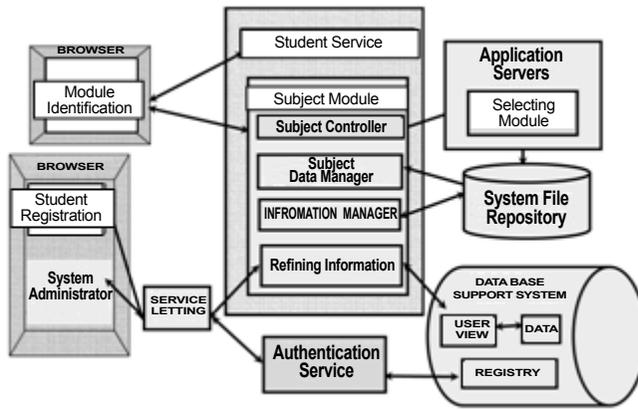


Fig. 2. System architecture.

During the consolidation process the introduced by the lecture ICT module is presented on students’ screen together with its corresponding background knowledge modules. In the case where there were “missing” for the student modules the student was able to “order” these modules from the system.

The system worked with indexes in order to achieve module’s direct access from the stored module-database and the queries were in the form of key words.

#### 4 System Evaluation

As there is not any formal evaluation of the interactive multimedia learning applications, the evaluation of this learning system was based on its usability, accessibility, didactic effects and the number of required modules modification or implementation. The measurements were based on students’ participation, module content understanding, on students’ ability to solve the delivered problems and finally on Ning’s queries and comments. The evaluation of usability and accessibility was performed at the end of the semester where the students had to fill an online questionnaire in order to indicate their opinion about the way that this course has been delivered to them and also if they had found it useful for their learning process. According to the questionnaire students found this process more attractive and they did not face any problem during the module access process. They also mentioned that the use of Ning application had helped them and also that they wanted to use it for their other subjects too. The ICTs subject lecturers found very useful the use of Ning as students’ queries and comments produced a more realistic approach for the required modifications of all the “misunderstand” parts and for the required additional background information modules.

## 4 Conclusion

Supporting students with such auxiliary materials establishes a bridge between subject delivery and required background knowledge. The contribution of Ning during the course delivery assisted to the tracing of all the required modifications and implementations on time and according to each students needs. According to the results of the course assessments students demonstrated a better performance in comparison with the previous semesters' students who had followed the same subject. Finally the overall approach indicated a positive outcome concerning their learning process as the use of this system demonstrated a reduction of students subject drop out, higher students' performance, students' satisfaction for the way that the course context has been delivered and additionally lecturers' satisfaction concerning the overall process.

Further study is needed in order to measure up the reached level of learning, retention, and knowledge transfer to the students.

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