

# **EDUCATIONAL MODEL OF THE MERCHANT MARINE ENGINEERS' CONTINUOUS EDUCATION WITH THE USE OF ASYNCHRONOUS DISTANCE EDUCATION**

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## **ABSTRACT**

The rapid development of science and technology has created a very high level of requirements pertaining to knowledge necessary for man's professional career. On the other hand, in contemporary Information Society (InfS), distance learning offers a significant support to life-long educational process. This study involves the presentation of a suggested educational model of Merchant Marine Engineers' distance asynchronous distance education. The aim of this model is the constant training of Merchant Marine Academy graduates on contemporary technology and science developments. The development of educational digital material is based on the constructivist theory of learning, while the architecture of system implementation follows the principle of partitioning by task layer.

## **KEYWORDS**

Asynchronous distance education, e-learning, marine education

## **INTRODUCTION**

E-learning takes place when a great physical distance or other difficulties, which restrict face to face communication, exist between trainer and trainee, leading to the use of technological means (sound, picture, data, etc.) for the cover of the educational vacuum.

The suggested educational model of e-learning offers marine trainee officers the capability of working with the digital educational material for learning at their work, i.e. aboard the ship, in their free time, or in land, respectively. Simultaneously, they have the capability of an asynchronous communication and an exchange of ideas with their fellow trainees or with the trainer himself (Fry, 2001, Henry, 2001, Lytras, 2002). The subject of education pertains to modern educational subjects which are part of merchant marine engineers' education according to the regulation of IMO STCW '95 model, but also according to the shipping companies' demand.

## **DESCRIPTION OF THE EDUCATIONAL PROGRAM**

Distance teaching through ICT (Information, Communication Technology) assistance, as an auxiliary and supportive means, but as well as a basic tool of teaching, offers the opportunity for an exchange of educational relations to the extent, however, that there is an a priori ensurement of proper content organization and proper educational material formation (Kalogiannakis, 2004). Educational subjects of continuous marine educational program, which will be taught on the basis of distance education principles with the suggested model, pertain to the acquisition of specialized knowledge and ability on technical matters. Particularly, basic educational matters which will be initially included in the suggested model will be the following:

- Computer and Internet Technology

- Digital Systems
- Mechatronic Systems
- Power Electronics
- Modern Control Systems
- New Technologies of Marine Engines
- Logistics
- Computer Systems in ships

## EDUCATIONAL MODEL STRUCTURE

The structure of the system’s educational model was based on the following components (Vrettaros, Giannopoulos, Kouremenos and Kouremenos, 2004; Matsagouras, 1998; Raptis and Rapti, 2002; Solomonidou, 2001; Tsiantis, 2001):

1. Structure of the Educational Program. The educational process taking place consists of two educational levels (see Figure 1):

- **Basic Level.** At this level marine engineer officers (irrespective of their ranking position) are included. These have not attended any previous equivalent educational program, within the scope of the educational subject they have selected to be trained upon. At this initial level, educational material on basic knowledge of the selected educational subject is offered.
- **Specialization Level.** This level presupposes the successful “monitoring” of the previous level. At this level, a further deepening into the educational subject takes place through the presentation of more specialized knowledge and applications.

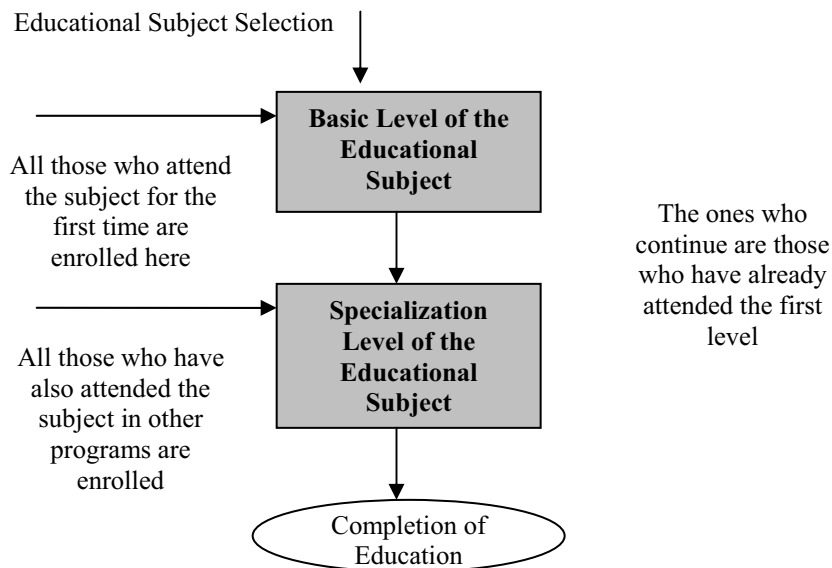


Figure 1. Structure of the Educational Program.

The selection process of every educational subject will be in the candidate trainees’ jurisdiction. From a list of programs they will be in the position to select from 1 up to 3 ones for every academic year. There will be educational subjects which will presuppose “monitoring” of previous related subjects. Technically, selection procedure will take place through the Internet on the continuous education program webpage, where the filling of a special form with specific information will take place for the final selection of the candidate. The selection will be accomplished by the scientific committee of the program and will be announced to the selected candidate together with instructions on program operation and access codes to educational subjects. The architecture adopted by the distance education program has the following structure (Figure 2):

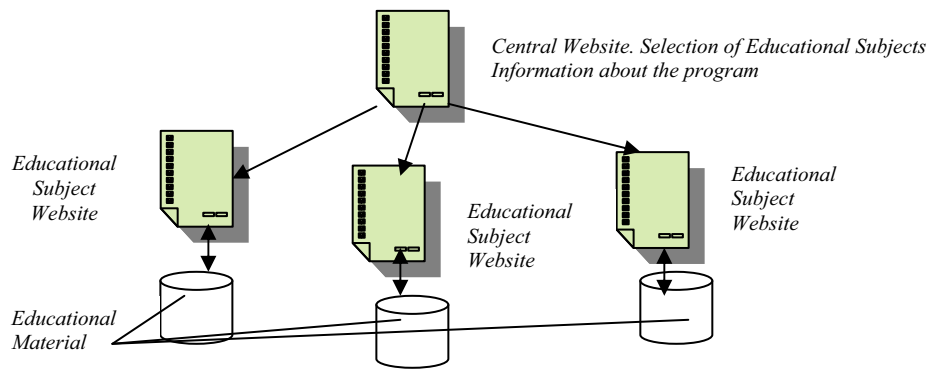


Figure 2. Architectural Structure of the Distance education Program of Marine Engineering Officers

Every educational level is divided into thematic chapters which follow a linear order in their presence. The trainee should finish up the first chapter in order to continue to the next one, because, in the end of each one, there is also a code for the opening of the next one, as seen in the next diagram (Figure 3).

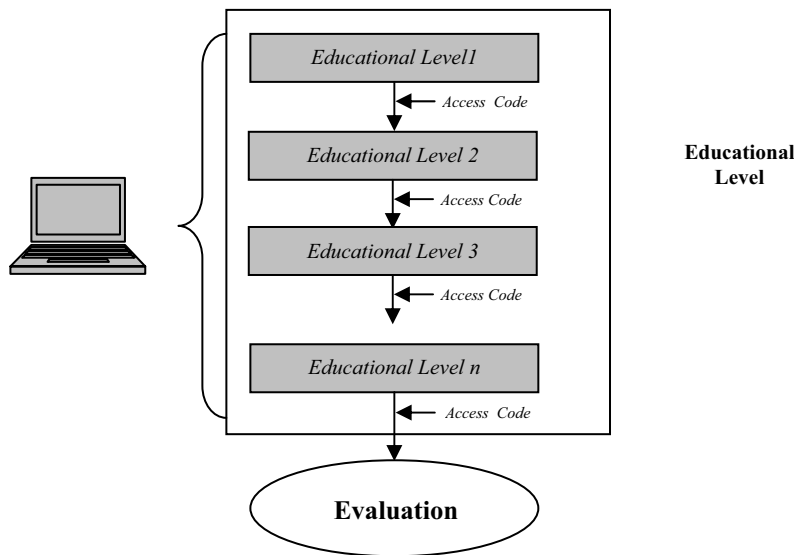


Figure 3. Educational Level Structure

2. Education Time. The total time of education at each level is 200 hours (every educational unit varies, according to the subject it is related to, between 10 and 20 hours). It involves studying, practice, assessment; moreover, amendment ability is also offered with an increase or decrease of hours according to the trainee's learning rhythm.

3. Educational Material. In the case of distance educational material, the existence of the one and only academic book is abolished, while a polymorphous material is created instead, consisting of the following (Holmberg, 2002):

- Lesson Material. It involves basic learning material of every educational subject (text, simulation, case study, pictures, designs, video, software etc.).
- Learning sources material. It involves bibliographic sources of every educational subject.
- Assessment material. It involves exercises, test, projects, assignments, projects related to every educational subject.

The characteristics of the educational material have to be the following ones: bearing the best simple expression, being trainee friendly, creating a segregated presentation of material, bearing clearly formed targets and expected results for every unit, exercises of self-assessment escorted by the right answers and discussion upon possible difficulties and mistakes, various examples and applications, advice on

how the offered educational material should be studied, frequent references to the trainee's experience, illustrations which can substitute an extended text, explanatory titles, matrixes, where crucial points are summarized and difficult notions are explained, catalogues with bibliographic references, suggestions for further reading, instructions on the discovery of supplementary sources, usage of alternative ways of material presentation where this is considered important, clearly stated awareness of the various difficulties which will probably be faced by the trainee.

4. Learning Theories. Learning can be defined as the relatively permanent change of behavior, or of the behavioristic dynamism of the trainee, which comes up as the result of practice, action or experience (Ellis, 1978). Since learning is not accomplished automatically, we are talking about a learning process which is a rather complex and not a completely understandable one so far, taking place within an organism (Tsiantis, 2001).

The methodology of educational material development which includes the suggested e-learning system is based on the constructivist theory of knowledge (Flouris and Kassotakis, 2003). The educational material of our suggestion involves digital material which is properly structured (gradually developed), so that the trainee who will attend the total material can understand it to a great extent, and, depending on the subject, he/she can accomplish a basic application.

5. Supervising means. The system will use as a presentation means of the educational material the computer for software illustration, also visual-auditory material, as well as usage manuals, printed material with suggestions, as well as bibliographic material, all of which are in electronic form.

6. Educational Techniques. In the suggested educational material, a whole variety of educational techniques is involved (Holmberg, 2002), the most important of which are the following ones:

- introduction (text, diagnosis, sound)
- presentation
- dialogue (through e-mail with the trainer, chat room between the trainees)
- assignments (personal, team)
- assessment

## **SYSTEM ARCHITECTURE**

The model of asynchronous education is very simplified and does not need great requirements in infrastructure, in material and software, both on the part of the server who emits the piece of information (the lesson itself) as well as on the part of the simple user (trainee), who asks for the piece of information (lesson) from the server through the Internet. Architecture design of the suggested system is accomplished on the basis of the principle of partitioning by task layer. According to this principle, the system is designed in such a way, that any subsystem of it can be installed and operated in a separate server. Thus, the suggested solution includes two (2) servers with the following competences (see Figure 3) (Vrettaros, Giannopoulos, Kouremenos and Kouremenos, 2004):

- Web Access Server: This server adjusted to the environment of the Internet Service Provider will be receiving and fulfilling the users' requests. More particularly, the Web Access Server will be hosting the central page of the junction, from where the system user will be lead either towards information services or education services (asynchronous educational model).
- Application Server: In the Application server are the system applications installed with the assistance of which the informing and education of trainees will be accomplished.

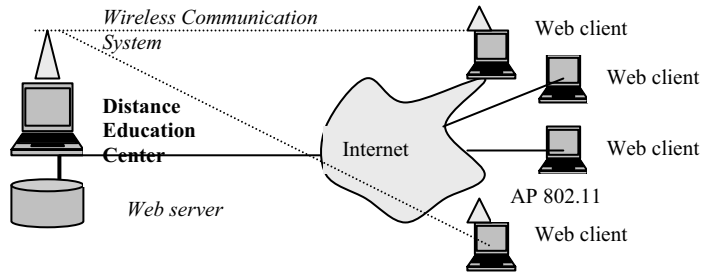


Figure 4. Asynchronous model of Distance education for Continuous Marine Education

## HARDWARE & SOFTWARE DESCRIPTION

The structuring of servers, as well as the software which will be installed in each one of them is the following (Vrettaros, Giannopoulos, Kouremenos and Kouremenos, 2004):

- **Web Access Server.** An ideal web access server would be a model with two Intel Pentium processors, of 1 Gbyte central memory, great storage space with a total volume of more than 200 Gbytes in double layer, with RAID-1 format and also with RAID-5 format for high availability, as well as a hot swap. Moreover, it would have two Internet cards and two feeding apparatuses, as well as an internal autonomous unit of back up device. System structure ensures a great and high processing speed, with the existence of two processors and drives of storage units of Ultra3 SCSI type.
- **Application Servers.** Powerful PCs or alternatively professional stations are required, which are destined for usage in combination with the Unix operating system, depending on software requirements. Since the computers of this category will be having the basic role of a central server, their dynamism in terms of memory, discs of data storage and other function parameters will be greater than that of computers-terminals. It is highly possible that a computer might be used for the accomplishment of more than one programs of the server type.
- **Communicative Equipment.** The transmitting and access to educational material will be achieved with the use of Access Point, or the Protocol IEEE 802.11, that each receiver-PC should be having.
- **Systems Software.** Servers' software depends on ultimate requirements of the application. Moreover, it depends on the operation system installed. Since e-self learning system addresses simple computer users, what is suggested is the Microsoft Operation System, which is the most widely established one in this category. More particularly, it should have:
  - Web Access Server: Steady Operation System (Win 2000 Server or something else), Internet Information Server-IIS, a program of pages development as well as of content junction.
  - Application Server: Steady Operation System, DataBase Server (SQL), SQL Server Internet Connector.
  - Asynchronous distance education software: e-class platform.
- **Trainees' PCs.** Users' PCs should have the specifications of a multimedia PC and be equipped with proper software in order to serve the protocol IEEE802.11 and the equivalent Access Point antenna.

## SYSTEM AVAILABILITY

High availability is necessary in an e-learning system for the great safety and security of system operation. This is accomplished with the operation of special software, related to the management of storage system means (RAIID-1 and RAID-5 technology) and the implementation of recovery mechanisms (hot swap architecture) (Vrettaros, Giannopoulos, Kouremenos and Kouremenos, 2004).

## CONCLUSIONS

Life-long education has been necessary in our times and simultaneously an impetus for the searching of new educational practices. The suggested educational model offers: flexible use of means and tools, a synthetic presentation of selected bibliographic texts which cover the whole educational subject, a cooperation development and educational quality. We hope that this model will constitute the impetus for the creation and achievement of similar attempts also in other sectors of the Greek Economy with the ultimate target of offering productivity and service quality improvement.

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