E-learning System for Ship Maneuverability

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Abstract: - The designing tools for an e-learning system in the naval engineering is the argument of this paper. The particularities of ship maneuverability field defined the methods and techniques for developing the specific components of the e-learning system. Testing and validation of the e-learning tools were important phase in implementing the educational system in the Naval Architecture Faculty of Galati.

Key-Words: - e-learning tools, ship maneuverability, simulation, virtual reality, assessment, testing, validation.

1 Introduction

In engineering education, the curriculum requires the specific technical disciplines. The time budget is mostly assigned for laboratories and projects.

If in the electronic, electrical engineering or computer science teaching materials are some types of circuits and components, in the naval education system, the ships, the blocks of the ships, even their panels can be presented to the students only in the shipyard. Because it was impossible to carrying out all of laboratories and project hours in the shipyard, determined during the time to realize the photos and layout models of the ship structures and piping.

Gradually, in last years, those materials have been replaced with electronic documents like.doc, .pdf, .ppt files. This list has been completed by video files with the records of welding and assembly processes.

All these materials were used sequentially in the educational process.

Another feature in preparing naval engineering students is related to the ship maneuverability study. If problems for presenting the ship structures have been resolved in the shipyard, the others, witch regarding the maneuverability have been presented only in theory because the teaching students, on board in the sea is impossible

About assessment, the students were note traditionally, being used classical examination forms with three subjects, two of them for argumentation and the third to solve a problem.

2 Problem Formulation

The quality of our education system being in the center of our concerns we considered very important to design, to realize and to implement an integrate e-learning system [7], [4], [5].

E-learning designing platform had to meet the particular field of education and students training needs, as well as quality standards on teaching, fixing and assessing the knowledge [1], [2].

The success of e-learning system based on the formulation of technical specifications. The system must:
• have the characteristics and properties of an integrated system, [11], [17]
• contain tools for presenting text and hypertext, [12],
• contain presentation tools for 2D and 3D models, [19],
• contain presentation tools for video files
• contains self-assessment tools
• contain assessment tools
• to provide facilities for centralizing the assessment and statistics presentation of these
• to respect psychological and pedagogical recommendations in visual perception and assimilation [15],
• to provide free or guided training [9]
• to allow the teacher intervention in the system to update the information [8],
• have interfaces with forms, chromatic and dynamic to be consistent with trends in web-art-design

3 Problem Solution

We chose for application development Visual Basic platform, being situated in the top generators of the layouts manager. E-learning system has been designed like any a classical Windows applications type that students are very familiar.

Such a system contains the first headline with the name of discipline followed by a line for menu bars designed for discipline chapters, each menu open submenus proper to discipline subchapters, which in turn contain submenus with various information type argument, examples, simulations, tests and self-assessment tests (see Fig.1).

If for the shipbuilding discipline the e-learning system needs tools for virtual models of various types of ship structures (see Fig.2) that students can "handle" for the maneuverability course the tools for of 2D and 3D simulations are required. In the turning circle maneuver case e-learning system was designed to open two windows simultaneously (see Fig.3). In the lower window is presented maneuver of 2D turning, and upper students can see the virtual reality "being" on the command post of the ship. The 2D simulation is the result of the transposition of turning circle equations of the ship in AutoLISP code file, creating and representing the instant ship position.
Virtual reality has been conceived by 3D modeling of the ship and the port area in the 3DStudioMAX system, defining the ship movement curves carrying out an animated system. Students can see the turning circle maneuver as they would be on board, having simultaneously in the windows2D and 3D images form virtual reality.

Self-assessment tests were created in Java using items form. The report instantly (see Fig. 4), fairness response after which it is allowed to shift gradually item.

Self-assessment tests can be found in the structure of e-learning system in each chapter and section, thereby allowing students to set the new arguments during the teaching.

Assessment tests have nature summative and were generated in Java and are 2 types: items with one correct answer and with multiple answers.

The results of assessment tests are viewed primarily by the student. At the end of each test the system inform the student about the number of points obtained (see Fig.5), the result being send in the system database, in the location reserved for the student and after he can access the test solutions. The results tabulation into the same unique database permit to obtain information about individual students achievements (see Fig.6) and for the whole group, being a tool for teacher self standing (see Fig.7).

4 Testing System

Like any product, especially information – teaching one also this e-learning application had undergone to some experimentation.

4.1 Operational Experiments

They were focused in two directions, taking in consideration teachers observations and the speed of students reaction in front of information. Such type of experiments in which teachers checked:

1. Time
   - to browse information guided by the teacher
   - fixing the concepts taught
   - assessment

2. Fluidity
   - in presentation the course chapters
   - of arguments fixing
   - assessment

3. Application efficiency

Experiments were conducted using two subjects groups: students in the third year of study in Naval Architecture Faculty of Galati (university year 2007-2008) (Bologna education plan).

Original conditions were very close:
   - Same specialization (the number of hours)
   - The same teacher
   - Annual average for two groups 7.26, 7.32

In those initial conditions it was decided to carry out experiment in the next version:
The experiment was done to the maneuverability course.

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<th>TABLE I Educational technologies</th>
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<td><strong>Group</strong></td>
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<td><strong>Ways and Method</strong></td>
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If for the A group were used the classic educational technology in teaching and assessment for the B group it was used the E-learning system.

Results:

- On teaching:
  - An increased interest for B group versus A group confirmed by attractive teaching methods (presentation on computer).
  - Browsing a much larger number of examples (of these issues) for group B vs. A.

- Setting concepts more efficient by the teacher
  - Self – assessment:
    - Type of fixing the concepts taught by self was possible only for the B group.
  - Assessment:
    - The same assessment tests (items types) were both groups. They contained questions that have pursued a number of seven standard parameters comparison

1. Issues recognition
2. Forms association, arguments and technologies
3. Precision and rigor
4. The capacity of synthesis.
5. Errors identification.
6. Formula identification
7. Formula Knowledge

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<th>TABLE II Comparative results of correct answers</th>
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<td><strong>Comparative parameters</strong></td>
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The answers to these questions were the parameters of comparison between the two groups (see fig.8) as follows:

Fig. 8 Graphical comparison between effects of educational technologies

They were important differences (in favor of the B group ) and in particular for the visual perception objectives and imagination. Explanation for this difference is due to:

- simulation of the ship maneuvers
- dynamic teaching in e-learning system
- e-learning system facilities for student in self assessment
- assessment with excluded the subjective factor
- dynamic image viewing and a very large number of examples.

5 Conclusion

There seem to be several reasons for our integrate e-learning system success:

- The interface designed in the context of the learner’s tasks, for the purpose of supporting tasks to be done by the learner;
- The interface designed using the last theories in web-art-design;
- Using the visual 2D and 3D perception like a language for attention, understanding and motivation for accumulation and using the knowledge;
- The complex system of ship maneuverability equations simulated in virtual reality;
- Experience in naval architecture teaching.

References:


