Abstract- The designing tools for an e-learning system in the naval engineering are the argument of this paper. The field particularity, like variety and size of ship structures and piping have defined the methods and techniques for developing the specific components of the e-learning system, based mainly on the generation of animated virtual models. Therefore the creation of the necessary tools for a correct 3D perception of the ship and also the tools for self assessment and assessment are the main components for the present e-learning field. The efficient use of the e-learning tools is provided by the management of a unitary platform as an integrated e-learning system. Testing and validation of the e-learning tools has been an important phase in implementing the educational system in the Naval Architecture Faculty of Galati.

Keywords: e-learning tools, naval engineering, typical problems, simulation, testing, validation.

I. INTRODUCTION

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

If in the electronic and electrical engineering or computer science, teaching materials are basically circuits and components, in the naval education system, the ships, blocks of ships and their panels can be presented to the students only in shipyards. Because it is impossible to carry out all laboratories and project hours in the shipyard, we had to realize the photos and layout models of the ship’s structures and piping.

Such materials have subsequently been replaced by electronic documents like .doc, .pdf and .ppt files. This list has been completed by video files with the recordings of welding and assembly processes.

All these materials have been used sequentially in the educational process.

Another feature in preparing naval engineering students is related to the ship manoeuverability study. If ship structures can be presented in shipyards, manoeuverability has been presented only in theory because teaching on board at sea is impossible.

As regards assessment, students were traditionally evaluated by classical examination forms with three subjects, two argumentative and one problem.

II. PROBLEM FORMULATION

The quality of the education system is our main concern therefore we consider it is very important to design, execute and implement an integrated e-learning system.

E-learning designing platform has to meet the exigencies of this particular field of education and the student’s training needs, as well as quality teaching standards.

A successful e-learning system is based on the formulation of certain technical specifications.

The system must:
- have the characteristics and properties of an integrated system
- contain tools for presenting text and hypertext
- contain presentation tools for 2D and 3D models
- contain presentation tools for video files
- contain self-assessment tools
- contain assessment tools
- provide facilities for centralizing the assessment and statistic presentation.

Fig. 1 The menu bars
III PROBLEM SOLUTION

For application development purposes, we chose Visual Basic platform, due to it being situated in the top generators of the layout's manager. E-learning system has been designed like any classical Windows application and as a result students are very familiar with it.

Such a system contains the first headline with the name of the discipline, followed by a line for menu bars, designed for discipline chapters. Each menu opens submenus particular to discipline subchapters, which in turn contain submenus with various information type arguments, 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 2D and 3D simulations are required, as well.

In the case of the turning circle maneuver, the e-learning system was designed to open two windows simultaneously (see Fig.3). In the lower window the maneuver of 2D turning is presented, and in the upper window 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 positions.

Virtual reality has been conceived by 3D modeling of the ship and the port area, in the 3DStudioMAX system, defining the ship’s movement curves produced in an animated system. Students can see the turning circle maneuver as they would be on board, simultaneously visualizing in the 2D and 3D windows which form a virtual reality.

Self-assessment tests were created in Java using items form. The instantaneous report (see Fig. 4), which displays if the response was correct or incorrect, is very beneficial to the student.

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

Assessment tests have a summative nature and have been generated in Java and are divided into 2 types, items with one correct answer and with multiple correct answers.

The results of assessment tests are viewed primarily by the student. At the end of each test the system informs the student giving the number of points obtained (see Fig.5). The results are sent in the system database, in the location reserved for each student, allowing the student to access the test solutions. The tabulation of the results into the same unique database permits to obtain information about individual achievements of each student (see Fig.6) and for the whole group, thus being a tool for teacher self standing (see Fig.7).

IV TESTING SYSTEM

Like any product, this e-learning application has undergone several tests.

Operational Experiments
They were focused in two directions, according to teacher’s observations and student reaction in front of information. Such types of experiments in which teachers checked:

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