STUDENT`S TRAINING ONBOARD TRAINING VESSEL "NASE MORE"

Vedran Jelavic[1], Zeljko Kurtela[2]

Abstract— *Practical onboard training of maritime students became very important component of educational process. International Maritime Organization (IMO) proposed seagoing as integral educational part for future seafarers. Beside apprentice period on ocean going vessels, maritime students at The Poytechnic of Dubrovnik attend trainings onboard training vessel "Nase More" during regular studying period. This paper presents organizational structure and main activities of the practical training for marine engineering students. Ship "Nase More" is in compliance with relevant requirements for all equipment and machinery. Training takes place during the winter and summer semester of each academic year. Students are beeing trained according to the program courses at The Polytechnic. Beside theoretical knowledge they gain practicall skills which are necessary for their future work on the merchant and paeeenger ships.*

Index Terms ¾ training vessel, system, component, teaching method, practical training, individual work, teamwork, evaluation.

SHIP CHARACTERICS

Training vessel "Nase More" originated from reconstructed fishing boat. Reconstruction took place in shipyard Sibenik During the years 1998 and 1999, and the first group of students and professors sailed on the ship in autumn 2000. New purpose of the ship (education of students and oceanografic research) required significant modifications, so she changed from an average fishing vessel into the modern, fully equipped training vessel. Education and training is organized for marine and aquaculture students, and oceanografic research is benefit of scientists from institutes and accademies. Main characteristics of the ship like overall length, beam, type and power of propulsion, etc. remained as before, while facillities and accomodation suffered from radical changes. Main characteristics of the vessel are as followes:

- L. O. A. (length overall) = 31,35 m
- B (breadth) = 7,40 m
- D (draft) = 2,51 m
- P (power) = 662 kW

For educational purposes four different systems are recogniesed (figure 1) such as:

- navigation systems
- engineering systems
- electrical and control systems
- safety and environmental protection systems
- oceanografic research systems

All administrational, operational and maintenance activities are organized according to mentioned division.

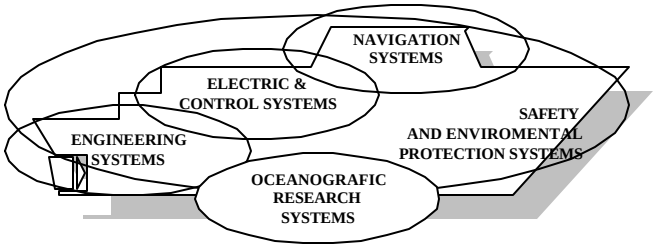

FIGURE. 1
TECHNICAL SYSTEMS ON TRAINING VESSEL "NASE MORE"

Navigation systems are situated on the upper deck of the ship which could be approached from inside and outside, thus providing cyrculation of two groups of students without interrupting each other. One group can stay on the deck and exercize, while the other group can operate on the bridge. Bridge of the vessel "Nase More" seems to be overdimensioned for that size of the ship, but that is done on purpose to accommodate 7-8 students which could exercize on the bridge simultaneously. Configuration of the navigation equipment has been carefully designed to obtain easy handling for the students and efficient presentation for the teachers. All modern navigation and control systems could be found on the bridge, but proper attention is also given to traditional methods and assessories. Because of that every student has to practise use of sextant and deal with traditional methods of terestic navigation. Beside normal educational activities, taditional watch is also organized to prepare students for such duties on the commercial ships.

Engineering systems are mostly found in the engine room. Main engine has not been changed During reconstruction because it fulfills all requirements for propulsion of the ship and beside that is is very usefull for educational purposes. All components which are parts of todays modern engines could be found on Wartsila 12 V UD 25. Space arround the engine is wider than on the ordinary ships of such size, so group of up to 10 students can work on the engine in the same time. Fuel and cooling systems are designed to be easily reached for maintenance and training

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purposes. All components could be easily identified and followed making each system logic and easily understood. Important pumps are doubled in the manner that one pump is attached to the main engine while the other is separated and driven electricaly. That increases redundancy of the ship and offeres variety of pump design solutions in order to meet marine training requirements. Cooling system consists of sea water part and fresh water part which are very similar to systems found on the big comercial ships. Fresh water system and drinking water system for accomodation are designed to supply enough water for full occupancy of the boat plus aditional quantities for research purposes. Therefore all laboratories are connected to sea and fresh water system suply. Water maker is producing fresh water by reverse osmosis process which is common for smaller ships. Drinking water is provided after sterilisation with ultra-violet rays what, eliminates risk of contamination and infection since young college age population is often crew of the ship. The same standards are required for cargo and passenger ships so students can have practical training on the same drinking water systems like on the ocean going vessels. Stearing gear is electro hydraulic with possibilities of automatic and manual operation. Each student has to make emergency stearing operation individualy as part of the practical onboard drill. Hydraulic system on the ship is very advanced providing oil for deck machinery, oceanografic winches and other assesories making it very interesting and usefull for the students. Heating, refrigeration and air conditioning systems are providing excellent living conditions during the whole year so practical training could be organized both in summer and winter semester. All other engineering systems are in compliance with requirements from Croatian Register of Shipping and beside that mounted to be easily reached and usefull for training purposes.

Electric and control systems are designed according to AUT 3 (automatic control) requirements. Electric system consists of DC and AC current, awaillable from shore supply or from ship generators. Distribution of electric energy is similar to electric distribution on cargo ships so students can practicly regulate and control electric generation and consumption like in their future work on cargo ships. Control system is providing operation from the bridge and from the engine room intruding cooperation and coordination between nautical and engineering students.

Group of electric and control systems are overlapping both with the group of nautical systems and the group of engineering systems (figure 1), making this system very important-like the *bridge* between deck and the engine room.

Safety and environemental systems are designed to meet requirements from two very important internatinal marine conventions. Convention regarding safety- SOLAS (Safety of life at sea) proposes all safety equippement on the boat which is necessary to obtain relevant safety certificates, and serves for educational and training purposes. All students are obliged to lounch life boat, respond and act according to emergency plan after allarm sounds, respond in all emergency situations etc. Convention regarding environmental pollution - MARPOL (Marine Pollution) proposes all equipement which is necessary to prevent pollution of the sea from the ships. Therefore bilge system is installed on the training vessel "Nase More" and every engineering student is supposed to run and handle bilge water separator according to requirements from Internatinal Maritime Organisation. Another very important equipment is Sewage treatment plant which is utilized to collect and treat sewage water. It is mandatory for every engineering student to learn how to handle this plant and pump overboard water which is steriliesed and therefore friendly for environement. Waste is beeing selected and collected into special containers so students can learn how to manage waste during each week of navigation. Management of waste is all organized and controled only by students. Group of the Safety and environemental systems is containing all other subgroups of systems (figure 1) what gives extreme importance to these systems.

Oceanographic research system consists of three laboratories where samples are being treated and equipment used for taking samples. Big powerful hydraulic winch is used for deep-sea sampling while other equipment-including working boat and diving equipment are used for shallow sampling. Laboratories are air conditioned and provided with all other facilities, which are necessary for high standard scientific oceanographic research.

TEACHING AND TRAININ G METHODS

Education, training and cruising on the training vessel "Nase More" is organized for 18 students divided into four different groups (figure 2).

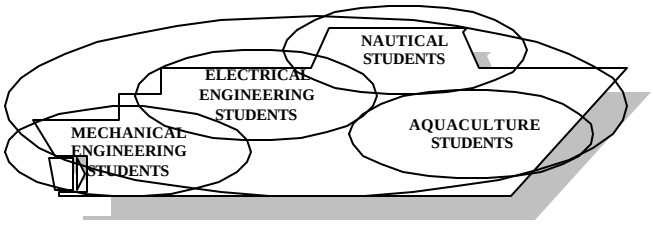

FIGURE. 2
GROUPS OF STUDENTS FOR TRAINING ON VESSEL "NASE MORE

Marine students such as: nautical, electrical engineering and mechanical engineering students are active on daily duties and watchkeeping under supervision of professors and professional crew members. Aquaculture students are taking samples or making experiments in the labs depending on the sailing conditions. All students are having some theoretical classes which are often an introduction to their later practical work. Four teaching methods are combined with practical training on the team and individual basis for all three groups of marine students.

The first step in education and training starts in the classroom at The Polytechnic of Dubrovnik or classroom/living room onboard training vessel “Nase More”. That is an introduction and overwiev of all activities on the ship taken by the teacher and group of students (figure 3).

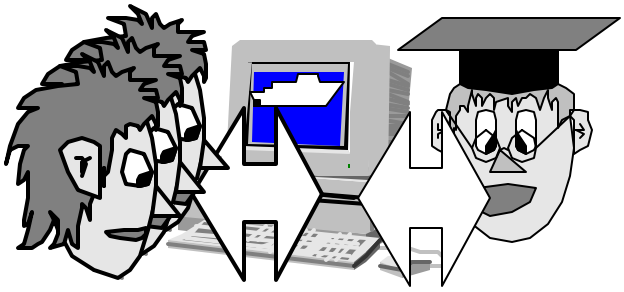

FIGURE. 3
ACTIVE TEAM CLASS SUPORTED BY THE COMPUTER.

Computer aid is very important at this step because it gives very fast and acurate information about ship systems that students are going to deal with. Beside general knowledge about all relevant systems and components they get some special individual tasks about specific topics. Total time spent for this method of learning is 20 %.

Individual learning is another way of gaining knowledge for the students. Each student has to work on special project where all data and informations are found in ship library or ship computer data base (figure 4).

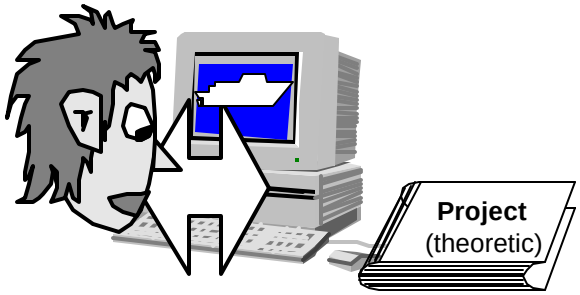

FIGURE. 4
INDIVIDUAL LEARNING AND CREATION OF THE PROJECT

Project is based on theoretic or constructional research of some systems or components installed on the ship “Nase More”. Ship library is supplied with all instruction books, Rules and regulations from the registers of shipping and other technical literature recommended by the professors. Total time spent for this method of learning is 20 %. During individual learning process professors and crew members (master and chief engineer) are awaillable for consultations.

Another step in onboard education and training is practical group (team) work organized and supperrvised by professors (figure 5). All systems are introduced to the students in the way that they can run them and control all the functions. Students are forming teams like real merchant vessel crew members and rotating their positions and duties within the team.

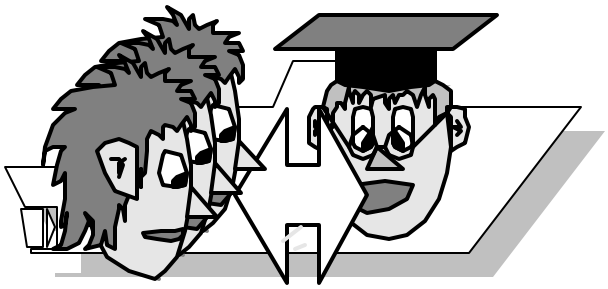

FIGURE. 5
PRACTICAL TEAMWORK SUPPERVIZED BY THE PROFESSOR.

During rotation within the team they work on different duties on management and operational level. Each student has to give daily reports to professors and captain or chief engineer and fill log books, check lists and all other documents. Emergency situation is beeing simulated several times for each group so the teachers and crew members can watch student skills and behaviour in such situations. Total time spent for this method of learning is 40 %.

Beside practical team work, individual work without continious supervision of the professor is necessary for each student (figure 6).

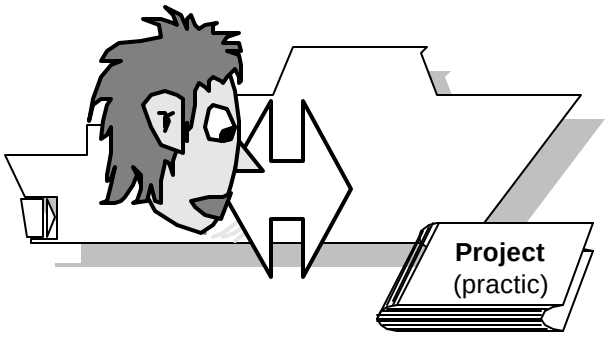

FIGURE. 6
INDIVIDUAL WORK WITHOUT CONTINIOUS SUPRVISION

Student can concentrate on one practical problem and solve it by using his own knowledge and skills. Practical problem is allways set from the project and solution of the problem is added as an appendix to the project. Like this project includes theoretical and practical part about particular system or component presented in written form. Total time spent for this method of learning is 20 %.

Through presented methods of education and training every topic that students are learning about starts with theoretical fundaments. After adopting theoretical part

students turn to practical operation with ship systems and machinery doing some maintenance work as well. To get familiar with the systems and machinery it is very important to have all necessary blueprints and instruction books from the shipyard. Beside that all systems installed on ship "Nase More" have editional computer designed drawings from all relevant views and cross sections of the main components. Togedher with drawings digital photoes taken from several angles are enclosed. That variety of visual documentation halpes a lot in recognising and understanding of the systems. All the drawings and the photoes are made by students and professors, and the data base with these informations is growing after each group of students.

TYPICAL TASK FOR THE STUDENT ON BOARD TRAINING VESSEL "NASE MORE"

To describe the sea water system on the ship with all relevant components. To make calculation of the sea water pump capacity, valve stations and main heat exchanger heat transmision. To operate and control the system during operation individualy.

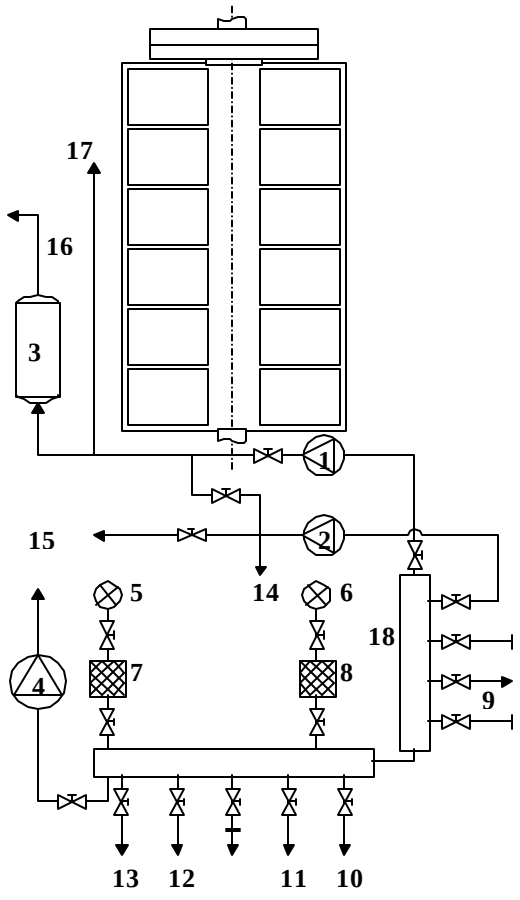

FIGURE. 7
PART OF THE SEA WATER SYSTEM ON THE SHIP "NASE MORE"

FIRST STEP

Detailed analyses of the blue prints, drawings and enclosed photoes. Consultations with professor and chief engineer. Example of very usefull computer drawing made by student is enclosed on figure 7.

SECOND STEP

Calculation of the sea water pump capacity. All figures and data to be found from instruction book, Rules and regulations from Croatian Register of Shipping and book Marine auxilliary machinery. Figure 8 showes the sea water pump (position 4 on the sea water system plan).

FIGURE. 8
SEA WATER PUMP ON THE SHIP "NASE MORE"

Calculation of the sea water valve station (figure 9) by using the same literature as before.

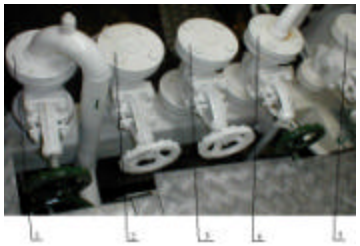

FIGURE. 9
SEA WATER VALVE STATION ON THE SHIP "NASE MORE

Position of the valve station on the sea water plan is number 18. The valve station is sub devided into five components which are detaily described.

FIGURE. 10
FRESH WATER MAIN COOLER ON THE SHIP "NASE MORE"

Calculation of the fresh water main cooler valve station (figure 10) by using the same literature as before. Position of the main cooler on the sea water plan is number 3. Main cooler is sub devided into four components on the photo 10. Description of the components is enclosed togedher with the calculation of the heat exchanger.

Calculation of these three components together with enclosed drawings makes the theoretic part of the Project

THIRD STEP

Introduction to the instalation of the system in the engine room following the tube from the inlet into the vessel till the outlet. Recognition of every component suported by designing and operating knowledge. Consultations with professor and chief engineer.

FOURTH STEP

Individual system management including operation, control and fault diagnosis – first under supervision of the professor or chief engineer and then alone. This has to be described in the practical part of the project.

TEACHING TIME SCHEDULE AND EVALUATION

Since students are spending five days cruising in every tour with an average half time in navigation and half time at anchor, the following time shadule for each method of teaching is found to be the most convenient (table I).

TABLE I
TIME PROPOSED FOR EACH TEACHING METHOD

Fig.	Method for education and training	% of time
FIG. 3	Active team class supported by the computer	20 %
FIG. 4	Individual learning	20 %
FIG. 5	Practical team work supervised by professor	40 %
FIG. 6	Individual work without continuous supervision	20 %

Evaluation of the students does not include only result of the test and project. After having practical training on the ship the final grade is calculated as presented in table II.

TABLE II
MODEL FOR STUDENT EVA LUATION

#	Activity	% of final grade
1	Written exam	35 %
2	Oral exam	35 %
3	Project	10 %
4	Practical skills	10 %
5	Respond to emergency situations	10 %

It is evident from the table that 70% of the final grade makes oral and written exam. That is because Maritime College is proposed for management level on the ship (captain, chief engineer and first mates) and excellent knowledge is still the key how to reach top positions on the ship. Practical skills and behaviour in emergency situations makes 20% of the grade because we think at The Polytechnic of Dubrovnik that those skills will surely improve with experience and therefore should not be dominant for the beginers.

ACKNOWLEDGMENT

Four methods used for education and training are combining theoretical knowledge and practical work applied on the training vessel “Nase More”. Both practical and theoretical knowledge are practiced through team and individual activities. Interest for particular topics, final grades and general theoretical and practical knowledge of the students incrised after repeated trainings on the training vessel.

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