

# **Special Subjects Teaching Methods in Marine Engineers' Vocational Education System**

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**ABSTRACT:** World marine engineering sector has been developing rather swiftly since recently. Every year the majority of leading shipping companies raise the level of management & maintenance of their vessels. Therefore the requirements to seafarers are increasing constantly. All these circumstances lead to the fact that every next year marine institutions, having limited time for teaching process, meet rising difficulties in seafarer's proper training. That goes particularly for the special (technical) subjects, which are being taught to future marine engineers and form the level of their proficiency by the time of the graduation.

## **1 INTRODUCTION**

Today a lot of MET institutions use ship machinery simulators widely, while teaching the special subjects. They facilitate students' studying the structure and operating principle of the machinery. However, proper studying of Automatic auxiliary machinery control systems and Automatic diesel plants control systems meets some difficulties. Of course, high-end and expensive full-mission simulation is almost unavailable to the MET institutions concerned, but building the automatic auxiliary machinery and diesel plants control systems practical "de facto" simulation is rather interesting direction.

## **2 TODAY'S PROBLEMS IN VOCATIONAL EDUCATION SYSTEM FOR MARINE ENGINEERS**

During recent years marine power engineering had reached stupendous achievements. Severe competition between shipping companies for cargo

lines stipulates the fact, that requirements for seafarers' professional skills are becoming stricter every next year. One of the main problems in vocational education system today is associated with the limited time for studying in educational institutions, particularly in Maritime Institutions of high education. Having limited class time the Institutions have to prepare the seafarers which have both necessary level of theoretical knowledge and sufficient level of professional skills to be able to carry out the duties of watchkeeper onboard a vessel after their graduation. Today, level of marine vocational education has some backlog from the level of proficiency, which is required for crew officers by the most powerful shipping companies. In order to get the proper qualification the students have to learn sufficiently large content of teaching material on their own, after classes. No less important question is "studying" onboard the vessel on real equipment that is not safe neither for the ship nor for safety of sea transportation in whole.

From other side, today, there are tasks which are on the agenda directly for marine educational

Institutions faculties. None methodology with any effective special subjects teaching models can make students' productive study without teachers' acquiring of the progressive special subjects teaching technologies, modern forms, methods and techniques, using best world practices. The outstanding problem is necessity to raise the level of the teacher's skills. It is a good practice if a special subjects' teacher has a possibility to upgrade his professional skills onboard a modern ship, taking position of an engineer double or as trainee (if the marine educational Institution has such a possibility). This gives the possibility not only to renew the academic curriculum for future seafarers in accordance with world water transport development, but also proper taking into account by the teachers the questions of a ship equipment technical maintenance procedures in order to provide profession competence and professional activity of the future water transport specialists. Another specific problem is English language teaching. Teacher, who has only philological education, can hardly teach marine engineering language to the students. In this case it would be better if the special subjects' teacher could use marine engineering English terminology in classes. One more outstanding problem is forming and developing the students' personal qualities. These qualities make direct impact on forming their future proficiency. Unfortunately, today traditional methodologies for special subjects teaching of the most marine educational Institutions don't give enough consideration to this component of the vocational education process. In order to improve this problem condition, the educational process should also perform the function of development. This function adds in education process such positive traits as: selectivity, self-development, integrity.

In order to solve main problems of the marine vocational education, methods, which are used by teachers for special subjects should provide:

- 1 Vocational education academic curriculum is to be renewed constantly according to scientific and technological advance in shipping industry.
- 2 Optimum relationship between the vocational education scope and practical training scope, given to the students when studying.
- 3 Possibility to hold laboratory lessons in class using equipment that is close to the real equipment of a ship.
- 4 Possibility to hold practical lessons in specialized auditoriums, which are equipped with both computer and practical "de facto" simulators.
- 5 Present vocational education level must be close to the current requirements of the seafarers' employment market as much as possible.
- 6 High professionalism and exactingness from the side of the teachers when teaching and examining the students.

Maintenance of any kind ship is purposeful activity of all crew members, which use all their professional potential onboard a ship. This potential obliges all crew officers to have four very important aspects:

- 1 The ability to make a correct decision in emergency situation onboard a ship.

- 2 The ability to think logically to solve difficult technical troubles (onboard a ship), which are not reviewed in ship manuals.
- 3 The ability to carry out duties living and working in multinational crew, keeping up friendly atmosphere onboard.
- 4 The ability to live and work in an enclosed space, which is a ship, during 1-8 months, according to an employment contract terms, overcoming psychological load.

To be successful in future career future seafarers should acquire all of these habits. Therefore, these aspects should be taken in consideration by marine Institutions' offices of the head of studies to develop proper marine vocational education programs for both future marine engineers and navigators. These points also make marine vocational education system a little bit different from vocational education systems of coastal specialties.

### 3 FUTURE MARINE ENGINEERS' PROFESSIONAL EDUCATION ASPECTS

The quality of future marine engineers' education depends on many factors. But the teaching forms and methods play one of the leading roles here. Before implementation of any new or modified special subjects teaching methods in the classes, obviously, it is necessary to examine them. Therefore, it is very important to choose the correct method of scientific investigation. Modeling, as a scientific investigation method, is widely used in MET institutions to investigate vocational education process.

Analysis of the Russian, Ukrainian and some world scientific literature confirms that it is still rather actual question today to search new effective marine engineers' vocational education process methods for teaching special subjects. This would ensure fulfillment of such tasks in the vocational education system as:

- 1 High level vocational education standards under the conditions when the education content is getting more difficult every next year with the world social & economic changes.
- 2 Arrangement of the students' self-studying process after classes, by means of providing the necessary materials and creating favorable conditions to interest them.
- 3 Having in educational process such component as students' character building, which will form every student's readiness for future professional activity onboard a vessel or a water transport company.
- 4 Working out difficult vocational technical problems by students in classes, that requires knowledge and practical skills integration with subjects, which are closely related to special subjects: "Ship construction theory", "Automatic control theory", "Ship's electrical equipment", "Thermodynamics", "Heat-transfer" and "Ship's power plants".
- 5 Arrangement of the students' educational-cognitive work in common information space, that would provide using of the modern information technologies.

So, realization of the above mentioned tasks can be achieved by implementation of the new teaching methods, which are based on new, modern vocational education models.

#### 4 CONCEPT OF PRACTICAL "DE FACTO" SIMULATION FOR FUTURE MARINE ENGINEERS TRAINING

In Kiev water transport academy a special subject teaching model has been developed. It includes combination of the practical "de facto" simulators, computer simulators, special subjects' syllabuses, marine engineering educational movies and special subjects' knowledge test system. Emphasis is put on using the practical "de facto" simulators of Automatic auxiliary machinery control systems and Automatic diesel plant control systems. Practical simulators can have special elements and devices, ensuring technological process while the power plant is working. This could be used safely in classes. The following practical "de facto" simulators are already developed and implemented in educational process of Kiev water transport academy:

- "Automatic auxiliary boiler burner AF-65 S" operator simulator".
- "Power plant automatic control system with warning protection system & controlled protection" simulator.

Developing of a "Main engine remote control system" practical "de facto" simulator is in progress.

Today many marine educational Institutions and marine advanced training program centers have already been using computer simulators, specifically for marine engineers. Any marine engineering computer simulator's main purpose is teaching the structure and operational principle of main engine, diesel generators, auxiliary boilers, auxiliary mechanisms, refrigerating plants, etc. Marine engineering automatic control systems "de facto" simulators give also the possibility to the students to carry out means of automatics settings in class. It is also possible to make alarm conditions and work out the troubleshooting. Ship's power plants simulators of various purposes enable speeding up the educational process, improving the quality of future marine engineers training lessons and showing the connection between processes theory, which are taking place and practice.

So, implementation of the new teaching methodologies in the educational process enables to reform tradition study into the productive study, which enables either to solve all mention above vocational education process tasks or considerably improve their condition.

#### 5 FUTURE MARINE ENGINEERS' EFFECTIVE STUDYING ASPECTS

While research, that took place in Kiev water transport academy recently, main constructs of the special subjects' productive study had been

determined, which take into account the educational tasks, above mentioned. The constructs are:

- necessary-motivational;
- objective;
- notional;
- problematic-cognitive;
- productive-practical;

Necessary-motivational component gives purposeful feature to the educational process. It forms students' cognitive activity, as a productive study factor. This component provides forming of the students' positive attitude to the subject of the educational process, independent, conscious and systematic fulfillment of the educational tasks. The component also ensures wishing to increase personal education level and students' understanding the social significance of the future professional activity.

Objective component facilitates the students' understanding of the entity and arrangement methods of the educational-cognitive activities. The component detects and forms theory and practical skills knowledge system, which should be acquired by the students. This component also provides ability of the students to sort out main elements, to work with scientific and technical literature, to work with reference literature, to formulate personal thoughts clearly and logically. The objective component furthers both the students' particular set of skills and future professional skill development.

Notional component is one of the fundamental in the special subjects teaching structure. It is reflected in syllabuses, academic curriculums, textbooks, manuals, didactic materials, visual training aids, basic summaries. The component is focused on the special subjects' actual stock of knowledge.

Problematic-cognitive component facilitates the special subjects' knowledge productive learning. The component stipulates the students' personal single-mindedness to master the knowledge.

Productive-practical component is pointed at practical skills systematization in order to have teaching content vocationally oriented. The component provides the productive-technical tasks fulfillment, based on theoretical and practical knowledge mastered by the students.

Using such a combination as practical "de facto" simulation, computer simulation, learning technical aids, basic summaries and the knowledge test system gives the possibility to make the educational process in marine educational Institutions more intensive, and of higher quality.

#### 6 CONCLUSION

It is obvious today, that majority technical troubles onboard a ship is caused by failure of automatic auxiliary and main machinery control systems. Familiarity and skill to maintain it by marine engineers is very important. A concept of practical "de facto" simulation can simplify studying and understanding the algorithm and operational principle of Automatic marine engineering control systems. This provide development of such important

students' features in future, as ability to make quickly a correct decision in emergency situation onboard a ship and ability to think logically to solve unordinary technical troubles (onboard a ship), which are not reviewed in ship manuals in order to make marine navigation and sea transportation more safe today.

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