

Interdisciplinary Teaching of Natural Science Training Courses

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Abstract. Georgian sailors hold leading positions on the world market. Therefore, they need to be thoroughly trained and successfully integrated into international transport systems. The presented paper describes the introduction of interdisciplinary teaching, which is the basis for the success of the set goal. The introduction of this method of training will have a positive impact on the process of acquiring professional knowledge of a sailor and the formation of his personal qualities. It is well known that understanding most of the issues related to a sailor's professional activity is based on knowledge of the laws and theories of natural sciences, elements of higher mathematics, digital technologies, the use of alternative energy, environmental safety and others. The acquired knowledge should be used by the student both in the educational process and in future professional activities. The model of interdisciplinary training of sailor training allows to achieve the professional competencies that are formed in the student in the process of learning and training. Competence is the ability of a sailor to apply in practice the knowledge gained in the learning process and properly formed skills.

Keywords: interdisciplinary teaching, integration, professional knowledge and competence.

Today, maritime transport is the most in demand, and seafaring is one of the most prestigious, but at the same time difficult and dangerous professions. He must possess the special skills and personal qualities that are formed in the process of professional training. The main feature that makes the seafaring profession different from the rest is the increased responsibility. The safety of the occupants of the ship and of the ship itself depends on the accuracy, timeliness and urgency of repairs, troubleshooting or other work. To do this, a sailor must have deep and solid theoretical knowledge, be able to demonstrate this knowledge in practice, have the ability to carry out professional activities achieved through technical and research thinking, show resilience in stressful situations.

The introduction of rapidly evolving technologies and equipment on ships necessitated certain changes to the seafarer's professional training standard, which were duly reflected in the STCW Convention (1978). A conference was held in Manila in 2010 to discuss and approve amendments to the International Convention on the Training, Certification and Voyage of Seafarers. According to the adopted amendments, additional requirements for the quality of professional training of seafarers were

defined, competencies, knowledge and skills were specified [1]. The implementation of the adopted changes required the introduction of innovations in the process of preparation, training, teaching and research. The learning process was optimized, educational standards were met (industry characteristics adopted by the National Center for Educational Quality Enhancement in 2017), and the recommendations set out in IMO Model Course 7.02, 7.04, 7.08 were reflected in the syllabi.

We conducted a detailed analysis of the Manila changes, aiming to improve the quality of teaching. As a result, we decided to integrate the educational process. The foundation of special knowledge and skills should be laid from the first year of teaching. We need to show interest and motivation from the very beginning to better master the courses Sailing Directions and navigation, ship sustainability, oceanography, electrical and radio navigation, astronavigation and other specialties in the following courses. If the foundation is solid, it is easy to build any knowledge on it. It is the training integrated with the disciplines of the natural sciences that provides the future sailor with the ability to better understand the principle of operation and operation of all the technical equipment with which modern ships are equipped [2].

According to the Interdisciplinary Learning Model, the following components are required for a seafarer to achieve the required level of knowledge and competence:

- Free possession of knowledge and skills of general education and special education courses;
- Adequate use of teaching methods and professional tools;
- Demonstrate knowledge and skills in accordance with professional activities;
- Ecological education, thoughtful and careful attitude towards the water ecosystems of their own and world countries, maximum avoidance of marine pollution during the operation of ships;
- A sense of patriotism, responsibility to one's own country;
- Equal treatment, communication skills and a favorable psychological climate among multinational crew members;

Forming professionally important personal qualities, understanding the meanings of these qualities and being satisfied with the chosen profession.

The level of knowledge of the general laws of nature and information technology has a significant impact on the formation of a separate component of the educational process of a marine specialist. The very fact that the Manila changes imply an in-depth knowledge of the fields of technology and technology requires a new understanding of the importance of science courses.

Equally important in the conduct of the educational process should be not only the acquisition of specialized knowledge and skills, but also the application of knowledge of the natural sciences integrated with them [3].

Existing knowledge has emerged and been formed as a result of the application of various scientific discoveries about nature in practice. For example, research in the field of electromagnetism has led to the introduction and use of radio communications on ships. Thermodynamic studies have made it possible to create different types of engines and improve vehicles. The development of electronics has led to the use of computers and Internet connections in a variety of industries, including the marine industry. It is the knowledge gained as a result of integrated learning that ensures the formation of correct ideas about the world around the sea and its development.

Education is the process of acquiring knowledge and skills, and competence is the ability to apply and demonstrate that knowledge. The use of the method of "interdisciplinary training" in the process of professional training of a marine specialist will allow us to correctly define and implement the transition to competencies.

Let us illustrate this point with specific examples. In studying the "mechanical properties" of a solid body, the future pilot will be introduced to the concept of "residual deformation" generated during the ship's motion. But its competence will be revealed only if it is able to assess this deformation and perform the appropriate loading-unloading work in a timely manner. "Conditions of body swimming. During the study of "ship sustainability" the student must master such concepts as shipwreck, water abyss, sinking, stability conditions. The competence of a seafarer must be manifested in the fact that in the event of any kind of external impact on the ship he will be able to correctly calculate the ship's deadweight and differential.

What is the essence of the "interdisciplinary teaching model"? What role does the teaching of natural sciences have in the training of a marine specialist? It is in this that understanding and comprehension of most issues related to the professional activity of a sailor is based on the foundations of the laws and theories of natural science. Due to his professional activities, the sailor has access to computer and special equipment, simulators, meteorological equipment, laser and optoelectronic systems and more. Working with all of them requires knowledge of any of the natural sciences (mathematics, physics, chemistry, information technology, and marine ecology) not only in theory but also in practice, in connection with the specialty. The range of knowledge content and involvement of the natural sciences in maritime affairs is so vast that it is impossible to list them all. Here are some:

- The ship's power plant specialist must have knowledge of the physical processes underlying the ship's engines, generators and vehicles.
- The use of digital technology in the activities of a pilot requires knowledge of the physical basis of receiving information in digital form. The same knowledge is required for the proper operation of the ship - taking into account the characteristics (navigation, ship speed, capacity, power of the power equipment, etc.) [5].
- The electromechanics must ensure the proper functioning of the ship's electrical equipment, such as: power plant, electricity users - electrified mechanisms and equipment, power converters, power tools, radio equipment, electro-navigation devices, systems and internal systems, etc. Their operation depends entirely on the operation of the ship. Therefore, it is clear that such a highly qualified specialist must have a fairly high level of knowledge in the field of electromagnetism.

I wonder how the level of knowledge of natural sciences can affect a sailor's communication skills, stress resistance, sense of patriotism and other personal characteristics? It is obvious that a sailor with thorough knowledge is distinguished by high intelligence, which provides motivation for the chosen profession and adequate self-esteem. All this leads to professional satisfaction, maturation of professionally important qualities and rapid career growth. High levels of intelligence also affect communication skills. Sailors whose views are based on scientific laws and theories are more psychologically sound because they pay less attention to the various prophecies, superstitions, and false conclusions that are so important in long-distance sailing [4].

Knowledge of the natural sciences is no less important in the process of forming a patriotic feeling. A sailor who is well acquainted with the laws of nature, the history of their discovery and use, the stages of development of science and technology, the names of researchers, information about the Georgian sailors and scientists who made a name for the Georgian Navy, etc. - They perceive their own nation differently when they are in society with other nations and, consequently, they are more deeply aware of their responsibility to the nation and country.

Conclusion

Over the past two years, we have partially incorporated elements of the specialty into the teaching process of a number of natural sciences (general physics, industrial chemistry, information technology) for the purpose of experimentation [6]. To do this, we developed professional-based

learning resources and methodological guidelines that students had unimpeded access to. We observed and analyzed the results of the assessment of students' academic performance, which is given in Table 1.

Training year	category					
	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)
2108 - 19 Average annual indicator	8,28	10,42	10,64	17,18	20,76	32,51
2019-20 (II Semester.)	9,31	15	15	16,17	14,7	30,65
2020-21 (I Semester.)	13,88	13,8	18,84	17,11	16	20,18

Table 1. Analysis of students' academic achievement results by categories

By analyzing the results of the last three years of academic achievement and combining the results of the teacher attendance, the students identified the following activities:

- Increased involvement and feedback on lessons;
- The student developed an interest in working with himself / herself;
- The student has become highly motivated to independently acquire special knowledge about the application of various natural science techniques and techniques in the marine field;
- Students' skills in working with additional literature and Internet resources were diversified;
- The process of preparation of presentations, abstracts, conference topics became interesting and joyful.

In this way we came to the logical conclusion that the method of teaching integrated with the subjects of our chosen specialty was justified. Therefore, it would be better to raise the status of natural sciences to the main disciplines of the specialty. This requires a new organization of the learning process and new methodological approaches.

We mean the improvement of the syllabi of natural science courses by integration with the disciplines that define the specialty. As a result, the learning process will become dynamic, flexible and result-oriented. The student will be able to apply the acquired knowledge and skills properly formed in the learning process in practice, which is a prerequisite for his professional competence.

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