EXPERIENCE OF USING SIMULATOR TECHNOLOGIES IN FORMING COMPETENCIES TO FUTURE NAVIGATORS USING RADAR EQUIPMENT AND GLOBAL MARITIME DISTRESS AND SAFETY COMMUNICATION SYSTEM

The article presents the generalization of the experience of using simulator technologies in forming the competence to future navigators re-
Regarding the use of radar equipment and global maritime communication system in case of disasters and to ensure safety.

It has been found that the amendments made by the International Maritime Organization to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers have expanded the role of simulators in assessing the relevant competencies of maritime professionals. At the same time, it should be noted that logistical support of maritime higher educational institutions lags behind the requirements of modern shipping industry, the requirements of the seafarers’ labor market, and so on. It is a systemic problem that encompasses all levels of training and skills upgrading for shipping industry professionals. To solve the problem of improving the quality of professional training it has been proposed to carry out this process taking into account the principles of contextual approach, providing for the use of modern equipment and simulators, which departments and laboratories of maritime higher education institutions are equipped with. Training on simulators occupies a special place in the training of navigators, because it allows to exercise modeling of situations, which reproduce the conditions as close as possible to the real world. It is also important to include into the content of academic disciplines some components of simulator training on the formation and development of skills to work with electronic mapping systems, radio and electro-navigation equipment of ships, as well as skills associated with maritime safety (operation of fire-fighting equipment, rescue equipment, first aid on board ship, cargo operations with heavy cargo and containers, etc.). Each of these courses is taught in specialized laboratories equipped with the necessary simulation equipment in accordance with international requirements for training maritime professionals and the requirements of employers.

**Key words:** use of simulator technologies; competence formation; future navigators; navigation and ship control specialists; use of radar equipment; global maritime distress and safety communication system.

1. INTRODUCTION

International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended and supplemented 1995 and the Manila amendments of 25.06.2010 (hereinafter referred to as the...
International Convention STCW 78/95) [1], as well as national departmental regulations [2] impose certain requirements for the use of training equipment, which is used in maritime institutions of higher education to train and test the knowledge of future navigators – specialists in navigation and ship handling. In particular, it is determined that the use of full-scale navigation simulators with visualization is aimed at developing competencies in the use of radar equipment and global maritime communications system in disaster and safety, as well as readiness for professional and social interaction, in particular the ability to work productively in a team on the bridge and to interact with rescue coordination centers and the coast guard involved in emergency situations. The use of simulator technologies for training of navigation and ship handling specialists for navigation watch in conditions of considerable ship movement under conditions of restricted navigation area both by day and by night, as well as under adverse weather conditions and with limited visibility is of great importance.

Thus, the use of simulator technologies in the formation of competencies to future navigators with the use of radar equipment and global maritime communication system in disasters and safety is an important didactic and organizational condition for improving the quality of training of future navigators in maritime institutions of higher education.

**Problem Statement.** Amendments made by the International Maritime Organization (IMO) to the International Convention STCW 78/95 expanded the role of simulators in assessing the relevant competencies of maritime professionals. We agree with G. Popova that the amendments to the International Convention STCW 78/95 clearly defined uniform requirements for mandatory use of simulator complexes and individual simulators in the educational process [3]. At the same time in the Code of Training and Certification of Seafarers and Watchkeeping (STCW) in the tables the mandatory minimum competence requirements to the level of competence of specialists (captain and deck crew, personnel of certain types of ships, engine room personnel, etc.) are given. The use of simulators as a tool for mastering practical skills during the training of maritime transport specialists and for evaluation of skills obtained in the course of training is expressly
recommended. At the same time, STCW emphasizes the obligatory physical and behavioural realism of simulators [3].

In order to provide the necessary learning outcomes as required by the International Convention STCW 78/95, maritime higher education institutions (MHEI) must have modern, appropriate hardware, software, simulators and highly specialized technical facilities for practical training and simulator training to ensure the advanced nature of education. But it is necessary to state that the logistical support of the MHEI is lagging behind the requirements of the modern shipping industry, the requirements of the seafarers’ labor market, and so on. Researchers [4]–[6] state that it is a systemic problem, which covers all levels of training and professional development of specialists of the shipping industry. The introduction of modern information educational technologies into the practice of training water and maritime transport specialists is hindered by the slow introduction of modern technical resources, simulator complexes, as well as relevant didactic and methodological recommendations.

**Analysis of recent research and publications.** Important aspects of the professional training of future navigators in the MHEI have repeatedly attracted the attention of scientists. In particular, K. Tkachenko [4] conducted a study of the problems of the system of training specialists of water and sea transport, C. Voloshynov [7] substantiated the peculiarities of the systematic approach to algorithmic training of navigators in the information and communication environment, L. Gerganov [5] defined the conceptual foundations for professional training of skilled maritime employees in the workplace, M. Musorina [8] investigated the formation of technical competence to future navigation specialists when studying technical disciplines, A. Pohodaeva [6] presented the results of the analysis of professional training of maritime specialists in terms of the competence approach. The peculiarities of using information and communication technologies in the training of future navigators are covered in the publications of M. Sherman and A. Bezbakh [9], as well as of V. Smelikova [10]. However, the experience of applying simulator technologies in forming competencies to future navigators using radar equipment and global maritime communication system in disasters and safety needs additional coverage.
The aim of the article is to promulgate the generalization of the experience of using simulator technologies in forming competencies to future navigators using radar equipment and global maritime communication system in distress and safety.

2. RESEARCH RESULTS

The leading MHEI of the Danube region is Danube Institute of the National University “Odessa Maritime Academy”. Since 2014, this institution of higher education has been brought up to a full bachelor’s degree in both full-time and part-time study. Experienced specialists of the maritime complex of the Danube region are involved in the educational process. The institute employs experienced scientific and pedagogical staff. Now there are five departments at Danube Institute: navigation and ship control, ship power plants and systems, engineering disciplines, humanities and general scientific disciplines. Advanced training courses for naval command staff are also working and developing [11].

Danube Institute has a powerful modern material and technical and laboratory facilities, is constantly updated with modern devices, computers and simulators. Lessons are held in interactive classrooms and multimedia laboratories. The library collection of the Institute has more than 11,500 copies of specialized literature, it is systematically replenished. Cadets undergo practical training on the basis of Izmail Commercial Seaport, ship-repair enterprises of Izmail, as well as navigational practice on ships of private JSC “Ukrainian Danube Shipping Company” and other shipping companies.

Professional training is based on the principles of the contextual approach, which involves the use of modern facilities and simulators that are available in the equipment of the departments and laboratories of the faculty. Simulator training occupies a special place in the training of navigators, because it allows to realize the modeling of situations that reproduce the conditions as close as possible to the real world. For example, the following maritime simulators are used to train future specialists in navigation and ship handling:

- a comprehensive dynamic positioning simulator consisting of a full-featured dynamic vessel positioning navigational bridge (Class A DNV), a the-
oretical training class and a class with individual dynamic positioning stations (Class C DNV);

- Global Maritime Distress and Safety System (GMDSS) simulator, consisting of two separate practical training classes;
- means of electronic navigation;
- full-featured engine room simulator;
- full-function vessel simulator with dynamic positioning system;
- a training complex for practicing water safety and firefighting skills;
- cargo operations simulator;
- fire ground;
- collective rescue facilities on board the ship;
- ship power plants;
- medical assistance on board the ship;
- high voltage equipment;
- mooring station.

For example, programs for practical exercises on simulators have been created for cadets in various courses to assimilate the skills to use the acquired knowledge. The structure of the model course “Teamwork while on watch” has also been developed; its application involves mastering the formation and development of appropriate competence from simple to complex, from practicing elements to practicing the whole action, from writing the theoretical component to describing requirements, orders and rules.

It is also important to include into the content of academic disciplines some components of simulator training to form and develop the skills of working with electronic mapping systems, radio and electro-navigation equipment of ships, as well as skills related to safety at sea (operation of fire-fighting equipment, rescue equipment, first aid on board ship, cargo operations with heavy cargo and containers etc). Each of these courses is taught in specialized laboratories with the necessary simulator equipment in accordance with international training requirements for maritime professionals and the requirements of employers.

The implementation of such training made it necessary to provide scientific and methodological support for the development of professional competence of scientific and pedagogical specialists to form the compe-
tence to future navigators using radar equipment and global maritime communication system in distress and safety.

For this purpose, special seminars with scientific and pedagogical staff are organized at the beginning of the first semester of each academic year, where they have the opportunity to update their knowledge on the most important issues of the organization of professional training of future specialists of river and sea transport, the use of modern information and communication technologies, simulators and training complexes, modern means of teaching and knowledge control, the content of modern requirements of international and national regulatory documents on the requirements for the level of professional competence of future navigators and the like.

Before training seminars with scientific-pedagogical workers, as a rule, the requests and needs of scientific and pedagogical workers on issues related to the organization of the educational process in MHSE, the potential of simulators and simulator complexes in training specialists of river and sea transport, the use of knowledge control in the system of quality assurance of education, the effectiveness of modern didactic technologies and teaching tools, innovative methods of teaching, the order of navigational practice, the content of modern requirements of international and national regulatory legal documents on the requirements for the level of professional competence of future navigators and the like are investigated.

Representatives of employers, crewing companies “Marlow Navigation”, IMEC, “Columbia Shipmanagement Ukraine”, “Eurocrewing”, employees of Ministry of Education and Science of Ukraine, representatives of developers and manufacturers of simulators and simulator complexes, institutions of postgraduate education and advanced training as well as leading methodologists of the National University “Odessa Maritime Academy” are involved in conducting training seminars with scientific and pedagogical specialists.

Here is an example of how to perform laboratory work for the discipline “Global Maritime Distress and Safety Communications” using the modern TGS 5000 simulator. This simulator realizes with high probability ship-to-ship and ship-to-shore radio-navigation contacts by means of highly realistic simulation of communication protocols. Trainees have the
opportunity to learn Global Maritime Distress and Safety System (GMDSS) communications techniques, namely: management, disaster notification, urgency and safety notices, and general communication skills. The simulator imitates GMDSS equipment produced by S.P.Radio, Thrane & Thrane, and others.

The laboratory work provides the knowledge and practical skills defined by the minimum competency standard specification for the first mate to be awarded the GMDSS Operator General Diploma, or the GMDSS Limited Operator Diploma as defined by the STCW Code. Specific skills are determined by the goal established at the beginning of each laboratory work.

By the beginning of the lesson, cadets are required to become acquainted with the material of the relevant topic, work through the outline and the recommended academic literature. Before performing the laboratory work it is advisable to read its content, guidelines, evaluation criteria and the main theoretical provisions on the topic of the work. One must have a course (outline) of lectures in class. The order of the work and its variant are specified by the instructor. Each laboratory work is evaluated by the instructor after the end of the class. Detailed requirements for the work (if necessary), are specified in the methodological instructions to each laboratory work.

The works are performed in the order that corresponds to the order of the sections headings. A written report on the laboratory work is not necessary. Defense work is carried out at the end of the current class by oral or written questioning on control questions, a list of which is shown at the end of the instructions to each work.

It is possible to view some of the activities in the specified laboratory works in video mode.

The TGS 5000 simulator provides six interactive workstations. The program at all workplaces is started by the instructor from the instructor’s station. The Station info window appears in the gray background of the radio console on the monitor screen of the workstation.
Figure 1. Window Station info

The window contains the following information: the user name; the workplace number; the ship’s name; the ship’s radio station identifiers; and the ship’s coordinates.

The instructor sets two variants of simulation of shipboard radio equipment: modern – TGS 6000 and older generation – TGS 4000, TGS 2000. In this way, students and cadets can master different generations of equipment.

When you press the Close button, the information window disappears. The user gets access to the main menu of the simulator workstation.

It shows a real ship console from the Danish company SAILOR.

Figure 2. SAILOR 6000 console main menu

The main menu contains images of a GMDSS SAILOR 6000 produced by the Danish firm Thrane & Thrane including the following instruments: a VHF radio with a DSC SAILOR 6222; a MF/HF radio with a DSC SAILOR 6301 and a telex terminal; an Inmarsat-C satellite station (SAILOR 6110 with an EGC receiver).

The simulator program provides students with the opportunity to study the instruments included in the simulator on their own. In addition, they can check their knowledge in a test or exam mode. In order to use the self-study program, you have to click on the Tutor button at the top of the main menu. This button is only available when the workstation is in Standalone mode.

3. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The use of simulator technologies in forming competencies to future navigators using radar equipment and global maritime communication system in distress and safety is an important didactic and organizational condition for improving the quality of training of future navigators in maritime institutions of higher education. Regarding the prospects for further research, one of the topical areas is the introduction of e-learning / mobile-learning technologies in the training of future specialists in navigation and ship handling. Such technologies can provide simulation, practical and laboratory
classes using real physical equipment by creating virtual laboratories and simulators. It is also important to further improve the methods of using simulators implemented on the basis of appropriate problem-oriented integrated systems that provide simulation of the workplace of a specialist / group of specialists, modeling of the external environment, ensuring repeatability of the results of functioning and the possibility of implementing a large number of options and scenarios of professional activity of the seafarers.

Список використаних джерел


3. Попова Г. В. Симуляційні тренажери в підготовці майбутніх судноводіїв. Information Technologies in Education. 2019. № 1(38). URL: https://rep.ksma.ks.ua/jspui/bitstream/123456789/64/1/Popova_SumylTren.pdf


5. Герганов Л. Д. Теоретичні і методичні засади професійної підготовки кваліфікованих робітників морського транспорту на виробництві : дис. ... д-ра пед. наук : 13.00.04. Київ, 2016. 485 с.


Рижков Юрій, Мітін Юрій, Діденко Олександр. Досвід застосування тренажерних технологій у формуванні компетентностей майбутніх судноводіїв з використанням радіолокаційного обладнання і глобальної морської системи зв’язку у разі лиха та забезпечення безпеки

У статті представлено узагальнення досвіду застосування тренажерних технологій у формуванні компетентності майбутніх судноводіїв щодо використання радіолокаційного обладнання і глобальної морської системи зв’язку у разі лиха та забезпечення безпеки.

З’ясовано, що поправки, внесені Міжнародною морською організацією у International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, розширили роль тренажерів щодо оцінки відповідних компетентностей фахівців морської галузі. Водночас доводиться констатувати відставання матеріально-технічного забезпечення морських закладів вищої освіти від вимог сучасної судноплавної галузі, вимог ринку праці моряків тощо. Це є системною проблемою, яка охоплює всі рівні підготовки та підвищення кваліфікації фахівців судноплавної галузі. Для вирішення проблеми поліпшення якості професійної підготовки фахівців запропоновано здійснювати цей процес із урахуванням принципів контекстного підходу, що передбачає використання сучасної техніки і тренажерів, якими оснащені кафедри і лабораторії морських закладів вищої освіти. Тренажерне навчання займає особливе місце у підготовці судноводіїв, оскільки дозволяє здійснювати моделювання ситуацій, що відтворюють максимально наближені до реальних умови. Важливе значення має також включення до змісту навчальних дисциплін окремих компонентів тренажерної підготовки щодо форму-
вання і розвитку навичок роботи з електронними картографічними системами, радіо та електронавігаційним обладнанням суден, а також навичок, пов’язаних з безпекою на морі (робота з пожежним обладнанням, рятувальними засобами, перша медична допомога на борту судна, вантажні операції з великоваговими вантажами та контейнерами, тощо). Кожен із таких курсів викладається у спеціалізованих лабораторіях, обладнаних необхідним тренажерним устаткуванням відповідно до міжнародних вимог до підготовки морських фахівців та вимог роботодавців.

Ключові слова: застосування тренажерних технологій; формування компетентностей; майбутні судноводії; фахівці з навігації й управління суднами; використання радіолокаційного обладнання; глобальна морська система зв’язку у разі лиха та забезпечення безпеки.

References


