APPLICATION OF NEW TECHNOLOGIES IN THE HIGHER SCHOOL OF UKRAINE IN THE TRAINING OF MARITIME TRANSPORT SPECIALISTS

Abstract. Negative changes have recently occurred in the process of training maritime professionals in Ukrainian maritime universities, this has affected the rating of maritime officers, the office is steadily declining. The reasons for this degradation are multifactorial; despite the improvement of the training process with the use of simulators, new technologies of teaching, and attempts to raise the level of discipline among cadets, the proper result was not achieved.

Considering the issues of cadet motivation to the learning process, we are faced with the problem of practical application to the theory of the major subjects studied. It becomes obvious that the organisation of cadets' practice does not correspond to the modern level of their training on foreign companies' ships, which reduces the overall holistic level of knowledge of the graduate.

This problem is in the field of view of scientists of the World Marine Complex and is reflected in many scientific works.

The aim of this paper is defined by finding new ways to train cadets to achieve a meaningful qualitative level that can only be fully revealed in the labour market.

The complexity of maritime education lies in the fact that every graduate of a maritime university must meet international requirements and in addition to the theoretical diploma he/she also receives a working diploma, which enables him/her to hold an officer position with the right to be on independent watch. In order to receive the working diploma, the cadet must have completed 12 months of sailing practice with evidence of the prescribed form. In this regard, the maritime specialist's training programme must contain all the necessary international regulations on navigational safety, environmental protection and more. The programme covers lecture material, laboratory and coursework as well as practical training. All types of cadet training are conducted in the educational establishment with the active use of modern simulators, scientific and technical films and visual aids.
Despite of all attempts to improve the situation in terms of Ukrainian specialists, demand at labour market, no proper results were given. The author of the article is deeply convinced that our falling rating lies in poor quality of training and navigation practice on ships of foreign shipowners, where work of trainee is often outside of international requirements and work and rest regime is violated.

The analysis of sailing practice in the last century of the Ukrainian state in educational institution Odessa Higher Engineering Marine School OHEMS and carrying out of modern practice in leading European universities and the advanced ship-owning companies, that gives the grounds to consider in correctness of finding of the decision and answers to the put questions in the given article are resulted in the article.

**Keywords.** Training-simulator, cadet, independent watch, OHEMS, international maritime labour market, maritime safety.

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**ЗАСТОСУВАННЯ НОВІТНИХ ТЕХНОЛОГІЙ У ВИЩІЙ ШКОЛІ УКРАЇНИ ПРИ ПІГОТОВЦІ ФАХІВЦІВ МОРСЬКОГО ТРАНСПОРТУ**

**Анотація.** Останнім часом у процесі підготовки морських фахівців у морських вузах України відбулися негативні зміни, це позначилося на рейтингу морських офіцерів, які неуспішно знижуються. Причини цієї деградації – багатофакторні, незважаючи на вдосконалення процесу навчання з використанням тренажерної техніки, нових технологій викладання та спроби підвищити рівень дисципліни серед курсантів, належного результату не дали.

Розглядаючи питання мотивації курсантів до процесу навчання, ми стикаємося з проблемою практичного застосування до теорії досліджуваних профільних предметів. Стає очевидним, що організація практики курсантів не відповідає сучасному рівню підготовки їх на судах іноземних компаній, що знижує загальний цілісний рівень знань фахівця, що випускається.

Ця проблема знаходиться у полі зору вчених Світового морегосподарського комплексу та відображена у багатьох наукових працях.

Мета даної роботи, це знаходження нових шляхів підготовки курсантів задля досягнення значущого якісного рівня, який може лише повністю розкритися на ринку праці.

Складність морської освіти полягає в тому, що кожен випускник морського вузу повинен відповідати міжнародним вимогам, і до теоретичної диплому він отримує ще й робочий диплом, що дає можливість займати офіцерську посаду з правом несення самостійної вахти. Для отримання
робочого диплома курсант повинен мати плавальну практику протягом 12 місяців із підтверджаючими документами встановленої форми. У зв'язку з цим програма підготовки морського спеціаліста повинна містити всі необхідні міжнародні нормативні документи безпеки мореплавання, охорони навколишнього середовища та багато іншого. Програма охоплює лекційний матеріал, лабораторні та курсові роботи, виконання практик. Усі види підготовки курсантів у стінах навчального закладу проходять при активному використанні сучасних тренажерів-симуляторів, науково-технічних фільмів та наочних посібників.

Незважаючи на всі спроби виправити ситуацію на краще у плані затребуваності Українських фахівців на ринку праці належних результатів не дали. На глибині переконання, автора статті наше падіння рейтингу лежить у площині неякісної підготовки та проходженні плавальної практики на судах іноземних судновласників, де найчастіше праця практиканта проходить поза міжнародними вимогами з порушенням режиму праці та відпочинку.

У статті наведено аналіз плавальної практики у минулому столітті Української держави у навчальному закладі ОВіМУ та проведення сучасної практики у провідних вузах Європи та передових судновласникських компаніях, що дає підстави вважати у правильності знаходження рішення та відповідей на поставлені питання у цій статті.

Ключові слова. Тренажер-симулятор, морський офіцер, курсант, самостійна вахта, ОВіМУ, міжнародний ринок праці морських спеціалістів, безпека мореплавання.

Problem statement. Over the past thirty years of training maritime professionals in Ukrainian higher education institutions there has been a qualitative change for the better. We have gone from second in the number of maritime officers in the merchant marine fleet to sixth in the number of our specialists in the World Maritime Fleet. The reasons for this degradation are multifactorial, despite the improvement of the training process with the use of simulators, new teaching technologies and attempts to increase the level of performance discipline among cadets, the proper result has not been achieved.

Motivating cadets to learn is one of the most important qualities of a teacher. Unfortunately, this is not always achieved by pedagogical skill alone; the organisation of the cadet's practical activity on board ship also plays an important role.

Recently, all countries in the world have faced certain difficulties in the organization of the educational process of distance learning, as most countries in the world did not have a similar experience before and there was a need to completely reorganize the educational process. In Ukraine, the effects of the Pandemic have been compounded by the war, which has firmly established distance learning. Such training cannot be perfect, it can be applied as a separate part of the whole training process.

Merchant maritime officers are now under increasing international demands for in-depth study of international conventions on seafarer training and certification,
watchkeeping, the International Maritime Code and much more. Each ship-owning company has its own additional requirements, which are taken into account when enlisting on board a vessel.

**Analysis of recent research and publications.** Scientific researches of recent publications of scientists in the field of the World Navy: M. Miyusov, A. Foka, V. Golikov, V. Golubev, M. Kolegaev, I. Kuznetsova, etc. were mainly aimed at improvement of training process in Ukrainian maritime universities, radical change of responsibility and discipline level of cadets. Many scientists in their works emphasize organic connection of theory and practice, reveal significant shortcomings in knowledge of professional English, normative international documents, physical education, professional training in general.

In a number of works, our scientists point out the necessity of a laddered education - nautical school and then a higher educational institution according to the chosen marine specialty. This proposal is dictated by the rapidity of technological progress, rapid change of ship control technologies of technical means and navigational equipment.

**Purpose of the article.** Exploring the negative aspects affecting the quality of higher maritime education and finding new ways in distance teaching during the war unleashed by Russian aggressors against Ukraine.

**Presentation of the basic material.** All our research work will be oriented in the plane of Applied research in order to understand the variety of phenomena and problems in the training of maritime professionals in higher education in Ukraine. Without an in-depth analysis of the emerging negative problems in cadet training, it is virtually impossible to achieve meaningful results in training.

Application of the most modern, science-intensive technologies to improve the level of education without using the historical experience of Ukrainian higher education maritime universities will prove to be unsuccessful, which is what we are facing today.

The complexity of maritime education lies in the fact that every graduate of a maritime university must meet international requirements and in addition to the theoretical diploma he/she receives a work diploma, which enables him/her to hold an officer's position with a right to be on independent watch. In order to receive the Operational Diploma, the cadet must have completed 12 months of sailing practice and be in possession of evidence of the prescribed form.

In reviewing the main simulators for training navigators and mechanics in the maritime fleet, one should focus on the documents governing the amount of knowledge and international requirements for navigators and mechanics of the world's maritime fleet.

The ICSTCWS (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) Convention and the ICSTCWS, Code are binding treaties, the interpretation of which is governed by the Vienna Convention on the Law of Treaties [1]. The revision aims to bring the Convention
and the Code up to date, taking into account advances since the last full revision, and, in contributing to efforts to raise standards of competence and professionalism for seafarers, on which the protection of human life, property and the environment depends. The major conventions also include: The International Convention for the Safety of Life at Sea (SOLAS), the main purpose of which is to establish minimum standards that meet safety requirements for the construction, equipping and operation of ships, the International Convention for the Prevention of Pollution from Ships (MARPOL), which ensures between signatories to this convention that environmental protection requirements are strictly enforced, all ocean waters prohibiting that the deliberate discharge, negligent discharge or accidental discharge from ships of oil and other harmful substances is a serious source of pollution. Failure to comply with all convention requirements will result in penalties and, in some cases, criminal liability.

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TRANSAS TGS 5000 multifunctional training simulator is widely used in Ukrainian maritime universities to ensure compliance with the convention requirements. The simulator ensures training of electronic charting, navigation and information systems (ECDIS), which allow solving complex tasks of navigation from the position of safety of navigation and rescue at sea.

With the introduction of electronic charts to the practice of navigational work, there are new opportunities to improve the quality of course setting, finding the absent-minded point of location of the vessel. Cadets use raster and vector charts in the simulator for full preparation of the voyage in a given navigation area. Raster maps use raster formats - a method of digitally recording an image as a matrix of dots (pixels).

The advantages of raster maps (RC) are:
- The high productivity of scanner-based raster map production technology raster maps which involves virtually no manual labour;
- Cheap, easy to produce as compared to vector maps;
- Colours and symbols familiar to users;
- Accuracy and reliability equivalent to that of paper PNC navigation charts;
- Possible to use for navigational tasks performed with the help of PNC [2].
Fig. 1. View of an electronic raster map.

Vector Navigation Charts (VNC) are stored in memory as a sequence of records characterising each map object (CO) present on the map. Based on these records, a special navigation and information system (NIS) program builds the map itself on the display screen. The main advantages of VNCs can include their small volume in comparison with RCs, storage of VNC information in the form of CO records allows highlighting these objects on the screen (for example, dangerous isobath), organizing automatic alarms about situations requiring the attention of the navigator, obtaining information about objects by pointing the cursor at them and performing a number of other useful operations [2].

Fig 2. View of the vector navigation map.

The full version of the TRANSAS TSG 5000 trainer allows you to learn the GMDSS (Global Maritime Distress and Safety System). GMDSS consists of Inmarsat satellite communication components, which include the International Space System for Search and Rescue of Ships in Distress (COSPAS-SARSAT).

Training of ship mechanics in Ukrainian maritime academies requires up-to-date technological equipment, high-performance simulators: TRANSAS 2020, CONGSBERG 2020, UNITEST of the latest version and others, which will give initial in-depth knowledge of the chosen speciality. Unfortunately, new versions of the leading companies cannot afford many educational institutions, if we take into account the Russian aggression, which razed a number of educational institutions to the ground, and the Kherson Maritime University was occupied by the headquarters of the armed forces. We will have to use old versions of the named companies, for example TRANSAS 2017, which practically has a full range of subjects in the
specialty, but does not have the latest technological solutions to meet the new requirements of the World Maritime Fleet. These requirements are dictated by pressing eco-navigation issues to reduce harmful emissions from transport ships in the marine and river fleet. The last requirements to emissions into atmosphere with exhaust gases of ship engines of boiler plants of the following indicators: CO - carbon oxide, CO₂ - carbon dioxide, NOₓ - nitrogen oxide, NO₂ - nitrogen dioxide, SOₓ - sulphur oxide and others. New line of ship internal combustion engines with different types of fuel: diesel fuel, methane, ethane, hydrogen and alcohols - ethanol, methanol - are in demand for simulators. Nowadays, marine mechanics qualified to work on multi-fuel engines are in demand by the world's maritime fleet. The Anglo-Belgian ABC Corporation has developed a range of four-stroke trunked marine diesel engines capable of running on all the above-mentioned Ship Internal Combustion Engines SICE fuels, meeting the latest IMO regulations for ship emissions [3].

Simulators with 3-D imaging capabilities remain an important feature of cadet training at an early stage of training. Starting from the second year of the Bachelor's degree programme, each trainee starts to enter the main speciality of a ship's mechanic in 3-D simulators: "Engine room", "Main engine", before undergoing a sailing internship. The simulator gives a fragmentary view of all the basic positions of control of ship mechanisms and systems, it should be admitted that cadets do not always master the simulator programme at a sufficient level, they perceive it to a greater extent as a game in ship mechanics. There is nothing wrong with this; later on in the third year, having gained some theoretical knowledge, they come back to this simulator with a more conscious understanding of the course programme.

Fig. 3. Three-dimensional animation of Unittest Marine's low-speed diesel engine [4].
The main engine 3D animation trainer allows a step-by-step approach to preparing the engine for start-up and operating it at different operating modes. The main advantage, it is to look inside of the engine and to see in movement of the cylinder-piston group CPG, the connecting rod gear CRG, practically all details of a skeleton and engine movement. In the latest versions of the simulator it is possible to assemble and disassemble the engine itself, learning the sequence of all operations with the use of equipment (devices) to perform preventive and repair work.

Despite the modern methodology of teaching the specialty using multifunctional simulators, new programmes developed on the basis of many years' experience of teaching in maritime educational institutions, we surrender our positions in the global maritime labour market. Ranking of merchant maritime officers of Ukraine in 2011 was the 3rd place, ahead of us were England and the United States, and, according to the International Labour Organization (ILO), in 2019 we were between the 6th and 7th place in the labour market, unfortunately, we continue to fall behind. The main reason for our lag in the ranking, is due to the socio-economic aspect, which has been overlooked for a long time. The basic principles of this aspect are based on a harmonious combination of theory and practice in the education of our cadets. The organic link between theory and practice has been broken. Talking about internships on foreign vessels, we come across flagrant violations of work and rest schedule; it is no secret that Ukrainian trainees work 8-12 hours instead of four, and they have to use the rest of the time for self-training.

We need to return to the experience of the collapse of the Soviet Union, when leading maritime educational institutions such as Odessa Higher Marine Engineering College OHMEC, and now National University "Odessa Maritime Academy" provided maritime practice of cadets with leading teachers OHMEC onboard modern vessels, where each cadet carried four hours of walking watch, and the remaining four hours of training in a specialized class ship.

Modern cargo-passenger vessels were built at Polish shipyards at that time for: OHMEC "Professor Pavlenko", "Professor Anichkov", "Professor Minaev".

Fig 4. Professor Anichkov's motorboat for practical training.
Future navigators necessarily passed one of practice on a three-masted sailing barque "Tovarisch", which constantly participated in international regattas, where he almost always won first places, developing speed up to 16 knots per hour (30 km/h). Voyages of our trainees passed in various latitudes of the World ocean and lasted to six months where for this time to practical studies were involved according to the program of practice officers of the ship. All course projects and works on special subjects were performed by cadets in ship conditions [5].

Today in Ukrainian maritime universities there is a difference of opinion on the question of internships for our cadets. Some teachers believe that returning to the past model of practice organization is an anachronism, and it is enough to pass it on foreign ships of various ship-owners. That is the problem, there are few shipowners who adhere to international requirements, which were adopted in the form of the Manila amendments in 2010, which clearly regulate the organization of work and rest of cadets undergoing practice.

Looking at the organisation of internships in the leading maritime universities in Europe and the USA, we find confirmation of the correct understanding of the existing problem. Szczecin Academy has its own research and training vessel "Navigator XXI", on which cadets undergo practical training. The ship carries out numerous scientific studies on the hydrology of the marine environment, degree of water pollution, accuracy of navigation and marine traffic engineering.

The vessel is equipped with modern systems, mechanisms and radio-navigation devices and has been ensuring safe navigation during Unity Line regattas for 8 years. The vessel has been designed to provide training and research facilities for the Academy and other institutes. According to independent experts, the vessel with its research equipment is one of the best marine research units in the world and provides quality free training in Poland [6].

Maersk provides training on its programmes for maritime cadets. A senior officer is assigned to each trainee and all officers of the vessel participate in the traineeship, providing professional assistance in studying the training programme offered by the company. At the end of the sailing practice, each officer assesses the cadet's practical knowledge. The cadet training programme itself is structured in strict accordance with the ICSTCW and the Manila Amendments of 2010 [7].

Conclusions. The training of cadets in Ukrainian maritime schools can and should be improved by organically linking practice and theory. It is necessary to revise the internship programmes using the experience of Maersk, Szczecin Maritime Academy. There is a need for supervision of practice on the part of maritime educational institutions with the participation of IMO and ILO representatives in the ports of call.

The use of simulators should be selective, taking into account the future specialisation of each cadet in accordance with the type of vessel. Recent practice shows that young officers tend to fixate on a particular type of vessel, taking into account its propulsion system.
References:


