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Development of Seafarers' Foreign Language Communicative Competence Using Simulators

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ABSTRACT

Due to the high speed of technical progress in the maritime industry, seafarers need to constantly improve their professional competences and not lose sight of important prospects. To study the experience of developing foreign language professional competence of seafarers, the authors consider the conditions for using a wide range of educational tools, including simulators, at the maritime university and find the rationale of the logics of development and application of simulation modelling. The article reflects descriptions of various research methods (theoretical analysis of scientific literature, questionnaires, ranking and comparison, discussion and interviews, collection of statistical data, ascertaining and formative experiments).

Analysis of educational expertise through the prism of the competence approach and the results obtained at different stages of activity prove that the effectiveness of developing foreign language communicative competence increases when applying an integrated interdisciplinary approach and modern high-tech teaching aids, a special place being dedicated to simulators. The authors emphasise the need for appropriate methodological follow-up, when the technological approach involves special scenarios of simulator training, situational algorithms using standard IMO phrases, considering many factors, both related to the technical features of the devices themselves, their software, and the situational component.

Keywords: water transport, simulator training, foreign language communicative competence, training of seafarers according to international conventions.

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INTRODUCTION

According to statistics, today about 90 % of all cargo is transported by sea vessels. This proves the high importance of this mode of transport in the global economy. To ensure efficient and uninterrupted operation, almost all procedures on board the ships are regulated. There are international conventions and national codes, ship safety management systems, instructions and guidelines containing norms and rules, articles, provisions and appendices. It is extremely important to comply with all of them in general and with individual ones under certain circumstances.

Working in the international maritime industry means being disciplined and competent, which is vitally important, since any vessel can instantly become dangerous if personnel do not comply with all mandatory procedures. There are many factors that must be constantly monitored, especially during navigation. These can be both external circumstances and those related to the vessel: weather and navigation conditions, type of cargo, information received from the shore or other vessels in the vicinity, operating conditions of various equipment, external and internal procedures performed, etc.

The training of any specialist is aimed at developing a certain set of competences for working according to profession obtained. The paper *analyses* creative approaches and *identifies* leading trends in formation and development of professional competences [1, pp. 250–251]. The competence maps used at the maritime university are based on international and state requirements specified in the STCW Convention[1] and state educational standards. All competences are considered, distributed and designated in the educational and methodological packages intended for individual disciplines. Thus, each discipline is aimed at forming a set of certain competences, while general and professional competences being distinguished, their content and planned results of mastering the disciplines specified. Identifiers detail the description of the set of required competences through a set of knowledge, skills and experience, as well as behavioural indicators that can be tracked and assessed. The specification of minimum requirements reflects different levels of training, relevant positions and specialties. Competence is specified through the designated knowledge, comprehension and professionalism. The methods of demonstrating competence are supplemented by criteria for their assessment. They serve the basis for development of funds of assessment tools. The latter contain an extensive database of test materials and assignments for midterm and final assessments in disciplines.

Competences are closely related and determine interdisciplinary interactions. The analysis of the digital educational environment of the maritime university indicates the effectiveness of the use of interdisciplinary innovative pedagogical technologies [2]. Thus, the specifics of the minimum «requirements for officer in charge of a navigational watch on ships of 500 gross tonnage or more» indicate several competences, including «use of [IMO] standard maritime communication phrases, and use of English in written and oral forms». This implies adequate knowledge of the English language to enable the officer to use charts and other nautical publications, to understand meteorological information and messages concerning ship's safety and operation, to communicate with other ships, coast stations and VTS centres and to perform the officer's duties also with a multilingual crew, including the ability to use and understand the IMO Standard Maritime Communication Phrases (IMO SMCP). Methods of demonstrating competence are examination and assessment of evidence obtained from practical instruction. The criterion for assessing competence is that English language nautical publications and messages relevant to the safety of the ship are correctly interpreted or drafted. Communications are clear and understood[1].

Modern forms of educational and methodological work involve the development of a multi-level didactic electronic package of educational, methodological and research materials [2]. To ensure high-quality training of specialists, the training program / development of competences should reflect the entire diversity of communicative situations, and this is possible only in conditions of close interdisciplinary cooperation. Thus, all teachers of the Department of Foreign Languages have access to educational and methodological packages and manuals on related disciplines of a special study cycle. They regularly undergo courses of training and practice as instructors and assessors, in accordance with the requirements of the International Convention STCW (regulations I/6, I/8), where, in conditions of close professional cooperation, they have the

[1] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers Part 3–1 – Principles to be observed in keeping a navigational watch. IMO, 2021. [Electronic resource]: https://www.imo.org. Last accessed 23.03.2023.

opportunity to discuss both the training process and assessment procedures involving the use of simulators with representatives of other departments. The working language of the international maritime industry is English and most of the information available is in English, and when performing his duties, the officer in charge of navigational watch must be attentive to any situation and circumstances, as well as to the applicable instructions and operations that are being performed or planned to be performed. There are many sources of information that need to be monitored at all times. «The officer of the watch is the master's representative and his primary responsibility at all times is the safe navigation of the vessel. He must at all times comply with the applicable regulations for preventing collisions at sea» [1]. Not only the navigational situation, but also the general internal and external environment must be kept under constant vigilance and control.

An important component of a specialist's training is his ability to work with modern warning systems. While on duty, an officer must not lose sight of any detail of the constant flow of information coming from various sources. At any time, an officer is ready to receive and transmit the necessary general communications, instructions, discuss the navigation situation, warning and distress signals, etc. in English. There are a number of devices that help the officer on watch manage the safety of the vessel and take into account many factors and conditions. A seafarer's developed foreign language competence presupposes the ability to perceive and reproduce oral and written speech using these devices and/or their readings. An electronic navigational chart display and information system provides a detailed overview of the surrounding area, detailing the distances between objects, to the coastline and sea depth, as well as navigational warnings. It is usually connected to a radar and an automatic information system that provides more detailed information about other vessels (including their bearings, coordinates, speed, course, distances between vessels). The global positioning system is used to specify the course and speed of the vessel relative to the ground. Another way is to measure the speed with a log, which allows for a more accurate measurement of the current speed. Other means are also used in combination, such as gyro- and magnetic compasses, VHF radio, course recorder, various panels (signal, deck/navigation lights, fire alarm), echo sounder, computer (informing about the operation and possible malfunctions of the engine room equipment), ship's computer, telegraph, bow and stern manoeuvring thrusters, ship and satellite phones, radio room with various equipment, Inmarsat (international maritime satellite communication and distress alert system), GMDSS (Global Maritime Distress and Safety System), e-mail and NAVTEX (international automated alert system), etc. Not to mention the need to know and strictly follow the regulations provided for by international conventions, national legislation and rules adopted by shipping companies. Thus, in addition to issues of ship safety, environmental protection is also under control, since the prevention of pollution from ships, both in normal and emergency situations, is included in the requirements of key industry conventions.

The officer of the watch is thus in a situation of constant multitasking and the need for increased attention to many factors. To prepare a seafarer for an activity (for example, to stand watch on a bridge), it is necessary, but not sufficient to practice the skills and abilities of working with individual elements (exchange of information in various situations, their assessment, risk analysis, resource allocation, application of instructions, use of systems and individual devices and tools, etc.). The integration of a set of competences considering foreign language communication requires step-by-step preparation and the use of special training tools, such as simulators.

All elements are practiced in Russian and, at the same time, at the Department of Foreign Languages, in English. At first, even when solving familiar situations, students face problems and are forced to overcome the language barrier. This is reflected in reduced rates of decision-making and task completion speed, compared to exercises in Russian. The process of integrating competences determines step-by-step professional development. Comprehensive formation of competences and training of skills is implemented using information technology in general, language laboratory equipment and simulators.

We assumed that to overcome the language barrier when solving operation problems using the simulator, to implement system approach and increase efficiency, it is necessary to develop not only special scenarios, but also a set of situational algorithms using standard IMO phrases.

The objective of the study is to analyse the experience of developing and using simulation

modelling to form the professional foreign language competence of seafarers in the context of using a wide range of educational tools, including simulators.

METHODS AND ORGANISATION OF THE RESEARCH

Based on experience, «the procedure of pedagogical design is implemented at the levels: conceptual level, development technology, its implementation and the level of assessment and correction. Developing the concept of the project, we define the functions and levels of competences, as well as the standards for their implementation. At the level of technology development, the situation is analysed, goals are set, competence tasks for the performer, content, types of educational activities of students, functional features of subjects of study, potential capabilities of teaching aids are determined, a conceptual model is built.

At the next stage, ways of implementing the model are determined, ensuring successful development of the necessary competences, taking into account the identified conditions. At the next level, an analysis of the effectiveness of simulation modelling, the content of training is carried out and a final assessment is made. The content of the exercises is adjusted and adapted considering the level of training of cadets» [3].

At different stages of the research, different methods were used: theoretical analysis of scientific sources, questionnaires, analysis, ranking and comparison, discussion and interviews, collection of statistical data, ascertaining and forming experiments, etc.

Modern maritime education is focused on prospects, responding to the challenges of reality, considering the specifics of management. In order to work effectively, modern maritime universities must comply not only with the general requirements for training students for professional activities [4], but also with a number of regulations and requirements set by international conventions. One of them is the use of a wide range of training tools and equipment, including ship simulators equipped with modern information technologies. The development of training materials takes into account detailed recommendations for the use of simulators[2], which provide various training in organising activities on board, including navigation watch in normal and emergency modes of operation, communication, the use of various technical means and documentation, environmental protection, etc. [5]. To work effectively with the equipment, it is necessary to consider the latest developments and prospects, analyse and adjust activities at each stage, create a high-quality educational information environment not only for work in classes, but also for distance learning and self-development [6]. Used in maritime education, simulators can transfer people to a virtual world with full immersion in the circumstances of various navigation and weather conditions, normal and emergency situations, where sensory receptors are maximally included in the learning process. Seafarers must develop the skill of concentrating on completing a task, despite the presence of many factors.

The software allows setting up various scenarios, simulating the work of officers on the ship's bridge in conditions where the cadet not only observes the surrounding picture at 360 degrees, but also experiences real pitching in accordance with the programmed storm level on the Beaufort scale. At the same time, access to real bridge equipment, operating in strict accordance with the selected scenario, increases the effectiveness of seafarers' training. Groups of cadets, working together on this virtual bridge, can improve the entire range of competences, since they have to perform their duties as a real team, where everyone is responsible and interaction is ensured through communication that occurs both on the bridge, between crew members, and with other ships and the shore.

The Department of Foreign Languages of the Maritime University has to prepare people to work as part of a mixed crew, using the working language of the industry which is English. For this purpose, educational technologies and teaching and methodological complexes aimed at developing foreign language professional competence are developed and regularly improved, along with others specified in the international STCW Convention and in the State Educational Standards for deck, engineering or electrical personnel. «In the process of teaching professional maritime English, the capabilities of existing computer training complexes, basic and mobile computer systems, network, information and communication and cloud technologies are widely used» [7]. «Elements of distance learning are used at all stages of the cadet's professional training, designed to ensure high-quality feedback and organise full-fledged methodological support for the educational process. Almost all types of educational and research work at all stages, from design and modelling to

[2] IMO Model Course 1.22 Ship simulator and bridge teamwork; etc.

presentation of results, control, data processing and adjustments, are performed using computer technologies» [3].

When working with simulators, a set of methodological techniques and means of special and basic training of a specialist is used. High-quality content with integrated technical solutions is necessary to provide cadets with well-organised working conditions, where cadet self-organisation programs make it possible to consider individual needs [8].

An individual approach to teaching professional proficiency in a foreign language is manifested through the introduction of flexible educational programs [9], the use of distance learning technologies, the actualisation of interactive teaching methods and self-processes. The electronic educational platform, as justified, acts as a means of organising, as well as independent work of cadets [10, pp. 221–223].

The task of developing and applying situational algorithms based on standard phrases of the IMO affected several disciplines. The technology of interdisciplinary interaction is not only in demand and necessary in a foreign language environment [11, pp. 351–356.], but also in the modern conditions of digital transformation is an integral part of the training of a specialist with higher education [12, pp. 48–50]. In particular, many disciplines of maritime specialties aimed at forming the leadership qualities of future seafarers, developing the skills of effective teamwork, implementing effective communication in conditions of work in a mixed crew, as well as managing social and labour relations, are conducted exclusively in English. Cadets take lectures and practical courses, where the focus is on communication situations on board a ship, in a mixed crew [13], as well as between ships and between the ship and the shore. Each course has its own objectives, aimed at forming a specific set of competences, which determines the set of topics and the specifics of teaching. The development of communication skills is carried out in conditions where language is not the goal, but a means of studying a wide range of communication issues with colleagues on and off the ship, and shore service personnel. Each course includes elements of simulator training for both standard and emergency and search situations; cadets have access to various sources of information, including those that allow them to implement a professional self-organisation program, working with lectures and additional materials in video and audiovisual distance format, in the educational environment of the university [14].

The presented courses are divided into blocks, which, in addition to work in the classroom, suggest a distance format, where the courses contain materials of a lecture presentation with audio and video accompaniment, to find gaps in understanding and eliminate barriers through clarification and elaboration of the material at an individual pace, as well as practical and creative tasks, additional materials, ship documents, examples of situational communication, links to previous and current discussions in the distance maritime English club, which is supervised by the department. After completing each of the blocks, the cadet must pass testing.

The system allows automatic creation of individual tests and suggested answer options for each cadet from a question bank, which is regularly updated. The tests must be completed by at least 80 % so that the cadet can access the next block of studying the discipline. If the required score is not scored, the system returns the cadet to the previous block.

In 2022–23, two versions of the courses were launched: for the control group (176 people), using standard, proven methods of teaching and professional development, and for the experimental group (149 people). The methodological material for the experimental group was supplemented with specially developed scenarios and situational algorithms based on standard IMO phrases for additional development. In both groups, the entire range of technical training tools was actively used.

The language labs where all practical classes on these courses are held are equipped with a modern Linko-v8 system. It makes it possible to use elements of simulator training, situational scenarios and decision-making algorithms in a dialogue format and individually, include cadets in various forms of activity, create dialogue and group communication, use oral and written speech, monitor the development of each cadet in almost all types of educational activities, and make timely adjustments if necessary.

RESEARCH RESULTS AND THEIR DISCUSSION

In the process of professional self-organisation, while developing foreign language competence, the question of self-confidence plays an important role. An officer on a ship, being a leader, must instil this feeling in his subordinates and colleagues. This is associated with other qualities, such as determination, enthusiasm, conscientiousness,

social activity and, of course, cannot exist in isolation from communicative activity. When it comes to foreign language activities, solving not only educational problems, but also overcoming one's own complexes becomes a priority. A special case of self-confidence is a positive adequate level of self-assertion and self-esteem.

According to the study, in the 2022–2023 academic year, there was a stable trend of a positive adequate level of self-aspiration and self-esteem in communicative foreign language activities (thus, at the stage of preparation for the included activity, the positive adequate level of self-aspiration and self-esteem was about 57 % in both the control and experimental groups, while after completing simulator training, business games and courses taught in English, 86 % of cadets in the experimental group and 70 % of the control group showed such a result), where the growth of the indicator, to a greater extent, was due to the acquisition of positive experience by cadets in applying the formed competences and, as a result, increased self-confidence. At the same time, a positive effect of the inclusion of situational activity algorithms was noted.

Another important effect of the application of the developed algorithms is reflected in the obtained results. The intermediate control, organised in standard conditions, where the cadets are tested, answer theoretical questions and solve situational problems using analytical methods, with reference to current documents and theoretical course material, did not show a significant discrepancy, both in the score received and in the quality of the answers of the students from the control and experimental groups.

However, when including elements of simulator practice in the examination tests, an increase in the speed of decision-making and task completion by 23 % was noted in the experimental group compared to the control group.

The study of these indicators, based on solving professional problems, allows us to conclude in favour of the growth of cadets' confidence in professional competence in the conditions of quasi-professional activity, and the use of the developed situational algorithms accelerates the execution of tasks and increases self-confidence. During the survey, all cadets unanimously noted the effectiveness of training on simulators, primarily while practicing professional communication, the formation of teamwork algorithms.

Analysing the obtained results, we could not help but highlight the technical component as one of the most important and influencing the content and procedure of any stage. In addition to focusing on increasing the level of responsible professional self-development, we organised an open discussion on the Internet and, based on the results obtained, prepared a questionnaire. 160 people took part in the 2023 survey. The largest number of participants were cadets/sailors of the full-time department of the Maritime University. The overwhelming majority of respondents were men aged 18–27. The assessments were taken as a percentage and ranked according to their repeatability.

The survey showed that three most popular prospects for business games using information technology and simulator training for cadets are «gaining positive experience of foreign language professional communication» (30 %), «teamwork in solving professional problems, the ability to change roles» (28 %), «increasing efficiency when working with sources of information in English, activating analytical potential» (24 %). Other popular answers included: «activation of mental activity in a foreign language, without internal translation» (18 %), «development of decision-making skills, coping with anxiety when completing timed tasks» (15 %), «increased reactivity» (12 %), «strengthening self-processes, including, first of all, self-control, self-organisation, self-development, etc.» (12 %). Support from teachers and high-quality methodological support were also noted, including through accompanying online courses, with access to a wide range of materials and the possibility of self-control, and a friendly atmosphere in the classroom.

When analysing potential problems and shortcomings, the most popular answer among those who noticed them was «there are not enough lessons in the course» (52 %), and this was true for any of the courses presented. Others pointed out that it would be much easier to complete some tasks without time restrictions (12 %). Others pointed out the intensity of the course and the need to spend a lot of time at home, preparing for classes (6 %).

This experience has shown that for the effective use of technical support during the professional training of a seafarer for work in a mixed crew, a technological approach is needed, where all elements of the educational system are involved and considered significant, the priority tasks include established communication between all subjects of activity, where the development of foreign language competence plays a crucial role. At the same time, all elements of a complex interdisciplinary system can influence the development of training scenarios, especially when self-organisation is logically

implemented in the training procedures. Thus, cadets at each stage feel their responsibility for the process and the result. The use of an integrated modular approach to the design of didactic support for a professionally oriented course [15] allows for the effective use of technical teaching aids and the use of a wide range of the entire system of the university's educational environment, including simulator training.

The use of situational algorithms of communication activities with elements of standard IMO phrases allows to increase the speed of completing tasks and contributes to formation of positive self-confidence, overcoming communication barriers, especially in standard communication situations, which are practiced according to the requirements of conventions.

For the first time, cadets have to try their developed communication skills in a foreign language outside the alma mater during an interview in crewing companies before the first practice, as a result of which the best are selected for further practice on ships operating on international voyages. This high-order motivation encourages cadets from different countries to do everything possible to speak maritime English fluently. Thus, while studying at the university, the guys spend at least a year working on board real ships before they can complete theoretical training and receive an academic diploma, based on which a working one is subsequently issued.

The effectiveness of the foreign language training program is actualised and demonstrated at the state examinations, which are organised using business games on simulators, where it is assumed that the watch will be handed over, a plan for the vessel's pilotage and navigation in conditions of dense traffic will be drawn up, where everyone has a task set before them and controls their vessel. Navigators must be attentive to the constant flow of incoming information and radio calls. All participants are ready to report on the situation at any time upon request of the external «coastal VTS», simulated by the teacher in English, and to request the necessary support. Stable «final results» of the state examinations indicate a sufficiently high level of professional competence. Cadets cope with the tasks set before them, and the overall average indicator steadily remains at a level above 90 %, while it is accepted that if it falls within the range of 85 % to 100 %, then this indicates the effectiveness of the training» [3]. These results are confirmed by statistics obtained after interviews of cadets in English in crewing companies, which, following the provisions of the Maritime Labour Convention, check the qualifications of job candidates from various angles and in strict accordance with international rules and national recommendations.

CONCLUSIONS

Established communication is a vital part of the effectiveness of any ship's crew. It is an absolute requirement for safe navigation and all cadets have to work hard on their English during their studies at the university. Constant attention to development of professional self-organisation, harmoniously included in the process of activity, allows stimulating the individual component of the entire process of professional development, where training is the most important, but not the only factor. Simulator training helps to activate analytical activity, which allows to expand the possibilities of long-term planning and design at the research stage.

Since the work of the ship's crew is impossible without established effective communication, special attention in the process of training specialists for work at sea is paid to professional foreign language competence. The results of the study confirm the effectiveness of the use of various means, including simulators, allowing to transfer language material from the educational sphere to quasi-professional activity, taking into account a wide range of influencing factors. Conducting state examinations on simulators close to the harsh conditions of the sea shows a high level of readiness of cadets to perform duties on board. The implementation of developed scenarios of simulator training and situational algorithms using standard phrases of the IMO in educational practice allows to increase the efficiency of activities by overcoming communication barriers, increasing self-confidence and speed of decision-making and task execution. An important element of simulator training is the advantage of using high-tech technologies in order to block risks when practicing professional teamwork of the crew in situations potentially dangerous to the environment and human life, during which it becomes possible to timely gain experience and practice decision-making skills in standard and stressful situations of professional activity.

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