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## **Integrated teaching of foreign language and technical disciplines for increasing the efficiency of training in maritime universities**

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### **Abstract**

The article deals with the pedagogical conditions for developing mariner's professional competencies in the process of integrated training sessions of basic technical disciplines and foreign-language training at the Maritime University. A reflection has been carried out concerning innovative pedagogical technologies aimed to increase the efficiency of formation of future experts' professional readiness for practical activities on board sea-going vessels. The authors present model of an integrated lesson developed on the basis of a block-and-modular system revealing the content and structure of its components. The technological "chain" of developing an integrated lesson has been allocated, and cognitive activity tasks for students in the interactive educational environment defined. As the study shows, the effectiveness of cognitive activity of students is determined by the professional orientation of educational process, as well as by using advanced information and pedagogical technologies which allow students to understand the mechanisms of application of special technical knowledge and foreign-language skills for solving professional tasks in real-life working conditions. The article emphasizes the importance of such form of integrated training sessions as simulator-based training for navigators and marine engineers, as it is considered to be an integral part of maritime education and the basis of safety and security of shipping.

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**Keywords**

Advanced didactic technologies, educational process, development of professional competencies, integrated training sessions, basic technical disciplines, foreign language training, simulator-based training programs.

## Introduction

At present stage of sea transportation development, in the context of a large-scale intensification and informatization of marine engineering labor and constantly increasing requirements to the professional competency of maritime university graduates, there is a great need to conduct new psychological and pedagogical studies in the field of formation of professional outlook of future mariners on the basis of integration of fundamental, professional and foreign-language training components in modern information and communication educational environment. This is connected with innovative approaches to the implementation of educational activities at all levels of the maritime education system, and, first of all, in the course of university education.

The process of intensification and informatization of the world marine transport sets the task of improving the quality of professional competency of the graduates at higher marine educational institutions all over the world. The matter is that young specialists in real-life situations on board ship do not always demonstrate due conformance of their training level to modern requirements of the employer, despite the fact that educational process in maritime universities is focused on professional activities of future seafarers [Belogurov, Gabeev, 2014].

In our opinion, the problem of the Russian marine education seems to arise from the fact that more attention is paid to the teaching methods, than to the practical skills of the cadets.

We believe that the conflict between "good teaching" and "not quite satisfactory results" can be overcome in the process of integrated foreign-language and professional disciplines training, the requirements of which are defined by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 78/95 (STCW 78/95 Convention), as well as by the national higher educational standards of Russia. The solution of this problem requires the revision of the content, forms and methods of higher marine education and, first of all, its special subjects and foreign language components [Balyaeva, Khvingiya, 2013].

## The study

It becomes obvious that integrated use of modern didactic technologies and e-learning resources has provided new opportunities for increasing the effectiveness of learning. Due to the development of advanced computer and telecommunication training means there is a great need to improve the forms, the content and structure of the didactic means of educational process, which, in its turn, determines the main purpose of this study: the didactic opportunities of integrated training sessions of professional

and foreign-language disciplines as a means of implementation of future seafarers' professional and personal potential.

In our opinion, efficient integrated teaching of foreign language and technical maritime subjects may be achieved on the basis of innovative pedagogical and information technologies in accordance with the requirements of the national and international educational standards. Therefore, it is necessary to develop theoretically and test by experience an invariant block model of an integrated training session that reveals the content and structure of its components. Besides, it seems quite expedient to us to allocate a technological "chain" of the teacher's activity in projecting an integrated lesson and to define special tasks of cognitive activity of students in the interactive educational environment [Baljaeva, 2017; Tokmazov, Baljaeva, Pan'kina, 2017].

We associate the creation of the necessary conditions for the professional development of a specialist at various stages of university education with the new arrangement of the educational process, not only by expanding the volume of professional knowledge, but also by determining the ways of forming this knowledge and their applying in practice, which is supposed to result in the development of a professional outlook on the basis of a new type of intellectual activity and new characteristics of orientation in this activity [Baljaeva, 2016, [www.http://dx.doi.org/10.15863/TAS.2016.04.36.23](http://dx.doi.org/10.15863/TAS.2016.04.36.23); Mishhik, 2017].

The use of a systemic-activity approach contributes to the formation of knowledge about the subject to be studied in accordance with the model of the systemic content of this knowledge. In this case, the student's cognitive activity should be organized by certain adequate means. The assimilation of these means ensures the formation of a generalized type of orientation in academic disciplines of both professional and foreign language learning cycles, the combination of which becoming the basis of the theoretical thinking of a new type specialist for maritime industry [Reshetova, 2002; Baljaeva, 1999; Reshetova, 1985].

At present, one of the factors of sea transport successful functioning is personal innovative professional outlook of a seafarer which involves constant improving and activating of cognitive actions, searching and applying of new methods and techniques of professional activity, readiness for flexible rearrangement of the direction and content of his activities in conditions of constantly changing demands of the labor market and marine technologies. These changes in functioning of a future specialist in the context of global informatization of his professional activity cause transformation of his professional outlook and expansion of information culture, and an important factor of this is complete understanding of the influence of information technologies on the content and structure of marine engineering professions, reflecting the characteristics of professional activities of a seaman in modern information field [Baljaeva, Uglova, 2016, [www](http://www.baljaeva.ru)].

The central place in the set of conditions ensuring the development of the professional competencies of future marine specialists belongs to innovative pedagogical technologies in the form of integrated training sessions with a wide use of electronic training facilities. The latter expand the didactic opportunities of the lessons, making it possible to form special, foreign-language and quasi-professional knowledge and skills [Baljaeva, Hvingija, 2017].

As one of the promising directions of integrated professional and foreign language training of marine specialists we consider the theory of the integrative-context model of forming professional competences on the basis of the context-competence approach developed by Academician A. Verbitsky and Dr V. Tenishcheva, Professor of the Admiral Ushakov State Maritime University of Russia. According to them, the systematic implementation of this approach means transformation of "knowledge and skills" educational paradigm into the paradigm of the new level – "professional

competences" [Verbickij, 2012, 52]. They believe that "the basis for the formation of the professional competence of an engineer should include student's learning activities on mastering a foreign language into the analogue of his future professional activity" [Verbickij, Tenishheva, 2007, 28], and the main stages of a specialist's training model, besides training-cognitive activity, should also comprise "quasi-professional" activity. This can be achieved by using foreign language in the process of solving typical professional problems and tasks, modeling real professional situations in the form of role-playing games while using computer programs and other electronic educational resources.

The block model of the integrated lesson we developed (Table 1) defines its objectives and tasks, ways of presenting the content of the learning material and the choice of its organization forms, the means of training activity, information resources, as well as integrative links with the external and internal information environment.

**Table 1: A block model of an integrated lesson**

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TARGET BLOCK                 | <ul style="list-style-type: none"> <li>– formation of knowledge and skills in special disciplines and foreign language;</li> <li>– formation of professional competences.</li> </ul>                                                                                                                                                                                                                                                                                                                                     |
| CONTENT BLOCK                | <ul style="list-style-type: none"> <li>– designing the content of learning material in the form of training modules based on the requirements of national educational standards in the context of systemic-activity approach (learning-by-doing method);</li> <li>– including professionally-oriented components in the content of training modules.</li> </ul>                                                                                                                                                          |
| PROCESS BLOCK                | <ul style="list-style-type: none"> <li>– developing methodology for the use of electronic learning tools in the course of a training session;</li> <li>– allocation of integrative links with external and internal information environment.</li> </ul>                                                                                                                                                                                                                                                                  |
| ORGANIZATION BLOCK           | <ul style="list-style-type: none"> <li>– integrating of traditional and innovative forms of learning activities using information resources;</li> <li>– accumulating of personal experience and formation of competencies by the students;</li> <li>– taking into account students' individual characteristics and personal needs;</li> <li>– implementing of teaching methods that promote the integration of special knowledge and foreign language skills for their use in future professional activities.</li> </ul> |
| CONTROL AND CORRECTION BLOCK | <ul style="list-style-type: none"> <li>– monitoring the dynamics of professional knowledge and foreign-language skills formation;</li> <li>– monitoring the dynamics of forming professional competencies of students;</li> <li>– adjusting the means and methods of forming special and foreign-language knowledge, skills and professional competencies in the context of achieving the aim of the lesson.</li> </ul>                                                                                                  |
| ASSESSMENT BLOCK             | <ul style="list-style-type: none"> <li>– assessment of the results and establishment of integrative links of basic, foreign language and special disciplines;</li> <li>– evaluation of educational activities by the students themselves under the guidance of the teacher;</li> <li>– qualitative and quantitative assessment of achieving the aim of the lesson by the teacher.</li> </ul>                                                                                                                             |

Designing of integrated lessons assumes a close connection with the individualization of teaching,

which involves organization of the independent cognitive work of each student, taking into account his personal needs and abilities. The immersion into a quasi-professional situation and solution of typical professional problems demands of the student to apply theoretical professionally-oriented knowledge in the cycle of both basic and foreign-language educational disciplines. The implementation of e-learning tools in the process of integrated training sessions allows modeling of students' training professional activities in particular quasi-professional situation, thus contributing to their adaptation to real professional activity.

Organization of cognitive activity of students at the integrated lessons of basic technical disciplines and foreign language training should be aimed at modeling and solving real professional problems which ensures higher efficiency of forming the required competencies of students.

In general, technological sequence of the teacher's activity in designing an integrated lesson is presented in Table 2. The aim of the student's cognitive activity at the lesson is integration of special knowledge and foreign-language mastering skills with elements of quasi-professional activity in the context of forming the required set of competencies in compliance with the provisions of the STCW-78/95 International Convention and the national State Educational Standards of Higher Education in the relevant areas of marine specialists training.

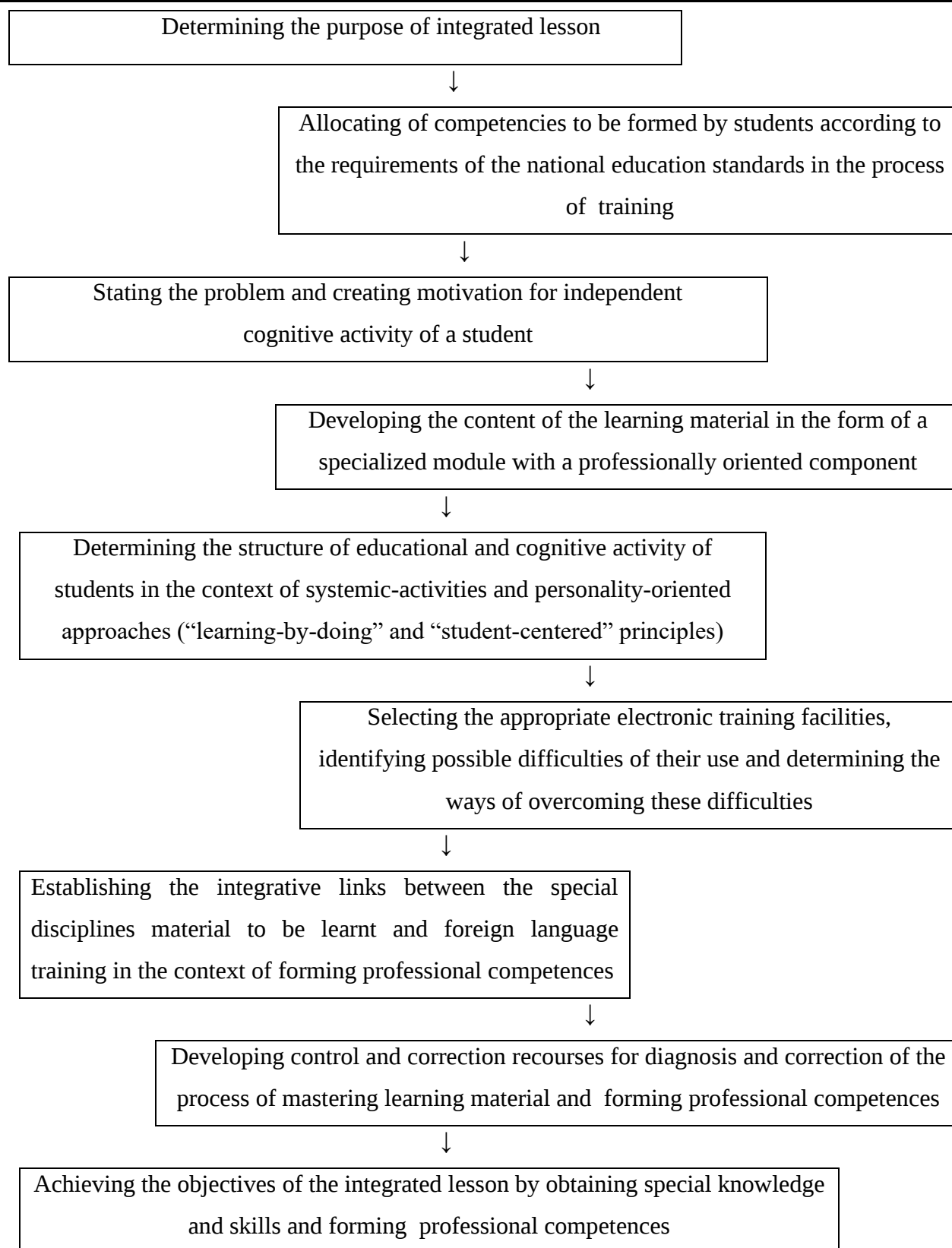
According to the aim of the integrated lesson, we define special tasks for cognitive activity of students in an interactive educational environment:

- the analysis of available special knowledge and foreign-language skills and their application in professional situation;
- the formation of skills of searching and processing new information data needed for successful solution of tasks and problem situations with a professionally oriented component;
- forming a set of cognitive actions to solve educational and professional tasks as a simplified model of real professional activity;
- assimilating of special disciplines knowledge and foreign language skills as an integrative component of future specialists' professional competence.

The effectiveness of cognitive activity of students in the process of integrated training sessions is determined by the professional orientation of the educational process, the use of advanced information and didactic technologies that allow students to understand the mechanisms of application of special subjects and foreign-language knowledge and skills for solving typical professional tasks in real-life professional activity.

Wide implementation of electronic educational resources and usage of computer simulation of real technological processes in marine labor greatly contributes to modification of methods and forms of conducting integrated training sessions, thus transforming the activities of both a teacher and a student. Owing to the use of electronic educational resources, the teacher exercises overall control over the process of interaction between the student and the information educational environment.

At the same time, electronic resources, acting as an intermediary between the teacher and the student, perform such didactic functions as presentation of educational information, modeling and demonstration of objects, phenomena and processes, measurement and processing the results, as well as monitoring the learning process. The efficiency of training is also raised due to increasing motivation, activity and initiative of students. In addition, the computerization and informatization of the educational process fully corresponds to other modern education trends: its systemic-activities approach (learning-by-doing principle) and personality-oriented ("student-centered") character [Baljaeva, Hvingija, 2016].

**Illustration 1 -Stages of organizing the activities of the teacher in designing an integrated lesson**

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## Findings

The opportunities of computerization and informatization application for integrated lessons of special disciplines and foreign language learning are rather wide, they include electronic teaching aids, multimedia training programs, testing programs, Internet resources, training videos and animation, electronic reference books and dictionaries, as well as modern simulator-based training technologies etc.

Let us dwell in detail on one of the forms of integrated lessons – simulator-based training which should be an integral part of seafarers' preparation. Such simulator-based training courses as Emergency Response, Crew Resource and Crisis Management are some of the most important components of maritime education. The best way to achieve experience and to gain corresponding skills in these aspects is practical runs on specially designed simulators which realistically represent the complex shipboard conditions. In recent years new types of simulators were developed for training specific aspects of Maritime Safety and Security. Simulators are well recognized as beneficial for training of human mentality and motivation, which is vital to create a permanent underlying safety culture [Baldauf, Nolte-Schuster, Schröder-Hinrichs, 2012, [wwwhttps://commons.wmu.se/marisa\\_papers/4/](https://commons.wmu.se/marisa_papers/4/)].

The system of simulator training for seafarers began to develop actively in the 1980s, following the adoption by the International Maritime Organization (IMO) of the STCW International Convention in 1978. The "new breath" of simulator-based training for navigators was given owing to the implementation of the Global Maritime Distress and Safety System (GMDSS) by the International Maritime Organization. Assignment of the GMDSS operator status to navigators became mandatory, and this competence was included in the STCW Convention requirements in 1995.

A great number of training programs for seafarers underwent significant changes after coming into force in 2012 the Manila amendments to the STCW 78-95 Convention. As a result of these amendments, the educational activities of marine educational institutions and simulator training centers have been greatly improved and modified: retraining programs have been introduced, and new programs have emerged related to the security and protection of ships. Besides, the oil and gas and passenger fleet training programs have been divided into three levels – basic, advanced and management levels.

So, if in studying the basic academic disciplines the student is required to master the basic subject-specific concepts, laws, definitions, then in the process of the simulator-based training, he acquires integrated knowledge and practical skills of ship's systems and equipment operation and maintenance procedures, as well as emergency response and crisis management procedure skills. This combination of two different approaches to marine education, through complementation and mutual enrichment, significantly increases the level of professionalism in decision-making by the operators and commanders of the vessel, which ultimately has a huge positive impact on reducing the number of ship accidents.

During the role-playing game on the simulator, complex professional tasks are performed in the context of a holistic technological process in situations of foreign-language communication. Assignments for role-playing, united by a single plot (a fragment of watch-keeping, training exercises to extinguish a fire, etc.), are gradually becoming more complicated and, under conditions of spontaneous work, reveal the actual level of the student's professional competence in foreign-language environment.

In our opinion, one of the most important features of simulator-based training for marine specialists

is the fact that in the process of performing various exercises on simulators they have to interact with their colleagues. As a rule, the implementation of exercises to carry out, for example, search and rescue operations are limited to interacting of the trainees with the instructor in the role of the officer of the watch on board the vessel in vicinity of the ship in distress. Such exercises are usually carried out quite easily. But when the same task is performed on the simulator by the trainees themselves, interacting with each other, they will probably face some difficulties in carrying out the task successfully. In the conditions of ideal training, the instructor or computer is always ready to react correctly to the situation, but, under real conditions, one has to deal not with a machine or an instructor who knows all the algorithms of actions, but with similar ship operators, whose knowledge of the English language and international documents regulating organization of these emergency procedures may be not quite sufficient.

Therefore, another significant function of simulator training is considered to be its scientific research potential. Simulation laboratories give an opportunity for all safety plans and procedures to be developed and tested in a simulation environment for more detailed evaluation of their effectiveness under various conditions and during different courses of events before their implementation in real world [Baldauf, Nolte-Schuster, Schröder-Hinrichs, 2012, [www](#)].

Integrated lessons on simulators for training marine technical engineers have their own special characteristics. The line of the engine room simulators of “Transas” production (St. Petersburg, Russia) is designed for training skills and assessment of the competence of the engine room crewmembers, who are keeping watch in the engine room, including Chief Engineers. Typical simulator training courses for marine engineers include a series of practical exercises on maintenance and operation of ship power plants and other engine room equipment.

The simulator training course for marine engineers includes the following learning objectives:

- familiarization with the systems of the engine room and their elements - mechanisms and equipment;
- study and analysis of schemes of ship systems;
- control and management of systems, mechanisms and equipment operation;
- learning the principles of control, automation and emergency alarm systems operation;
- control of harmful emissions, ways to optimize harmful emissions and fuel economy;
- electric power plant control, distribution of power;
- maintenance of the ER equipment and carrying out of the watchkeeping duties in the regular and emergency modes of operation, troubleshooting;
- management of crew resources.

Controlling the performance of exercises and commenting on trainees’ actions in English is carried out by both the special subject instructor and the English language teacher. In the process of integrated lesson, trainees get acquainted with measuring devices and instruments for controlling the engine room equipment, acquire the skills of monitoring parameters and assessing the normal operational state of the equipment, and develop English language skills while performing the engine room watch keeping duties. As the course progresses, the complexity of simulator exercises increases, trainees study and practice procedures of preparation, starting-up, putting into operation, setting normal operating parameters, and stopping ship’s mechanisms and systems.

Two versions of Transas simulators have been developed for different levels of training: the first model for basic level at the stage of college and university education, while the second one is designed for advanced and management levels of training in conditions of an ordinary or emergency situation.

The final exercises are aimed at developing the skills of detecting and diagnosing faults and equipment failures that may arise during the operation of the power plant. Each exercise is accompanied by a brief lecture in English, and ends with a collective discussion, including the analysis of the actions and decisions proposed by the students. In the course of the series of exercises, the trainees take on different roles of the Engine Room team, with the opportunity to fulfill the duties of the Engineer Officer of the Watch [Baljaeva, Hvingija, 2016].

The "case study" technology used in the process of integrated training exercises on the base of specific material of a particular topic is aimed to develop the skills of group discussion, the ability to see the problem from different points of view and take up joint decisions, as well as to learn how to eliminate possible causes of malfunctions. It should be noted, that apart from training professional skills these integrated lessons greatly increase motivation for English language learning, because the trainees are convinced of the need for its practical use.

At the stage of University education the final control is carried out in the form of an integrated examination on simulator-based training and English-language skills, which is the part of the State certification of the maritime university graduates. In the process of the final state examination, graduates demonstrate not only better results in the development of skills of all types of English language communication, but also a higher level of formation of the professional knowledge and skills which are required to solve typical problems successfully in their future professional activities.

## Conclusion

Summarizing the above, we may note that the implementation of e-learning resources in the process of integrated lessons significantly expands their didactic opportunities. Including such activities in the traditional forms of the educational process, in our opinion, contributes to increasing the degree of motivation of students, and concentrating their efforts on the achievement of learning objectives.

We would like to emphasize that the proposed block model of the integrated training session and the technological sequence of the teacher's activity in its process are aimed at the formation of innovative behavior, the communicative skills of students, and the ability to work with various sources of information. This contributes to the activation of opportunities for the development of professional competence of future maritime transport professionals in the context of an innovative educational environment.

One of the most important factors of this development is the optimal organization of students' thinking, and their searching and creative activity by means of using information technologies for teaching, which allow introducing educational resources of any format, including quasi-professional or special content, thus providing interactivity between the teacher and the student. In the process of organizing the learning activity owing to the use of advanced educational technologies, students can obtain the skills of solving problem tasks with a quasi-professional component, and get acquainted with the professional terminology and elements of the future professional reality.

In conclusion, it should be noted that the expansion of the didactic opportunities of integrated training sessions is associated with the optimization of the educational environment through the qualitative selection of methodological support for basic academic disciplines and foreign language training. The use of innovative pedagogical technologies and electronic educational resources is aimed at enriching the relevant knowledge, skills and competencies of students, as well as increasing their motivation and creativity through professionally oriented content of training.

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**Интегрированное обучение иностранному языку и техническим дисциплинам как средство повышения эффективности подготовки в морских университетах**

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**Аннотация**

В статье рассматриваются педагогические условия для развития профессиональных компетенций моряков в процессе интегрированных учебных занятий по техническим дисциплинам и иностранному языку в морском университете. Приводится размышление об инновационных педагогических технологиях, направленных на повышение эффективности формирования профессиональной готовности будущих специалистов к практической деятельности на борту морских судов. Представлена модель интегрированного учебного занятия, разработанная на основе блочно-модульной системы, раскрывающая содержание и структуру ее компонентов. Выделяется технологическая «цепочка» разработки интегрированного учебного занятия, определены задачи познавательной деятельности студентов в интерактивной образовательной среде. Как показывает исследование, эффективность познавательной деятельности студентов определяется профессиональной ориентацией учебного процесса, а также использованием передовых информационных и педагогических технологий, которые позволяют студентам понять механизмы применения

специальных технических знаний и навыков иностранного языка для решения профессиональных задач в реальных рабочих условиях. В статье подчеркивается важность такой формы интегрированных учебных занятий, как тренажерная подготовка штурманов и судовых механиков, поскольку она является неотъемлемой частью морского образования и основой безопасности и охраны судоходства.

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#### Ключевые слова

Передовые педагогические технологии, образовательный процесс, развитие профессиональных компетенций, интегрированные занятия, базовые технические дисциплины, обучение иностранному языку, тренажерные обучающие программы.

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