Methodological concept of distance learning at the stage of basic training at the Maritime University

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Abstract. The article presents an innovative approach to the educational and methodological support of the educational process in a distance format. The purpose of the study is associated with the identification of such a structure and content of thematic complexes of e-learning tools, the use of which at the stage of basic training of specialists at the Maritime University would optimally meet the objectives of improving the quality of basic knowledge and competencies, the level of digital and professional literacy of industry personnel. The scientific novelty of the study is the development of the methodological concept of distance learning in the direction of increasing the efficiency of the educational process based on the thematic electronic modules developed by the author, consisting of subject-specific video blocks, to different forms of training sessions united by one topic. The author reveals the structure, content and technological features of the implementation of video blocks in the process of educational activities of students in lectures, practical and laboratory classes, as well as in the process of evaluating the success of mastering the course being studied. The article presents the qualitative results of the study, which show the effectiveness of the developed methodological concept of distance learning in the cycle of basic academic disciplines in terms of improving the level of basic training of students as a fundamental basis for professional knowledge and competencies.

1 Introduction

Currently, the educational system of the Maritime University is undergoing significant changes related to the digitalization of both the Russian economic space in general and the educational space in particular [1, 2]. The active use of e-learning tools in the educational process of higher education causes the need to develop innovative approaches to the methodological support of the educational process in maritime educational institutions. To improve the level of training of industry personnel in accordance with changes in the Federal State Educational Standards, it is necessary to renovate the educational and methodological base of the university [3, 4].

As the analysis of scientific and pedagogical sources shows, the processes of digitalization of higher education are studied in works devoted to the creation of a system for assessing the quality of maritime education in a distance format [5]; methodological aspects of the development of research skills [6, 7]; formation of digital literacy of graduates [2]; issues of scientific and methodological design and the use of digital technologies in education [8, 9].

Paying tribute to the results of these works and relying on our studies [3, 10], we believe that even greater reserves for optimizing the educational space of higher education are opened by innovative methodological concepts of on-line learning, which has a number of advantages in organizing the educational process compared to traditional forms of training.

2 Materials and Methods

It should be noted that the use of traditional methods for organizing distance learning activities of students is not effective enough in terms of improving the quality of the educational process. An analysis of the existing methodological equipment of basic academic disciplines shows that digital resources are not sufficiently involved in the educational process; that many textbooks contain a knowledge system ready for assimilation, but the forms of its active development are not defined; the necessary connection with future professional activity is poorly traced or completely absent. In this regard, higher education requires the modernization of tools and technologies for both basic and professional training of specialists, the search and implementation of professionally oriented information methods in the educational process that adequately reflect the standards of higher professional education and the capabilities of modern e-learning tools. Interpolation of traditional didactic approaches to the educational process in a distance format needs to clarify the ways of designing not only the content and structure of subject-specific knowledge, but also a professionally oriented component, as well as educational activities for their assimilation in an electronic educational environment.

This confirms the relevance of proposed study, aimed at eliminating the following contradictions between:

— the advantages of the distance learning format and the insufficient development of its didactic tools;
the growing possibilities of electronic resources and insufficient computer support for educational services;
— traditional means of education and the need to develop digital literacy of students.

Based on these contradictions, the problem of our research lies in the question: what should be the didactic means for organizing the educational activities of students at the stage of basic training of industry personnel, so that their use meets the objectives of increasing the level of digital literacy, the quality of basic knowledge and competencies necessary for the successful development of a cycle of special disciplines?

The aim of the study is to solve this problem. This implies the need to revise the educational and methodological equipment of the educational process in a distance format.

The hypothesis of the study consists in the assumption that the didactic support of distance learning classes, developed on the basis of a combination of a block-modular approach with progressive professionally oriented technologies implementing the integration of traditional didactic means with electronic learning resources, can contribute to the effective development of the basic content of academic disciplines; activation of cognitive activity of students; increase their digital literacy and positive motivation to studying the subject; development and formation of basic and professional competencies.

The aim and hypothesis of the study determined the objectives of the study:
— to identify and theoretically substantiate the structure of thematic electronic modules for teaching students in basic academic disciplines, in which it is necessary to implement, on the basis of a block-modular approach, the design of the didactic support of the training course and the integration of its theoretical, practical and experimental components using modern information technologies;
— to identify ways of structuring the subject-specific content of the training course for its adequate reflection in the corresponding video blocks based on a combination of invariant and professionally oriented variable components;
— to experimentally test the effectiveness of the created didactic support for distance learning in the basic academic discipline at the Maritime University.

The scientific novelty of the study lies in the renovation of the methodological concept of distance learning space based on the educational thematic electronic modules developed by the author, aimed at improving the efficiency of educational activities of students; in highlighting the structure of these modules and the original technology for their implementation in the educational process at the stage of basic training of marine specialists.

In order to achieve the goal of the study, test the hypothesis and solve the tasks set, the designing of experimental thematic modules on the basic academic discipline in the form of presentations with an integrated rating system for evaluating the success of passing the training course by university students was undertaken on the iSpring e-learning platform.

The structure of such a module includes various forms of training sessions, united by a common theme, and may consist of theoretical, practical, experimental and diagnostic video blocks containing electronic teaching aids for lectures, practical and laboratory classes, as well as a set of control-corrective and diagnostic materials. The electronic teaching aids for the course of physics developed by us in the form of presentations are a software product that allows students to choose the necessary stage of educational activity in the standard window mode.

The main objectives of the electronic thematic module are:
— creation of conditions for meeting the educational needs of students in the format of distance learning;
— design and implementation of individual educational trajectories;
— development of independent intellectual activity skills;
— formation of research skills in the process of learning activities to solve problems and perform tasks of laboratory practice;
— formation of basic and professional competencies.

For example, in the discipline “Physics”, the electronic teaching aids developed by us in the form of presentations for each lecture lesson included in the theoretical video block of the thematic electronic module consist of:
— examination questions and tasks considered in this lecture;
— theoretical model of the phenomenon under study;
— demonstration of subject-specific experiments;
— video clips with a professional orientation;
— a short test survey for feedback.

The practical video block of the thematic electronic module consists of teaching aids in the form of presentations with invariant and variable parts. The variable part of the presentations is aimed at applying subject-specific knowledge (theories, laws, principles) and skills (methods, tools) to solve tasks with professionally oriented content. The invariant part of the presentations of all practical classes has a single logical structure that reflects the following stages of a distance learning course in Physics.

The first stage is an on-line mini-lecture, during which the teacher introduces students to the topic and purpose of the lesson, outlines the lesson plan; briefly comments on the theoretical material; highlights the types of tasks that will be discussed in the lesson.

The second stage is the allocation of methods for solving typical tasks and the indicative basis of activities for their solution. In the general approach to solving problems, one can single out a set of basic actions that, as a rule, are carried out in solving any Physical problem: a) correlating the subject-specific or professional situation described in the task, or a technical device with a subject-specific abstract model; b) selection of the object of analysis, its integral properties and characteristics; c) the choice of means of solution and the implementation of executive operations; d) analysis of the obtained results.
The third stage is an independent educational activity of students in solving typical subject-specific tasks. The teacher in on-line mode activates the work of students, asks questions, clarifies the quantitative results of solving problems, sums up, draws conclusions. Let us note that it is important to teach the student not only to obtain a quantitative result, but also to represent the patterns obtained as a result of solving the problem in analytical and graphical forms. The interaction of students in online distance classes with a teacher in the process of solving tasks, mastering educational material means that there is cooperation in the exchange of knowledge, ideas, ways of cognitive activity.

The fourth stage – integrating subject-specific and quasi-professional knowledge and skills in the process of solving tasks with professionally oriented content. In this case, a physical task is considered as a special form of describing a physical phenomenon or properties of an object through a specifically given situation or an abstract one with a professionally oriented component. The quasi-professional aspect of such tasks consists in their focus on the formation of student skills to carry out educational and research activities that reflect one of the real directions of future professional activity in the navy.

The fifth stage of the lesson is controlling, aimed at diagnosing the assimilation of ways and methods for solving both typical tasks and tasks with a professionally oriented component on the topic of the lesson, and includes independent work of students to solve selected tasks or test tasks.

The sixth stage is the final one, at which the teacher comments the homework to students in on-line mode, highlights tasks and theoretical questions, draws attention to the educational literature necessary for homework.

The experimental video block includes teaching aids, which are also developed in the form of presentations for laboratory classes; they contain an invariant logical structure that provides the main stages of learning activities of students during a remote laboratory practice.

The informative stage implements three blocks of educational information: target, theoretical and electronic reference. The target block contains the setting of goals and objectives of training, due to the peculiarities of laboratory classes. It should be noted that the main goals of the practical lesson in Physics include: consolidation of theoretical knowledge, control of understanding of the essence of the studied physical processes and phenomena; formation of professional knowledge, skills, research skills; practical mastery of the elements of professional activity, training in making engineering decisions, forecasting and analyzing the results of activities.

Depending on the purpose of training, the tasks of a laboratory practice may be: research, design, operation of a technical object, and others.

The theoretical block reveals the preliminary knowledge and skills necessary to complete the laboratory task, which make up the theoretical foundations of the experiment (a brief theory, physical laws, formulas, definitions). The electronic reference block provides additional information material (physical constants, tabular data, calibration graphs, etc.).

The laboratory and research stage includes simulation and analytical blocks. The simulation block simulates a laboratory experiment, includes familiarity with the laboratory installation, measuring instruments, the procedure for performing laboratory tasks and taking readings of laboratory equipment. The analytical block regulates the performance of the necessary mathematical calculations, the construction of graphs, the analysis of the results obtained from a subject-specific point of view and, where necessary, from a quasi-professional one, as well as the formulation of conclusions on the work.

The feedback stage solves the problems of monitoring the progress and results of the theoretical and practical mastering of educational material, the formation of subject-specific and professional competencies provided for by the program, fixes the dynamics of educational achievements of students.

The diagnostic video block of the thematic electronic module with control, correction and diagnostic materials may contain:
- thematic training test tasks with answers and explanations in open access;
- examination questions and typical training tasks for the exam, also with answers and explanations;
- options for tasks of formative assessment; instructions for preparing and conducting the exam;
- diagnostic materials for formative and summative assessment in closed access.

It should be noted that some students in the process of learning activities in a distance format may experience difficulties in following instructions: can not identify keywords, do not understand the meaning of the technical text well, find it difficult to apply algorithms for performing practical and laboratory tasks.

This should be taken into account when designing teaching aids for e-learning. Educational texts should be short but succinct. The main information should be contained at the beginning of the text, abbreviations should be deciphered. Tables, graphs, figures should contain additional explanations. Algorithms of educational actions should be clear, without introductory words and synonyms.

3 Results and Discussion

It is assumed that after studying the material of thematic electronic modules, students should be able to know and understand the main subject-specific laws and the limits of their applicability in the study of special disciplines; techniques and methods for solving typical tasks; to understand the algorithms of educational and research activities. Also, students should be able to analyze and apply subject-specific knowledge when solving problems with a professionally oriented component; work with information reference sources; use tables correctly; perform calculations, graphical constructions, generalize and interpret the results of experimental research from a subject-specific and, where necessary, from a professional point of view.

To test the hypothesis of the study, a pedagogical experiment was conducted, in which 2nd-year students of
the specialty "Navigation" of the Admiral Ushakov State Maritime University took part. The experiment included three stages: ascertaining, forming and generalizing. Based on the results of testing the initial subject-specific knowledge, the control group (CG – 28 students) and experimental groups (EG1 – 27 students and EG2 – 30 students) were determined in such a way that at the beginning of the experiment the average academic performance of the EG1 and EG2 groups was 0.08 lower compared to the CG group.

Classes in the control group were conducted using traditional methods. Classes in experimental groups were held in a distance format using the developed didactic software in the form of thematic training electronic modules.

At the formative stage of the experiment, the success of achieving an educational result during the semester is revealed by the diagnostic module using a rating system of evaluation in points. The survey of students showed that two-thirds of them positively assessed this system, noting that it motivated them to achieve high academic performance, stimulated cognitive activity, helped to adapt to the distance learning environment. At this stage, there was an increase in the average score by 0.29 in the EG1 group and by 0.34 in the EG2 group compared with the CG group.

The midterm examination took place in the CG group at practical and laboratory classes in full-time format, in the EG1 and EG2 groups at distance practical and laboratory classes and was of a control and correctional nature.

The final control was carried out at the end of the semester using attestation testing programs in the CG group in full-time format, in groups EG1 and EG2 at distance learning. A comparative analysis of grades showed an increase in the average score by 0.47 in the EG1 group and by 0.56 compared to the EG2 group.

Conducted at the generalizing stage of the experiment, a qualitative analysis of answers of students to the attestation tasks showed that the formed knowledge of the students of the EG1 group and the EG2 group is quite generalized, integrating the basic, special and digital components, and the formed knowledge of the CG students is mostly of fragmentary nature.

Thus, it can be stated that the goal of the study has been achieved, the tasks set have been solved, the research hypothesis is confirmed by the results of experimental training.

As follows from the analysis of research in the field of higher school didactics, the problem of developing innovative methodological concepts of distance learning is very relevant. Our work is based on the results obtained earlier, which laid the methodological basis for the development of educational-methodical complexes of the new generation [9, 11].

Technological reliability and pedagogical efficiency of modern e-learning tools are the main condition for optimizing the distance learning environment. In this regard, we believe that the implementation of the developed electronic thematic modules in the basic academic discipline in the educational process can become an important tool for optimizing the educational space, expanding the individual trajectories of theoretical and practical training of industry personnel.

Comparison of the results of this study with the conclusions of previously completed works [4, 10, 12] shows, in general, their consistency and outlines the directions for further development of educational and methodological equipment of the educational process in a distance format using advanced information interaction technologies in the subject environment. These directions include:

- development of a complete electronic application to the training course in the form of thematic electronic modules containing video blocks with packages of necessary materials for organizing project and research work of students;
- creation of Internet support for the training course with the inclusion in the content of thematic modules of the virtual consultation system in the form of video blocks on demand, aimed at actively mastering the basic content with an expanded profile component;
- universalization of the proposed methodological concept of distance learning in the basic academic discipline in order to extrapolate it to the disciplines of the humanities and special training cycles, as well as to other stages and links of the maritime education system.

4 Conclusion

The practical significance of the research consists in the development of a methodological concept of distance learning in a basic academic discipline, which can be used not only at the basic stage, but also at other stages of training marine specialists; in the creation of educational and methodological equipment based on thematic electronic modules; in the specification of the structure and technology of the implementation of these modules in the educational process of the maritime University.

The results of the survey of students, midterm and final diagnostics of the formed knowledge and skills show that the proposed methodological concept of distance learning makes it possible to ensure the uniform nature of independent learning activities of students throughout the semester, motivate them to achieve a sufficiently high level of mastering the course being studied, reduce the number of underachievers in this academic discipline. In this respect, based on the analysis of responses of students, the necessary correction of the educational process, electronic learning and evaluation tools is provided.

In conclusion, we note that the experience of experimental application of thematic electronic modules in the educational process confirms the effectiveness of the above methodological concept of distance learning at the stage of basic training. We believe that it is advisable to continue working towards optimizing this concept by summarizing the results of the study for all stages of training specialists at the Maritime University.

References


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