Intelligent Information Technology in the System of Teachers' Advanced Training

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Abstract

The article is devoted to the use of Intelligent Information Technology (IIT) to improve teachers' qualification. The article describes the process of development and use of Intelligent Information Technology on the example of the Center for Professional Development of Teachers of Kherson State Maritime Academy. The focus is on the importance of increasing the level of digital literacy, which includes creation and development of an innovative automated system to improve the existing state of the education system during the pandemic crisis. The latest studies on the use of Intelligent Information Technology, primarily in the field of education, were analyzed. This research provides an understanding of the essence of the concept "intelligent information technology" as a technology used to process large amounts of information with subsequent automatic decision-making in solving problems. The emphasis is placed on the fundamental aspects that must be adhered to and on the criteria and principles to meet in the use of IIT in the educational process. The examples of the use of electronic courses LMS MOODLE by the Center for Professional Development of Teachers of the Academy in theoretical, practical and analytical areas during the implementation of the distance format of the advanced training were provided. Taking into account the peculiarities of remote advanced training of teachers, a range of advantages and disadvantages of the introduction of Intelligent Information Technology in forming a single information and high-tech environment were outlined. An effective mechanism to provide conditions for the organization of the educational process aimed at solving a range of problems of different complexity levels in the context of advanced training of teachers of HEIs, vocational education institutions and secondary schools was described.

Keywords 1

LMS MOODLE, Intelligent Information Technology, maritime professionals, teachers' advanced training

1. Introduction

Educational processes around the world are influenced by the need to introduce the latest educational technologies to provide students with skills and knowledge that are necessary and relevant in the 21st century. Higher education is currently constantly undergoing transformations and reforms, primarily in the teaching staff of higher education institutions, because professors and teachers are the first link in the chain of further transfer of the latest information and knowledge. The orientation of the world community to create a single high-tech and information space also plays an important role in promoting the use of Intelligent Information Technology (IIT) in the educational process. The 2020 pandemic has significantly accelerated the pace of innovation. COVID-19 has become one of the primary reasons for the development, implementation and active use of distance learning in the educational process. These trends of modern higher education require proper training of university teaching staff. Today, it is insufficient to have a scientific degree, it is necessary to constantly improve professional skills by

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acquiring new skills in the field of Intelligent Information Technology. Modern automated teacher training systems are a key element in the process of creating a modern higher school of the 21st century, which meets all the necessary characteristics of today: it is open, accessible, mobile and international.

This research is devoted to the creation and development of an innovative automated training system for teachers of higher education institutions specializing in the provision of educational services in the maritime sphere. In particular, it is proposed to consider the process of using the automated system LMS MOODLE in the educational process on the basis of Kherson State Maritime Academy. The use of electronic resources of LMS MOODLE by structural units of the academy was studied in several areas:

1. Theoretical. Theoretical and methodological basis of the main educational programs placed in LMS MOODLE; construction of basic principles of LMS MOODLE operation; qualification requirements and recommendations for teachers who improve their professional skills with the help of LMS MOODLE resources;
2. Practical. Implementation of the basic principles of LMS MOODLE in practice; development of educational professional programs; adjustment of professional development courses in real time of training;
3. Analytical. Analysis of existing problems and shortcomings that have been identified in practice; analysis of the impact of the process of professional development of teachers on the level of educational services; forecasting and development of future stages of creation, implementation and impact of new measures to improve the professional skills of teaching staff with the help of LMS MOODLE.

The pandemic crisis that the world faced in 2020, the problems that have arisen and with which we are continue to face today, require radically new approaches to address them and improve the existing state of the education system. The higher education system is inherently very mobile and inclusive, which is why raising the level of use IIT to improve teachers' qualifications is an extremely pressing issue, as the education sector of today must be just that.

2. Modern scientists' research

Intelligent Information Technology is one of the promising areas in various fields of activity. Given their capabilities, interest in them as an effective tool for improving the participants' efficiency in the educational process is constantly growing. A number of researchers focus on the use of Intelligent Information Technology in specific areas. For example, S. Balan described the design methods and specifics of IIT in mechanical engineering and gave a number of examples of their use for optimization and operation of machine parts. Researcher Yu. Lysetskyi focused on the analysis of information systems and prospects for their development in economic management. P. Fedoruk provided information on the use of adaptive and intelligent educational technologies to meet the needs of distance learners, as also the types and place of modern AIWBES research in the field of artificial intelligence in education. The article describes the technology and methods of analysis of test results, gives assessment scales in testing of knowledge.

Methodical approaches to assess the effectiveness of IIT are studied by researchers K. Bandorina, L. Kovalchuk, and L. Savchuk. In these works the own understanding of the concept "intelligent information technology" is specified and presented, features and criteria of their estimation and mechanisms of realization are defined. In the study of A. Dovbysh, A. Vasylieva and V. Lyubchak the information is provided on the creation of e-learning tools based on the use of IIT on the example of Sumy State University.

The study "Intelligent Information Technology in Education" focuses on development of a mechanism for implementing the component of intelligent technologies – a decision-making tool, including artificial intelligence methods for diagnosing educational trajectory in blended learning format. There it is emphasized that one of the current problems of higher education is training of a large number of graduates, who can easily solve various problems and find the right solutions based on the acquired knowledge and skills. We understand IIT as a set of ways and methods of performing the functions of collecting, processing, transmitting and using the acquired knowledge.

Despite the significant volume of publications devoted to the use of IIT in e-learning [9, 10, 11], we have not found enough research on the use of these technology in the system of distance advanced training of teachers, automation of distance courses, automated assessment of the achievement of a certain knowledge level and compliance of the educational process with modern requirements [12].

3. Using of IIT in the system of teachers' qualification improvement

First of all, it is necessary to define what exactly intelligent information technology is. Intelligent information technology (IIT) - the latest class of technologies used by automated systems to process large arrays of information to model the mental processes inherent in a man, in order to further automatically make decisions when solving problems. IIT are used in all areas of human activity. The educational sector is no exception. It is proposed to consider the essence of IIT through the prism of the educational process [13, 14].

One of the main tasks of the process of applying IIT in the educational process is to specify and define the basic values and working categories that would ensure the effectiveness of the educational process. The work of the IIT should be carried out in accordance with a clearly defined algorithm that would ensure the achievement of the maximum level of efficiency. The working algorithm should take into account all the categories and structural units involved in the learning process [15, 16].

Based on this, we can identify 3 fundamental aspects that must be observed in the process of using IIT in the educational process: targeted, functional and directive.

An example of bulleted list is as following.

- The targeted aspect is responsible for the proper targeted functioning of the IIT, in general - for the coordination and organization of the elements of the existing system to achieve the end result, the goal.
- The functional aspect concerns the level of participation and influence of the human factor on decision-making processes, information processing and the use of intellectual opportunities in the educational process.
- The directive aspect is the most practical aspect, because its purpose is the most clear coordination and organization of all structural units in order to obtain the best end result.

Speaking about the educational process, we must remember that IIT must meet certain criteria, including:

1. - Complexity;
2. - Availability and compliance with the principle of full cycle of operation;
3. - Adherence to the principle of duality;
4. - Adherence to the principle of incompatibility;
5. - Adherence to the principle of external complementarity;
6. - Adherence to the principle of continuous development;
7. - Adherence to the principle of modularity, etc.

For a clearer understanding of the process of using IIT in the educational process, it is proposed to consider this issue from the structural aspect. In Fig. 1 it is shown a diagram of an automated control system of the educational process, taking into account all the main structural elements of the educational process [17, 18].

The diagram in the figure 1 shows that the principle of full cycle of operation is fundamental to the process of using IIT in teaching, as mentioned earlier. All structural elements are interconnected and complementary [19, 20]. To change one element means to change the whole system. It is necessary to analyze influence of each point on the full cycle of operation. Only in this way we can approximately forecast how the system will work in case of any trouble, change, adding/excluding any elements.

According to the figure each element of the system both receives information from the other one and transmits it. Each arrow is a stream of information. It is these data that are one of the key components of our research.

As mentioned earlier, Kherson State Maritime Academy uses LMS MOODLE in the educational process. The authors of the article studied the process of creating and implementing this system in the educational process of the academy. In order to assess the level of efficiency and identify existing problems, the analysis of statistical data was carried out by various methods (hypothesis testing, mean).

The next important step is to identify the strengths and weaknesses of IIT as a tool for effective and mobile learning [9, 21].

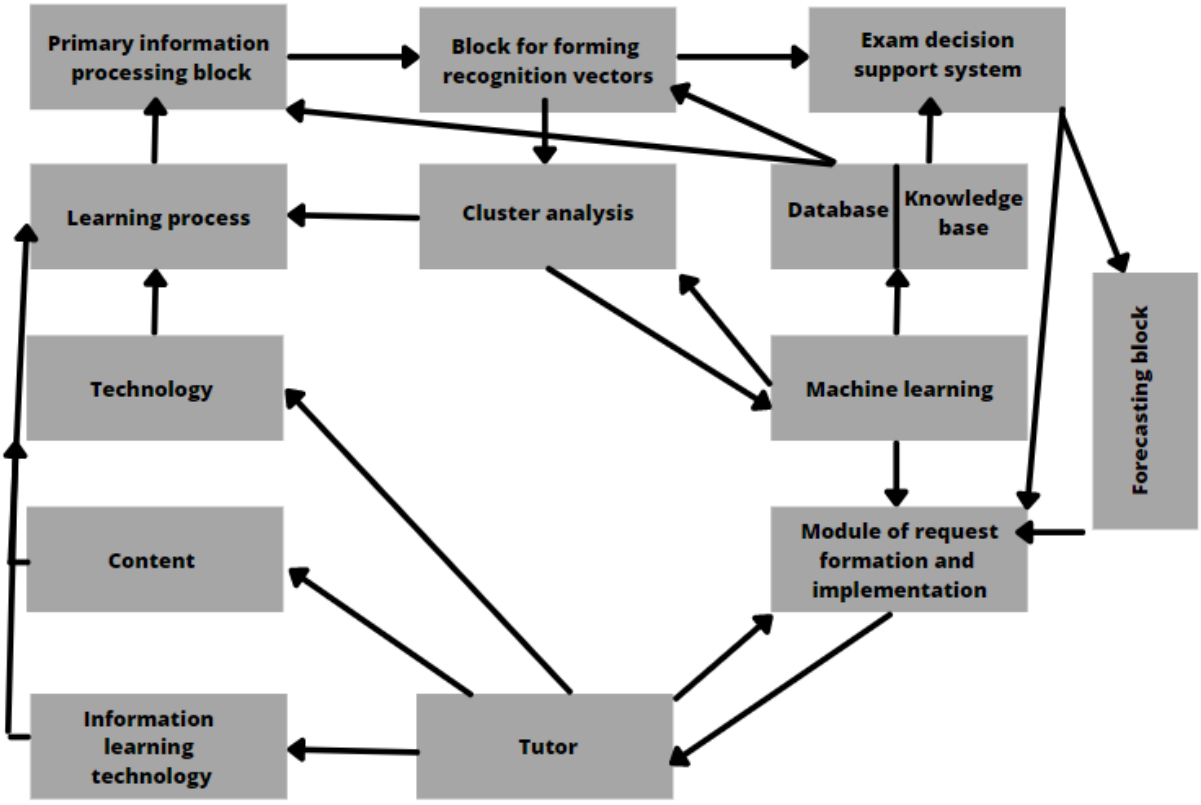

Figure 1: Diagram of an automated control system of the educational process

3.1. Advantages of using Intelligent Information Technology

A significant amount of information that a teacher must hold requires a clear structure of its presentation, using a variety of techniques and approaches to the use of Intelligent Information Technology. Given that distance advanced training plays an important role in today's development of information society, the implementation of Intelligent Information Technology can significantly individualize this process, although a lot of effort is required in developing and applying thereof by an institution [22]. Taking into account the specifics of the methodology of Intelligent Information Technology as compared with traditional information technologies, it is worth noting the possibility of building an individual educational trajectory of the educational process participant, i.e. individualizing the information to his/her level of knowledge and skills. The approach of dividing course participants into groups allows to effectively increase the level of their knowledge and provides an opportunity to conduct a comparative analysis of the dynamics of learning for different participants.

The possibility of using visualization tools allows to diversify the information resource, promotes the development of thinking and affects the quality assimilation of learning material by course participants. The LMS Moodle methods, taking into account the appropriate resources and settings, allows to go back and perform the same task again. Therefore, it is necessary to indicate the number of attempts and the method of evaluation, i.e. which attempt will be considered as final or best. It should be noted that in applying Intelligent Information Technology, partial responsibility for the educational process of participants is placed on the selected computer systems, which generally minimizes the human factor in the assessment.

3.2. Disadvantages of using Intelligent Information Technology

The disadvantages of advanced training in the remote format using Intelligent Information Technology for people who create courses and their students are:

- incomplete acquaintance and consideration of functional features as also technical and organizational possibilities of modern systems of distance learning at the initial stage of designing of a course, depending on the final purpose of their use;
- the creation of quality e-learning courses for distance learning format requires a lot of time and effort from the people who conduct them, but they can be also completely limited to the use of Intelligent Information Technology alone;
- in case of inappropriate use of technologies and methods, structuring of elements of the training course is not always successful;
- lack of direct contact between the teacher and the course participants; as a result, participants who begin to take the course do not complete it to the end, losing motivation [21].

3.3. The Center for Professional Development of Teachers at Kherson State Maritime Academy

The Center for Professional Development of Teachers started its activity in LMS MOODLE in 2019 at blended format (distance/face-to-face learning). Distance e-courses are developed by tutors of Kherson State Maritime Academy. E-course consists of number of modules not available unless the previous activity is completed. The beginning of every course is entrance testing which helps to find out the level of knowledge of course participants. It depends on the mark which section will be opened next. If the teacher who acts like a student on e-course shows high level of knowledge the section with hard tasks will open [2].

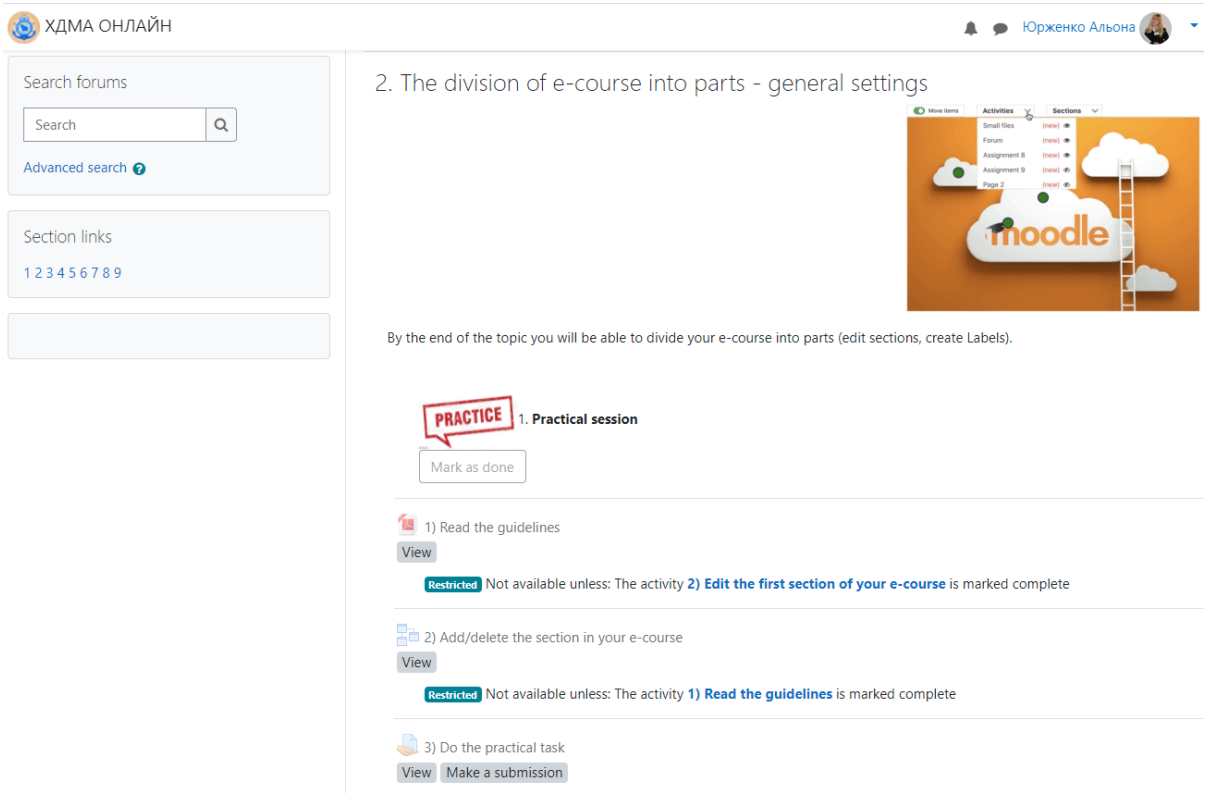

Figure 2: The example of the interface of e-course

4. Discussion

From 2019 248 teachers have participated in e-courses of the Center for Professional Development of Teachers at Kherson State Maritime Academy. In 2019-2020 academic year 69 teachers have successfully finished e-course called “E-course development on LMS MOODLE using e-learning tools and services” (88% of teachers were from Ukrainian educational establishments and 12% - from Indian universities) [21].

By analyzing the data of success after using fully remote format of the electronic course, one can observe that the current state of formation of the digital competence of current teachers 2020-2021 is higher compared with 2019-2020 academic year.

According to the results, we see an increase in the level of digital competence which was measured by final testing and questionnaire survey. Graphical representation of results can be seen in the figure below.

Figure 3: Results of formation of teachers’ digital competence in 2019-2020, 2020-2021

After the completion of the distance advanced training, the course participants are proposed to pass a specially developed online survey in Google Forms in order to obtain statistical data about the attitude to the main content of the advanced training programme and the level of satisfaction with their learning outcomes.

For the past study weeks of 2021, another wave of the scheduled survey has been conducted among distance course participants on an anonymous basis.

This is the eighth wave of the survey, which included a mandatory requirement to take the time to complete the e-questionnaire during the last lesson. Interestingly, the majority of participants (94.4%) recognized positive aspects of the course and were ready to apply the learning outcomes in their activity [3, 23].

The data of the conducted survey are used by the staff of the Center for Professional Development of Teachers to improve the content and methods of study, after making sure that the received answers are repetitive and can indicate both good practice and problematic aspects.

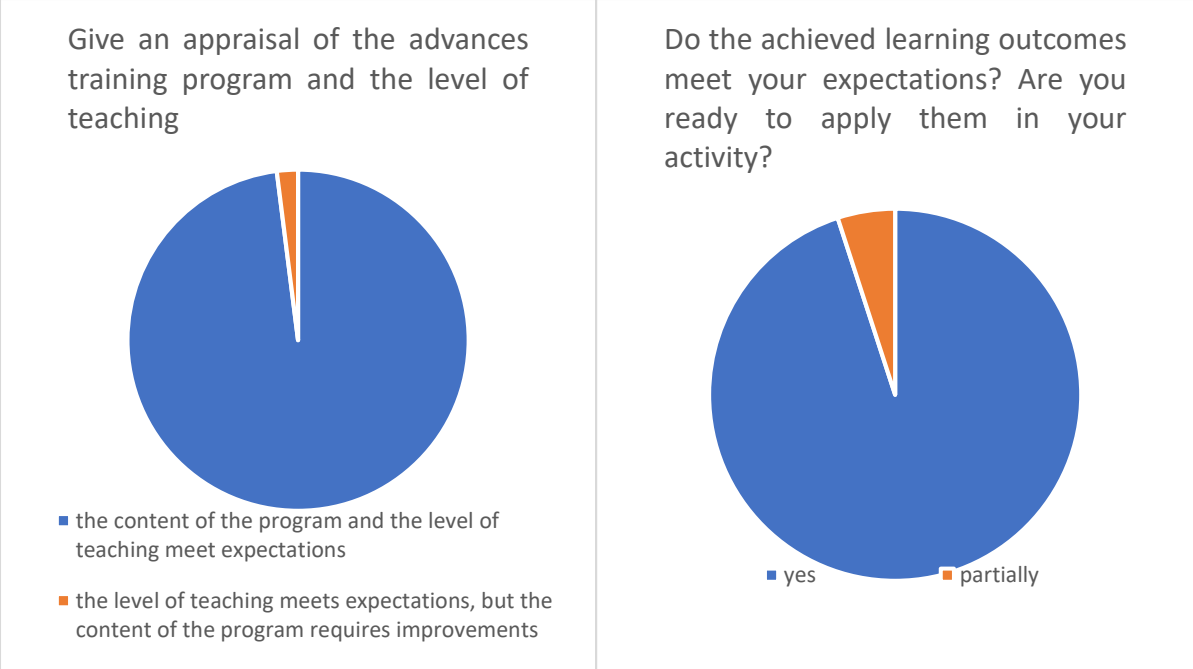

Figure 4: Results of the conducted survey with the participants of the Center for Professional Development of Teachers

5. Conclusions

In this article, the process of creating, implementing and using Intelligent Information Technology (IIT) in the educational process in higher maritime educational institutions was studied and analyzed, in particular, the practical use of LMS MOODLE at the Center for Professional Development of Teachers of Kherson State Maritime Academy. The research and analysis showed that the use of Intelligent Information Technology has a number of advantages over other teaching methods in higher education, for example: mobility, the possibility of distance learning, monitoring and analysis of the results obtained, working on mistakes in the learning process, forecasting and planning a further work plan based on the courses and taken materials. The relevance of this study was confirmed in practice by the interest in using LMS MOODLE both for the educational process and for improving their own professional qualifications by teachers not only from Ukrainian universities, but also from foreign ones, in particular from Indian ones. Summarizing and analyzing all the data obtained during the use of Intelligent Information Technology in KSMA (using LMS MOODLE), we can conclude that the future of higher education, in particular, the universities of the marine industry, lies precisely behind remote technologies, in particular Intelligent Information Technology. Only with the use of the latest technologies we will be able to guarantee the provision of students with high-quality, relevant knowledge, and teachers with opportunities to improve their own level of qualifications and develop new technologies and teaching methods.

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