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THE DISTANCE LEARNING IN THE ORGANIZATION OF STUDENTS' SELF-STUDY OF MATHEMATICAL COURSES

Abstract. *It is offered to use the open e-learning platform Moodle for the organization of students' self-study of mathematical courses. The management model of the students' self-study is developed as a pedagogical control system using Moodle at distance education conditions. The model combines information and educational resources, computer training facilities, management tools of the educational process, techniques and methods aimed at the development of modern methods of information processing and solving engineering research problems.*

Key words. *distance education, e-learning, Moodle, student' self-study, model, mathematical courses.*

I. Introduction

Nowadays higher education institutions need to react promptly to changes in the world, such as the rapid development of information technology, the width of internet applications, the growth of using e-books, high-tech personal computers, smart phones, iPads, etc. in study and in everyday life.

The development of higher education quality is of especial importance at present [8, 11, 13]. A global trend is formed toward a "knowledge economy" [15]. Therefore, people strive to obtain quality education to ensure their competitiveness in the labour market. Investments in the new knowledge become the most effective area of capital investment.

The traditional forms of education and training can not meet the needs for learning services in the current socio-economic situation and the education system of our country [8, 9, 12].

It should be noted that the distance learning aimed at large-scale interactive participation and access via the web or other network technologies is applied in the education systems worldwide on almost all levels of education [1, 7]. Moreover, the basic specific principles of the distance learning are mostly the same regardless of the educational institution. This intends further development of the common methodology of the emerging distance or e-learning systems [15].

Existing informational technologies provide opportunities for organization of all forms of training. But the quality assurance of mathematical learning in the distance education remains relevant today [10]. The mathematical courses are included in almost all general branch standards in different fields of high education system in Ukraine [9, 14] and surely not only.

"There's no secret to success in the modern world. If countries are going to win in the global race and children compete and get the best jobs, you need mathematicians and scientists – pure and simple. Maths and science should be the priority for England's schools", said David Cameron, Prime Minister of the United Kingdom [2]. So, improving mathematical skills will benefit the competitiveness of the economy and improve the job chances of individuals.

II. Statement of the problem

Mathematics has become an everyday research tool in each science and technology. The most of natural science, technical, economic, medical and humanitarian problems have to be first formulated in mathematical language. This

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means a mathematical model developing. Mathematical models are of great importance. The model may help to explain a process or a phenomenon and to study the effects of different components interaction, and also to make predictions about the behavior. The search of the solution is the next step.

Development of an adequate mathematical model is complicated because the researcher needs to know not only the branch of industry, from which the problem occurred, but also to have some mathematical knowledge. Lack of agreement between theoretical mathematicians and other specialists often leads to complex problems and possible mistakes.

So, the mathematical courses form the basis for different specialists to understand the modeling process and to be able to use analytical concepts. Therefore, the study of the mathematical courses plays an important role in implementation of the distance education system for the most specialities.

Ukraine made active steps to reform the education system to be consistent with the Bologna Process [8, 13]. The analysis of the current state of mathematical teaching in higher education shows a reduction in the number of class work hours and increasing the number of hours for self-study work of the students in recent years [14]. Independent work is the primary means of learning educational material in time, free from mandatory training sessions [13]. But this causes the problem of increasing attention to the organization of students' self-study. The problem can be successfully resolved because of the means of the distance learning. So, the distance education tools become a good assistance for traditional full-time, part-time and evening study forms [12]. It is not only modern, but also pedagogically justified.

III. Research of the problem

The elements of the information-educational environment for network courses are developed in the open e-learning platform Moodle [4] at Dniepropetrovsk national university named by Oles' Gonchar. Moodle has a simple interface, drag-and-drop features and well documented resources [5, 6, 16]. There a user can create and store electronic learning materials and also can specify the sequence in which

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they are studying. Due to the fact that access to Moodle is via the Internet or other network, the students are not tied to a particular place and time, can move through the material at their own pace.

The electronic format allows to use as a "textbook" not only text [5], but also online resources in any format from the Wikipedia article to video on YouTube. All course materials are stored in the system, one can organize them using labels, tags and hypertext links.

Moodle delivers a powerful set of learner-centric tools and collaborative learning environments that empower both teaching and learning [4]. To meet this purpose the system provides the following tools: wiki, Glossary, blogs, forums, workshops. This training can be done asynchronously, when every student learns the material at his own pace and in real time, organizing on-line lectures and seminars.

The system supports the exchange of files of any format, both between teacher and student and among students themselves.

The self-study is considered as an independent activity of students, supervised by the professor. New management possibilities of the student self-study in mathematics appear in the information-educational environment of the distance learning. Modular type courses, reflexive activity of subjects of the educational process, modular rating evaluation of educational activities, including student scientific-practical conference, public discussion on creative projects, etc. can be used as control tools of the students' self-study in terms of the informational and educational environment.

General development scheme for a network course is quite traditional. The theoretical material is given to students in the content block, as text of traditional lectures. Moreover, the entire base material is outlined in the distance course that allows a student to save time on the literature search and focus on other types of work. But this does not mean that the student can not use additional literature.

Activity block provides the application of the acquired knowledge, the formation of mathematical skills, activates the cognitive activity of the student. It is

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implemented in the form of tests, simulators, virtual labs and electronic reporting in the distance course.

The tests reflect the key points of the lecture material. Their main purpose is to organize focused understanding of the basic theoretical concepts, and not checking their progress. Tests perform both training and correction functions. The correction function is realized in the fact that a student has several attempts to run the test, and the purposeful access to the theory. Thus the student working with tests may choose an educational trajectory which handles content and test blocks. This is impossible to implement at a traditional lesson [3].

In this case the simulator is an interactive computer model that implements the algorithm for solving of typical tasks. There are the following advantages of using simulators: building skills and developing skills specific actions in solving the problem; the accelerated receipt of the signal on the right (wrong) action; exercising self-control; the introduction of new elements of the educational process in educational activities; the possibility of operational error correction; individual rate of executing jobs. The simulator provides a guide to the solution, which is implemented as instructions on what action to be taken and the support questions.

Due to the simulator the interaction between a student and a professor provides an implementation of the level of common-control and gives an opportunity for the professor to organize an independent solution of the practical tasks by a student. If necessary the student has the opportunity to consult with the professor during classroom activities.

The management model of student individual work includes the target, content and technological components in terms of the informational and educational environment of the distance education.

The students' self-study work is a means of formation of information culture of students in the process of learning and cognitive activity aimed at solving engineering and technical problems and the implementation of virtual laboratory work, assignments, online testing and online course.

The information-educational environment is a tool of the distance learning and includes modules that facilitate the educational process, the independent work of students, the research activities, information and technical support and pedagogical interaction.

The management model of the students' self-study is a teaching system that combines information and educational resources, computer training facilities, management tools of the educational process, techniques and methods aimed at the development of modern methods of information processing and solving engineering research problems.

Continuous individual student work is fulfilled on consolidation of the theoretical and practical knowledge, development of creativity, formation of skills of self-organization and collaboration in the management model of the students' self-study of mathematical courses in the distance learning system.

IV. Results

Studying the practical organization of the student individual work we formulated the minimum block of basic requirements, which, in our opinion, should be met by the distance system of the student self-study of mathematics. The goals and objectives of the out-of-class student self-study system should be determined by the goals, objectives and content of the course. The contents of the system of tasks for the individual work must meet the requirements of competence-based and student-oriented approaches.

So, it is necessary to develop creative individual work. For example, it could be a participation in research, methodological development of the scientific staff of the department. It is important that the results of these works are in demand, evaluated and controlled by a professor on specially developed monitoring rating of out-of-class self-study work. Undoubtedly, the high role of the professor is in planning, organizing, counseling and training students in creative learning, studying, and analyzing information of mathematical courses in the distance learning.

A theoretical model of organization of the student self-study of mathematics is a didactic system, aimed at the formation of the mathematical competence of students and representing a set of functionally interconnected blocks, such as target, substantive-procedural and effective evaluation.

The determination of the pedagogical conditions is important. Such conditions are aimed at improving the effectiveness of pedagogical support of students' self-study of mathematical courses in the distance learning taking into account the individual features of students. The professor takes into account the student ability to work independently with various training programs. The condition of advanced education consists in the fact that some learning activities motivate students for self-study theoretical aspects of a problem. The condition of free choice learning tools is displayed in the individual choice of training means for each student. The informing condition about passing the classes is reflected in the fact that the student must present the strategy of planning and conducting classes. The condition of self-monitoring and self-assessment also exists.

Thus the theoretical content of pedagogical support is revealed for the student self-study of mathematical courses in the conditions of the distance learning system.

V. Conclusions

The requirements for learning level increase in modern conditions of the society development. The main task of higher education system is to prepare competitive specialists with professional competence, mobility, preparedness for continuous updating of knowledge and skills and the ability to apply the acquired knowledge for the successful solution of professional problems. One of the priority directions is the use of distance learning technologies allowing optimize the educational process, develop and implement new approaches to learning.

The process of informatization is a logical and objective process, typical for the entire world community. It appears itself in all spheres of human activity, including education. New integrated, humanistic distance learning system became possible thanks largely to this process. The distance learning incorporates the best features of

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traditional forms of study: full-time, part-time, evening, externship, and integrates well with them. Attention to this form of learning is observed worldwide in all education systems. It is obvious that research and practical work on the problems of distance education must be ongoing and continuous.

References

1. Anderson Terry. *The Theory and Practice of Online Learning* – Edmonton: AU Press, 2008. – P. 143-156.
2. Coughlan Sean. Maths and science teaching a priority, says Cameron /BBC news (Education), from 8 December 2014. Available from <http://www.bbc.com/news/education-30373587>
3. Luiz Carlos Guimarães, Thiago Guimarães Moraes, Luiz Carlos Guimarães. Cooperative Distance Learning in Mathematics. - *China Education Review*, Volume 2, No.9 (Serial No. 10), 2005. – P 42-45
4. Moodle – open-source learning platform. Available from <http://www.moodle.org>
5. Андреев А.В., Андреева С.В, Доценко И.Б. Практика электронного обучения с использованием Moodle. – Таганрог: Изд-во ТТИ ЮФУ, 2008. – 146 с.
6. Анисимов А.М. Работа в системе дистанционного обучения в Moodle. Учебное пособие. 2-е изд. – Харьков, ХНАГХ. – 2009. –292 с.
7. Ганчарик, Л.П. Методология дистанционного обучения. Учебное пособие. Минск.: ред.-изд. Центр Академии управления при Президенте Республики Беларусь, 2002. – 164 с.
8. Закон України від 01.07.2014 № 1556-VII. Про вищу освіту (Відомості Верховної Ради (ВВР), 2014, № 37-38, ст.2004). Available from <http://zakon4.rada.gov.ua/laws/show/1556-18>
9. Індивідуалізація навчального процесу на шляху європейської інтеграції вищої освіти України. – Матеріали Міжнародної науково-практичної конференції. – Полтава, РВВ ПУСКУ. – 2009. – 127 с.
10. Методичні рекомендації "Дистанційне навчання - практичні поради" : для студ. усіх спец. дистанційної форми навчання / Д. В. Горобченко, Т. В. Лаврик, І. В. Возна та ін. – Суми : СумДУ, 2007. – 160 с.
11. Навчально інформаційний портал ННІ інформаційного і телекомунікаційного забезпечення НУБіП України. Available from <http://it.nubip.edu.ua>
12. Наказ Міністерства освіти і науки України (від 25 квітня 2013 р. №466). Про затвердження «Положення про дистанційне навчання». Available from http://osvita.ua/iegislation/Dist_osv/2999
13. Національна стратегія розвитку освіти в Україні на 2012–2021 роки. Available from <http://www.mon.gov.ua/images/files/news/12/05/4455.pdf>
14. Програми фізико-технічних дисциплін напрямку підготовки 6.040302 "Інформатика" / В.П. Сергієнко, М.П. Малежик, В.М. Франчук, І.С. Войтович, В.В. Єфименко, І.А. Твердохліб. – К.: НПУ, 2012. – 112 с.
15. Роберт И.В. Теория и методика информатизации образования (психолого-педагогический и технологический аспекты). 2-е изд., дополненное.: Монография. – М.: ИИО РАО. – 2008.-274 с.
16. Система электронного навчання ВНЗ на базі MOODLE: Методичний посібник / Ю.В. Триус, І.В. Герасименко, В.М. Франчук // За ред. Ю. В. Триуса. – Черкаси. – 220 с.