

METHODS OF USING ELECTRONIC EDUCATIONAL RESOURCES IN THE STUDY OF TRIGONOMETRY

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ABSTRACT

The problem of improving the quality of students' mathematical knowledge remains one of the urgent problems of education, acquiring new aspects of consideration.

Keywords: Methodology, resuser, trigonometry, mathematical knowledge, education.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

The works of V.V. Davydova and V.P. Zinchenko expand the concept of knowledge. So, V.P. Zinchenko in his work emphasizes that the so-called living knowledge, which differs from the finished knowledge in that it should be built by the students themselves, should be the main thing in the future development of education. Thus, special attention today is paid not only to the formation of knowledge, but knowledge of a new quality. The formation of quality knowledge is relevant for the modern information society, in which each person has the task of mastering the skills of acquiring and applying knowledge.

AND I. Lerner and V.V. Kraevsky describes in his works such characteristics of the quality of knowledge as completeness, depth, responsiveness, flexibility, concreteness and generalization, systematic and systematic, awareness, strength, coagulation and development. These authors not only provide characteristics, but also build these characteristics of the quality of knowledge into an integrated system. Without specially organized work on the formation of the components of the system of knowledge quality of students, it is impossible to further study the subject, which is based on already acquired knowledge, which is especially important for mathematics. Mathematics is an important element of human culture and is significant in various industries and spheres of human activity, is the basis for many related scientific fields. The level of mathematization of knowledge is accepted as the main criterion for determining knowledge as scientific (I. Kant).

Theoretical analysis showed that the leading in the system of qualities of mathematical knowledge of students is awareness, for the assessment of which it is advisable to allocate at least three levels. Awareness of knowledge "is expressed in the understanding of their connections and the ways to obtain them, in the ability to prove them, in understanding the principle of action of the connections and the mechanism of their formation" [I.Ya. Lerner].

The psychological aspect of increasing the awareness of knowledge was considered in their studies by such scientists as J. Bruner, Ya.I. Grudenov, Z.I. Kalmykova, V.A. Lviv, H.A. Menchinskaya, L.M. Friedman, M.A. Cold, E.B. Shiyanova, I.S. Yakimanskaya and others.

In the methodology of teaching mathematics, the formation of conscious knowledge is associated with the process of students working on the task material of the course (Smirnova

A.A.), while awareness is determined through the ability to solve mathematical problems.
Yu.M. Kolyagin, Sh.A. Ganelin, S.E. Lyapin

V.A. Hovhannisyan, N.L. Stefanova and others examined awareness in the context of the realization of the principle of consciousness in learning. When studying scientific research in the field of teaching mathematics devoted to the problem of the formation of conscious mathematical knowledge, we were not able to meet studies in which modern electronic educational resources (ESM) are considered as a means of increasing the level of awareness of students' knowledge. The use of ESM in the learning process requires the disclosure of their potential to increase the level of awareness of knowledge.

Achieving the required level of awareness of students' mathematical knowledge requires the organization of special work, due to the fact that trigonometry includes constructive concepts, the effectiveness of which depends on the awareness of the relationship between them and the ways of obtaining them.

Modern ESM, aimed at using trigonometric content in the learning process, contain a graphical representation of mathematical objects that can change with the change in their analytical representation, regulated by the student. Thus, ESMs allow students to explore the relationship between different representations of mathematical objects, as well as how to obtain them. This allows you to ensure the visibility of the process of establishing connections between mathematical knowledge, the passage of students on the path to obtaining new knowledge, understanding the principle of the relationship and the mechanism of their formation. Recent characteristics describe a qualitative component of knowledge - awareness, therefore, the use of ESM in the process of teaching mathematics is relevant to increase the level of awareness of students' knowledge.

In our study, we consider it necessary to emphasize two aspects of the relevance of the problem being solved to effectively use modern ESM in the process of studying trigonometry. First, the result of a stating experiment showed that the knowledge of most students (more than 65%) in trigonometry is not sufficiently conscious. Secondly, the analysis of the study showed that, despite the didactic potential of modern ESM for the formation of conscious mathematical knowledge, it has not been implemented in teaching practice, due to the lack of appropriate methods for their use.

All of the above allows us to conclude that the problem of our research is urgent, which consists in finding and scientifically substantiating ways to use ESM to increase the level of awareness of students' knowledge in the study of trigonometry in algebra lessons and the beginnings of analysis.

In connection with the foregoing, the topic of the study, "Methodology for the use of electronic educational resources in the study of trigonometry as a means of increasing the level of awareness of knowledge," was identified.

To achieve the goal of the study, the main characteristics of ESM were considered, among which, in the process of analyzing studies of the effective use of electronic educational resources in teaching, interactivity was identified as the main characteristic of ESM, which affects the level of awareness of students' knowledge.

During the study, it was substantiated that an increase in the level of awareness of students' knowledge in the process of studying trigonometric content can be achieved if the methodology for using ESM in the educational process provides, firstly, the correlation of ESM with levels of awareness, and secondly, the development of additional electronic educational resources. We additionally developed electronic educational resources developed in the process of research as interactive educational modules. The use of the developed set of interactive training modules in the process of studying trigonometric content is aimed at the formation of knowledge of the first level of awareness, which is relevant for mathematical knowledge and serves as the foundation for the formation of other levels of awareness.

Our research has done: An indicator of the awareness of students' mathematical knowledge is the knowledge and proper use of the relationships between different representations of mathematical objects. This indicator can be considered at three different levels. At the first level, this indicator is knowledge of the relationship between the definitions of the concepts of mathematical objects, their properties and various representations (analytical, graphic). At the second level, the ability to transform educational information using knowledge of the relationship between different representations of mathematical objects to construct a new mathematical object. At the third level - the ability to apply knowledge in a new situation and the ability to create new connections, which may take the form of a conclusion, consequence, hypothesis. Due to the specifics of mathematical knowledge, the formation of the first level of awareness containing the student's actions to build mathematical knowledge is especially significant. For the formation of students' knowledge of the first level of awareness, additional ESM is required in the form of a set of interactive training modules, with the help of which the visual connection of new and previously learned educational material by students is carried out, according to all stages of the knowledge acquisition process.

The main provisions of the methodology for using ESM, aimed at increasing the level of awareness of students' mathematical knowledge in the process of studying trigonometric content, are:

- the purpose of the methodology is to build students new mathematical knowledge with a high level of awareness; the means of knowledge formation are: 1) a set of interactive training modules; 2) a set of ESM;

- elements of the methodology should ensure the management of independent productive educational and cognitive activities of students, contributing to the formation of a link between new and previously learned educational material. The basis of such a management should be the dialogue interaction of the student with the content of the electronic educational resource, i.e. educational material presented in electronic form should be interactive;

- The result of the use of electronic educational resources in the process of studying new educational material should be mathematical or educational facts received by the student. A mathematical fact is understood as a number, expressions, formula, etc.

- learning material using electronic educational resources occurs in such a way that:

- 1) students use ESM in the process of solving problems of different levels of mathematical complexity;

- 2) the stimulation of educational and cognitive motivation is carried out using a problem situation;

- 3) the use of ESM, built on the basis of the principles of purposefulness, integrity, scientificness, allows students to independently work to build new mathematical knowledge in learning algebra and the principles of analysis and thereby enable students to master the learning activities that underlie skills, which forms the awareness of mathematical knowledge.

Our research is that:

- substantiated the feasibility of using ESM to increase the level of awareness of knowledge in the process of studying trigonometric content;
- highlighted levels of awareness of students' knowledge of trigonometric content;
- an indicator of awareness of the mathematical knowledge of students is determined;
- differentiation of ESM by levels of awareness of mathematical knowledge, based on requirements for the structure and content of ESM;
- a methodology has been developed for using ESM, aimed at increasing the level of awareness of students' mathematical knowledge in the study of trigonometric content in algebra lessons and the beginnings of analysis.

In conclusion, it can be noted that the significance of the study is that: the conceptual apparatus of the theory and methodology of teaching mathematics is supplemented by clarifying the content of the concept of an interactive learning module;

- the levels of awareness of the mathematical knowledge of high school students in the process of learning algebra and the principles of analysis are highlighted and theoretically justified;
- developed requirements for ESM, elements and methods of introducing ESM into the process of learning algebra and the principles of analysis, aimed at increasing the level of awareness of the mathematical knowledge of students in the process of studying trigonometry.

And the practical significance of the study is that:

- developed tasks to determine the level of awareness of the mathematical knowledge of students in the study of trigonometry;
- the structure of ESM is determined, aimed at increasing the level of awareness of the mathematical knowledge of high school students in the process of studying trigonometric content;
- developed interactive training modules for the initial topics of the study of trigonometry;
- a methodology has been developed for using ESM to increase the level of awareness of the mathematical knowledge of high school students in the process of studying trigonometric content.

Our research materials: The developed materials can be used by teachers of mathematics of secondary schools, gymnasiums and colleges in the process of work, departments of the methodology of teaching mathematics in the preparation of teachers of mathematics, as well as structures of the continuing education system for teachers of mathematics.

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