GEOGEBRA APPLICATION AS A TOOL FOR ORGANIZING PUPILS' RESEARCH ACTIVITIES

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Modern information and communication technologies have made it possible to change the methods of teaching mathematics. In the conditions of informatization of education, teachers face the following questions: how to modernize training sessions to increase their effectiveness; what software is best to use during the lesson to increase the motivation of modern students and create a comfortable environment for creativity. Electronic educational resources for studying mathematics should be easy to use and have a wide range of functionality.

An example of one such educational resource is the GeoGebra app [1]. This cross-platform dynamic mathematical application can be used as a means of visualizing information, as well as organizing students' independent work in mathematics classes.

The purpose of the work is to research and test the functionality of the GeoGebra application when studying a mathematics course in institutions of general secondary education.

Material and methods. The study uses the GeoGebra cross-platform dynamic mathematical application as a working material. The pedagogical experiment is planned to be carried out on the basis of State educational institution "Gymnasium №1 named after Zh. I. Alferov of the city of Vitebsk", State educational institution "Gymnasium № 8 of the city of Vitebsk".

Findings and their discussion. At this stage of the study, the main functional capabilities of the GeoGebra application have been identified: the creation of complex mathematical models and computer experiments.

Using this software, you can plot graphs of functions set analytically and parametrically, perform various kinds of geometric constructions in two-dimensional and three-dimensional spaces, visualize the stages of building a drawing, calculate derivatives and integrals, factorize an algebraic expression, solve equations and inequalities, and investigate functions. GeoGebra allows you to create dynamic drawing applets for research work and videos, which are then freely available on the Internet for use by teachers [2].

When studying functions in an algebra course, the teacher is faced with the problem of visualizing with the help of chalk and a blackboard the behavior of graphs of functions when changing the coefficients in their formulas. GeoGebra, using special tools that are responsible for the parameter values, allows you to

change the coefficients in the analytical formula of the function and thus demonstrate the movement or transformation of the function graph.

GeoGebra can be used to study functions such as linear, quadratic, power, exponential, logarithmic, trigonometric and functions containing a modulus. The application allows you to quickly and accurately determine the zeros, maximum and minimum values of a function; to visually define and demonstrate periods, domains of definition and values, intervals of constancy and monotonicity of a function.

When studying square inequalities, GeoGebra allows you to graphically define solutions to inequalities, so students can independently formulate the differences in solution options with a negative, positive or zero discriminant.

An important feature of the application is the ability to organize student research activities. For example, when studying the topic "Quadratic function" in the course of 8th grade algebra, students, working with the application, can themselves put forward hypotheses about the properties of a quadratic function: domain, range, largest and smallest value, zeros of the function, axis of symmetry of a parabola. To conduct research work, a teacher creates an applet with step-by-step instructions for students.

GeoGebra also allows you to build geometric objects, change their parameters, while maintaining the general construction algorithm. Thanks to this, it is possible to organize the experimental work of students in the classroom. For example, GeoGebra can be used to study inscribed and circumscribed triangles. To determine the center of the circumscribed circle, it is enough to build a triangle and the median perpendiculars of its sides. By changing the drawing of the triangle, students notice that every three mid-perpendiculars of the sides of all the different resulting triangles intersect at one point. Based on this observation, they formulate a hypothesis about the existence and uniqueness of a circle circumscribed around any triangle, which they further prove or refute. You can do the same with a circle inscribed in a triangle [3].

When studying stereometry in high school, the GeoGebra system will help in explaining such a complex topic as the construction of sections of three-dimensional shapes. This platform allows you to change the location of the cutting plane and analyze options for sections of various geometric shapes.

The advantage of the GeoGebra platform over some other resources is that it combines geometric, algebraic and numerical information. The application allows you to visually show the relationship between algebra and geometry: each geometric model is associated with its algebraic description, and, conversely, a certain geometric image is created for each algebraic object. This greatly facilitates the process of mastering educational material at any level of education. It is this fact, together with the dynamic possibilities of representing geometric objects, that determines the didactic potential of the GeoGebra application..

Conclusion. The study of the possibilities and pedagogical experience of using the GeoGebra application showed that the use of this environment in

mathematics lessons significantly increases their effectiveness. In the future, it is planned to develop fragments of lessons using the GeoGebra application and test them in the educational process.

1. GeoGebra Classic [electronic resource]. – Access mode: https://www.geogebra.org/classic. – Access date: 07.11.2021
2. Ализарчик, Л.Л. Изучение математики с использованием приложения GeoGebra / Л.Л. Ализарчик // Наука – образованию, производству, экономике: материалы 72 Региональной научно-практической конференции преподавателей, научных сотрудников и аспирантов, Витебск, 20 февраля 2020 г. / Витеб. гос. ун-т; редкол.: И.М. Прищепа (гл. ред.) [и др.]. – Витебск: ВГУ имени П.М. Машерова, 2020. – С.382-383. [Alizarchik, L.L. Studying mathematics using the GeoGebra App / L.L. Alizarchik // Science - education, production, economics: materials 72 Regional scientific and practical conference of teachers, researchers and graduate students, Vitebsk, February 20, 2020. / VSU; editorial board.: I.M. Prishchepa (Ch. edit.). – Vitebsk: VSU named after P.M. Masherov, 2020. – p.382-383.]
3. Using the GeoGebra app in math lessons [electronic resource]. – Access mode: https://infourok.ru/primenenie-programmi-geogebra-na-urokah-matematiki-2326802.html . – Access date: 04.11.2021.

RESEARCH OF AUTOMATED TRAINING SYSTEMS BASED ON SCORM STANDARD

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Activities of a modern person, organization or production cannot be imagined without learning processes. Due to the constant increase in the complexity and volume of the studied material, the question of partial or complete automation of the educational process is acute. Automation allows you to minimize training time without losing its effectiveness.

Information technologies which exist today make possible to organize training of specialists based on automated training systems.

The purpose of this article is to investigate automated training systems based on the SCORM standard.

Material and methods. During the analysis, articles from Internet resources, as well as literary sources were used. Descriptive and comparative methods were used to achieve the purpose.

Findings and discussion. SCORM (Sharable Content Object Reference Model) is an international standard for eLearning courses. It specifies the requirements for transferring information from the course to the system itself. SCORM allows you to ensure the compatibility of components and the possibility of their reuse: the training material is presented in separate small blocks that