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USING INFORMATION TECHNOLOGY AT TRAINING TO MATHEMATICS AT COMPREHENSIVE SCHOOL

Abstract. Perfection of methods of training to mathematics occurs in the tideway of the general approaches to perfection of general didactic training methods. Achievements of such sciences as mathematics and cybernetics, features of a computerization of human activity and use of information technology influence this process. Currently, the main objective of the education sector is to update the content of education through the use of technology. High-quality education now requires a wider use of new methods and technologies in organizing the work and training of students. The use of new educational technologies in the educational process will inevitably lead to an increase in the quality of education, therefore the use of new technology by each teacher is a necessity. By the decision of the United Nations "XXI century - the century of informatization".

Keywords: training to mathematics at comprehensive school, information technology, information culture, a program-methodical complex, the interactive geometrical environment.

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Аннотация. Совершенствование методов обучения математике происходит в русле общих подходов к совершенствованию общедидактических методов обучения. Использование информационных технологий влияют на достижения таких наук, как математика и кибернетика. В настоящее время основной задачей сектора образования является обновление содержания образования за счет использования технологий. Качественное образование в настоящее время требует более широкого использования новых методов и технологий при организации работы и обучения студентов. Использование новых образовательных технологий в образовательном процессе неизбежно приведет к повышению качества образования, поэтому использование новых технологий каждым преподавателем является необходимостью. По решению «ООН XXI век - век информатизации».

Ключевые слова: обучение математике в общеобразовательной школе, информационные технологии, информационная культура, программно-методический комплекс, интерактивная геометрическая среда.

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Аңдатпа. Математиканы оқыту әдістемесін басқару жалпы білім беру әдістерін жетілдірудің жалпы тәсілдеріне негізделеді. Ақпараттық технологияларды қолдану математика және кибернетика секілді ғылым түрлерінің дамуына зор ықпалын тигізеді. Қазіргі уақытта оқытудың негізгі міндеті білім беру технологиясын қолдану есебінен оқытудың жаңа нұсқаларын жасау. Қазіргі таңда білім беруде жаңа технологияларды кеңінен қолданылуын талап етеді. Жаңа оқу технологияларын қолдану білім беру процесінде білім алуды жақсартуға мүмкіндік береді. «БҰҰ-ның шешімі бойынша XXI ғасыр– ақпараттандыру заманы».

Түйінді сөздер: математиканы жалпы білім беретін мектептерде оқыту, ақпараттық технологиялар, ақпараттық мәдениет, бағдарламалық-әдістемелік кешен, интерактивті геометриялық орта.

The implementation of the modern concept of education requires new approaches to the content of academic disciplines and educational areas, to the entire organization of the educational process.

The effectiveness of the educational process depends on the form of interaction of the subjects of the educational process. In traditional education,teacher reports the information,student reproduces it, and the assessment is largely determined by the completeness and accuracy of the reproduction; in doing so, it is overlooked that the assimilation of the material is connected with its comprehension. The problem is to find convenient organizational forms, to preserve and develop the openness of the educational process at different levels of the system, and not only at the level of teacher – student.

Informatization of general education is a complex, multidimensional, resource-intensive process, in which both students and teachers participate. This includes the introduction of a complex of educational management programs, the use of information technologies in educational disciplines, the development of integrated lessons, project activities, and the active use of Internet education.

The introduction of information and communication technology suggests a solution such specific management tasks as the introduction of electronic

educational resources in connection with the achievement of a new modern quality of education; building a multi-model space using information and communication technologies in the educational system.

Table 1. The actions of students and teachers in the use of electronic resources of various types

Type of electronic resources	*Student's actions on the use of softwareproduct*	*Teacher's management action*
Information Reference	Perceptionreferencesupporting information (text, image, music) for solving traditional educational (extracurricular) tasks	Creating a space for choosing electronic resources, organizing their search, consulting students in the course of information perception
Instrumental – practical	Practical construction of information objects, creation and analysis of models of real processes	Counseling and pedagogical support of students in their interaction with software products
Training -evaluation	Perform actions on a computer command. Reflection and control of actions taken based on the results of computer testing	Organization pedagogically expedient use digital electronic resource
Complex	Self-learning based on a combination of digital electronic resources of various types for solving educational (extracurricular) tasks	Synchronization of the use of electronic resources with the development of curricula and additional education programs

The solution of the managerial task related to the introduction of electronic educational resources into the information space of the education system

requires streamlining the methods of their use in educational activities.Indeed, managers and educators need an indicative basis for their actions to make appropriate management decisions. For this, the types of electronic educational resources are distinguished depending on the content of the actions performed by students and teachers using this or that software product. Typology of electronic educational resources allows you to streamline managerial actions of the teacher.A bunch of "type of resource - the actions of the student - managerial actions of the teacher" is presented in the table 1 [2].

As a result, both teachers and managers receive a tool for managing the processes of mastering and using electronic educational resources. In recent years, electronic resources of a certain class have been used - digital educational resources. This allows you to expand the sphere of influence of information and communication technologies in the educational space. Teachers can now consciously and more reasonably plan the use of electronic educational resources, including digital, in developing work programs for courses and disciplines.

When developing new educational materials, three types of digital educational resources are distinguished, differing in the degree of their innovativeness.

The first type of educational materials - sets of digital educational resources. These training materials are best integrated into the existing education system.They represent an important and modern digital component of the CMD for most textbooks on the Federal List. The teaching materials expand the content of textbooks, teach to use information and help to create a "habit" for the use of ICT in teachers, encourage them to use modern educational technologies aimed at creating conditions for students to achieve new educational results. The second type of educational materials - information sources of a complex structure - is a private solution based on the use of ICT and aimed at introducing local changes in the educational process. This type includes specialized electronic encyclopedias, determinants, educational environments based on a set of digital geographical maps, virtual laboratories and many others.

Finally, the third type of educational materials - innovative educational and methodological complexes - claims for drastic changes in the content and organization of the educational process. They include a complete set of training tools necessary for its organization. These materials are aimed at teaching the teacher to work in a new way and fully prepare students for life in the information society [1].

All developed educational materials of the new generation, and in particular innovative educational and methodological complexes, create in the

Russian school a new educational environment in which the independence and activity of the student is formed, in which he masters ICT literacy.

The improvement of teaching mathematics in the framework of the information approach is carried out primarily by the active use of new information technology training: this is teaching students algorithms, raising their algorithmic culture in teaching mathematics, and building algorithms for learning mathematics itself, and using algorithmic languages for these purposes, and implementation of their technical means of computers.

With the development of multimedia technology, the computer becomes a learning tool that is able to visualize the most diverse information. As a result, the development of the student's creative potential, the ability to communicate, the skills of experimental research work; culture learning activities; the intensification of the educational process, increasing its efficiency and quality. Among the promising areas for the introduction of information technology in the process of teaching mathematics will highlight the use of an interactive geometric environment. The idea of dynamic geometry, or interactive geometric systems (IGS), has been around for about 20 years. Today, programs based on it are recognized worldwide as the most effective means of teaching mathematics using information and computer technologies. IGS means software that allows you to perform geometric constructions on a computer in such a way that when one of the geometric objects of the drawing changes, the others also change, keeping the ratios set between them unchanged. For example, if you move a straight line, perpendicular to it will also move, remaining perpendicular to it. Thus, a drawing created in an interactive geometric environment is a model that preserves not only the result of the construction (ie, the drawing itself), but also the source data (the algorithm of this construction).

Currently, there are several interactive geometric environments, each of which has both its strengths and disadvantages.

The program "Live Mathematics" (until 2006 – "Live Geometry") is the Russian version of the popular American IGS "Geometer's Sketchpad", developed by Key Curriculum Press. This is one of the oldest GCI. Its first version was released in 1995. In Russia, its translation and distribution is carried out by INT - the Institute of New Technologies. The program has good demonstration capabilities that allow you to visually control the behavior of complex models. The visual construction of complex mathematical expressions (using only themouse) is also a strong point of this program. Transformation operations (such as parallel transference, rotation, reflection, changing proportions) are another strength. Similar operations areabsent in the majority of IGS.

At the same time, “Live Mathematics” is somewhat complicated to manage and has an outdated interface. There is a lack of some standard for IGS operations (for example, the construction of a circle through 3 points). The absence of the function of automatically hiding/showing geometric objects by the condition (also quite typical) leads to the need to use complex tweaks in order to ensure this behavior of the models.

“Live Mathematics” is designed to work on a local computer; therefore, models exported from it to an Internet-compatible format do not have full functionality for editing and allow only to demonstrate the created model. Combined with the lack of the ability to prohibit the use of some tools, this feature significantly limits the scope of Living Mathematics for creating interactive construction tasks. Currently, the development of the program is almost discontinued.

Another GCI - “Mathematical Designer” - has been developed since December 2006 by 1C by order of the Federal Agency for Education (as part of the Federal Target Program for the Development of Education for 2006-2010).

Software environment “1C: Math Designer” is designed to create interactive drawings in mathematics, combining design, modeling, dynamic variation, experiment. The software environment is designed to meet the requirements of the Russian school and the Russian tradition of teaching mathematics.Software environment “1C: Math Designer”:

- can be used both at home and at school with various forms of conducting classes and with various computer equipment of the classroom;
- allows you to quickly and efficiently master the school course in mathematics, increases the memorability of the material;
- provides the opportunity to study mathematics on the basis of the activity approach due to the introduction of the elements of the experiment and research into the educational process;
- increases the degree of emotional involvement of students, provides the possibility of setting creative tasks and organizing project work;
- shows how modern technologies are effectively applied to the modeling and visualization of mathematical concepts.

Software environment “1C: Math Designer”:

- supports automatic verification of geometric constructions and symbolic responses, transfer of evaluation to the electronic journal of modern educational process management systems; It has a convenient, intuitive graphical interface, allows you to customize interface of the created training models;

- provides for the export of created training models in the form of Internet-compatible java applets, independent of the editor program, but allowing using all the possibilities of the constructive environment;
- provides the ability to work on computers running Windows, Linux, MacOS;
- allows arbitrary empowerment of the constructive environment and training models through the use of macros and the built-in scripting programming language.

Practical approbations confirm: after a brief acquaintance with the program, teachers and students can effectively use "1C: Math Designer" in the classroom and at home. The software environment allows you to organize various forms of educational activities.

A constructor can serve as a tool environment for independent work of students in a lesson (or at home) "from scratch". At the same time, students are given the task of building and researching certain objects, in the course of solving which certain educational goals should be achieved. The use of the constructor in this quality corresponds to the most modern pedagogical concepts. However, this presupposes a qualitative restructuring of the educational process, including the preparation of new textbooks and manuals designed for project and search activity of students, and the retraining of teachers. For educational institutions having state accreditation, under the terms of the license agreement, installation and simultaneous use of one purchased set of "1C: Mathematical Designer" on several computers of an educational institution is allowed.

The constructor can be used by the author (for example, a teacher) to create specific task models containing an explanation of the material, preparation of geometric objects, texts with conditions and drawings with data, step-by-step construction plans, etc. information. After that, the students work not with the designer as such, but with these ready-made models.

When developing an interface model for a designer, it is possible to create with it full-featured and ready-made models that work independently of the program designer. Such "rejected" model applets can be generated in other programs of dynamic geometry. The most important difference between the "Mathematical constructor" models is that they can contain any tools and commands of the full version of the program, including construction tools, and not only the possibility of moving drawing elements.

Unlike the previous ones, IGS "GEONExT" has no restrictions on use - the product is freely distributable.It has been developed since 1999 at the Department of Mathematics and Didactics at the University of Bayreuth (Germany).

"GEONExT" works in any operating system (since it is written in Java), has a convenient, externally attractive interface and contains a set of tools typical of most IGS.

Some disadvantage is the designation of points by a cross, adopted in the program by default.This is different from the traditional notation adopted in geometry. Also in the program there is no tool for calculating the area of figures, available in other IGS.

Currently GEONExT is developing slowly: the interval between the latest versions (containing only minor differences) was about two years.

The main characteristics of the GEONExT program are as follows:

- visual appeal and aesthetics;
- simplicity and ease of development and use, which is important both for students and for teachers;
- free software;
- works in any operating system;
- interface in Russian;
- used in the educational practice of other countries (Bulgaria, Germany, Ukraine, Czech Republic);
- has built-in tools for graphing functions and calculating trigonometric functions.

Accordingly, it can be used in the study of certain sections of algebra.

Modeling and monitoring the process of changing the studied geometric objects using an interactive geometric environment allows us to distinguish their characteristic features, establish patterns, make generalizations and even put forward hypotheses on their own..

In connection with the above, it can be noted that the use of interactive environments in the process of teaching mathematics helps to conduct a computational or graphical experiment with a mathematical model, helps stimulate the motivation, interest and curiosity of students, visualize abstractions and dynamize mathematical objects, educate basic skills and abilities theory, the expansion of mathematical practice, the awakening of primary interest.

Thus, new information technologies play an important role in the process of informatization of education.The introduction of ICT in the training of schoolchildren and students is an innovative process that organizes personality-oriented training, a differential transition to optimizing the process of training and education.

The role of a teacher in a general education school in an information society transitions from a source of primary information to an intermediary, which facilitates its receipt.

In an computerized society, without mastering basic computer literacy and the ability to use computer tools to solve certain problems, the realization of human creative potential in modern science, culture, manufacturing, business and other spheres of life is inconceivable.

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