

# Using Information Technology Tools In Mathematics Lessons For Teaching Future Teachers

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**Abstract** This article is written for the purpose of research is the scientific justification and development of methodological approaches to teaching teachers in the field of computer science and the implementation of the capabilities of information technology in the process of teaching mathematics at school in the aspect of the development of cognitive interest of students. The following tasks are ahead of the article: how to conduct an analysis of scientific and methodological developments in the field of implementing the capabilities of information technology in the process of teaching mathematics; to identify the methodological goals of using mathematical information systems and the pedagogical feasibility of their use in teaching mathematics in the middle school, in the aspect of the development of cognitive interest of students to formulate requirements for the structure, content of educational material and the organization of educational activities using information technology in mathematics; identify the main areas of teacher training in the use of information technology in the process of teaching mathematics; to determine the organizational forms and methods of using information technologies, in particular mathematical information systems, in the process of developing cognitive interest among students in the aspect of the formation of the applied orientation of teaching mathematics; to develop the structure and content of a computer science course for teachers "Using Information Technologies in Mathematics Education" and conduct an experimental verification of its effectiveness.

**Keywords:** creative technologies, problematic teaching, creative thinking in mathematics, animation, computer technology, ICT.

## 1 INTRODUCTION

The relevance of research. The modern period of development of the sphere of Russian education is characterized by the process of informatization, which involves the realization of the capabilities of information technology (IT) with the aim of improving the educational process, organizational forms and methods of training, education, ensuring the development of the learner, the formation of skills for independent learning activities in the collection, processing, transfer of information about the studied objects, phenomena, processes.

## 2. MATERIALS AND METHODS

The purpose of the study is the scientific justification and development of methodological approaches to teaching teachers in the field of computer science and the realization of the capabilities of information technology in the process of teaching mathematics at school in the aspect of the development of cognitive interest of students. The object of the study is the process of teaching teachers to use information technology in the aspect of the development of cognitive interest of students in mathematics lessons. The subject of the study is methodological approaches to teaching teachers how to use information technology in the development of students' cognitive interest in mathematics. The research hypothesis is as follows: methodological approaches to teaching mathematics teachers the pedagogically appropriate implementation of the capabilities of information technologies in the field of: creating screen images of mathematical objects, their dynamic representation; plotting graphs and charts on the screen; carrying out activities for the collection, processing, use of educational information; automation of computational and search activities will ensure the development of students' cognitive interest in the aspect of the applied orientation of teaching mathematics, the assimilation of specific features of using IT, the creation of conditions for the manifestation of personal interests and preferences in the field of mathematics. According to the goal and hypothesis, the research objectives are defined:

1. To analyze the scientific and methodological developments in the field of the implementation of the capabilities of information technology in the process of teaching mathematics.
2. To identify the methodological goals of using mathematical information systems and the pedagogical feasibility of their use in teaching mathematics at the middle level of the school, in the aspect of the development of cognitive interest of students.
3. Formulate requirements for the structure, content of educational material and the organization of educational activities using information technology in mathematics.
4. Identify the main areas of teacher training in the use of information technology in the process of teaching mathematics.
5. To determine the organizational forms and methods of using information technologies, in particular mathematical information systems, in the process of developing cognitive interest among students, in the aspect of the formation of the applied orientation of teaching mathematics.
6. To develop the structure and content of the computer science course for teachers "Using Information Technologies in Mathematics Education" and conduct an experimental verification of its effectiveness.

### Literature Review.

The problem of the application of information technology in training has been dealt with by many psychologists: S.Alikhonov [1], B.GAnanyev [2], V.LAndreev [3], A.KArtemev [4], I.SBekesheva [5], V. Gusev [6] B .IN. Disterveg [7], Druzhinin [8], V.A. Izvozchikov [9], E. Ogurcova [19], O. V. Fyodrova [20], E.I. Mashbic [17] M.I. Mahmutov [16], E.V. Kuznecova [13], V.A. Kruteckij [12], Ju.M. Kolyagin [10], M.V. Egupova [11], I. Lerner [14], S. Maslova [15], D. Mahmudova [18], A. Cukar [21] and others.

## Theory and Discussion.

To solve the tasks used the following research methods:

- analysis of literature on pedagogy, methods of teaching mathematics, computer science and other disciplines, psychology, theory of experiment;
- study and analysis of best practices in teaching mathematics, computer science, and physics courses using information technology;
- observation, conversation, questioning, conducting classes using information technology, a pedagogical experiment.

In modern theoretical and experimental studies of domestic and foreign authors on the use of IT tools by a teacher in teaching practice, the didactic capabilities of teaching tools implemented on the basis of these technologies are revealed: Providing immediate feedback between the trainee and the IT-based learning tool; the ability to process large volumes of information for small periods of time; visual representation on the screen of the studied objects, processes, both in the form of models and in the form of geometric interpretations (diagrams, graphs, tables, etc.); archival storage of large volumes of information in databases and data banks, their transfer and processing; automation of the processes of computing, information retrieval activity, processing the results of a training experiment; automation of processes for monitoring the results of assimilation), as well as the possibility of increasing the effectiveness of the entire education system as a result of their use. The listed capabilities of IT tools allow you to carry out training activities in the field of: registration, collection, storage, processing, transfer and duplication of information about the studied objects, processes; control the display on the screen of models of the studied objects, processes; automated control and self-monitoring of the results of educational activities; computer testing; training for the formation of skills and educational activities.

The above determines the possibility of implementing an in-depth individual approach to the trainee, in which each student can be provided with his own "trajectory" of learning. According to some researchers, the technological implementation of individualization of training based on the above-described capabilities of IT tools is advisable on the basis of personality-oriented learning (JIOO). Summarizing the opinions of specialists in the field of JIOO organization using IT tools, we mean by this phrase the learning process that takes into account: personal interests, preferences, level of preparedness and subjective experience of students; the specifics of educational activities; features of the study of a subject in the process of organizing various types of educational activities; the ability to choose the mode of educational activity from the acceptable and the level of complexity of the educational material. Modern methods of personality-oriented learning are currently under development. Despite the great contribution to pedagogical science, the JIOO theory does not consider the realization of IT capabilities as a factor in ensuring the learner's personal preferences when the student independently chooses his progress in learning, is adequate to his preparation and self-determination. In this case, the development of cognitive interest among the student, which is

an important factor in independent advancement in learning in the context of personality-oriented learning, is of particular importance. In the studies of scientists, the importance of developing a cognitive interest in learning for the successful mastery of knowledge is shown. According to these authors, if the motive of the activity is cognitive interest, then involuntary attention and memory are included, thinking is activated, activity becomes productive and successful, and knowledge is deep and strong. Therefore, the development of cognitive interest is an important means of increasing the effectiveness of training. At the same time, in modern pedagogical research, the full-fledged realization of the capabilities of IT tools in the process of developing cognitive interest is not well understood. There are many studies of interest in the implementation of IT capabilities in order to improve the educational process, increase its motivation, move to the level of independent "discovery" of the studied phenomena, patterns. The work of many modern researchers emphasizes the need to use IT in the study of mathematics. Domestic and foreign studies, as well as the experience of teachers using IT tools in the process of studying mathematics in a secondary school, indicate that in addition to specialized packages that provide the possibility of educational activities in the field of mathematics (Mathcad, Matlab, Mapl, Matematica, Derive, Excel, etc.) developed in a significant number of copyright computer programs used in teaching mathematics.

Software product providing the ability to:

making constructions on the screen (including dynamics) of mathematical objects, graphs of functions, diagrams describing the dynamics of the studied patterns; creating screen images of geometric objects and their dynamic representation; automation of computational information retrieval activity will be called a mathematical information system (MIS).

Noting the indisputable value of research in the use of IT tools by teachers in the process of teaching mathematics, it should be noted that they are mainly focused on:

automation of processes for monitoring the results of educational activities; graphing training for various functions; on the implementation of primary computing operations; to build individual geometric shapes.

It should also be noted that modern studies in the field of using IT in teaching mathematics do not pay due attention to adaptation to the age characteristics of students, the specifics of teaching this subject in a comprehensive school, and the development of cognitive interest based on the realization of IT capabilities. Also, studies do not reveal which MIS and at what stages of training it is advisable to apply to the teacher so that his mastery is accessible and effective. There are also no generalized approaches to correlating what types of IT tools should be used in the implementation of certain types of educational activities in the process of studying mathematics in the middle link of education. At the same time, as some researchers point out, local application of IT tools (in the form of separate application software or occasional application of specialized packages) does not provide mathematical education with basic training in the field of implementing IT capabilities. Despite the fact that the State Educational Standard for students - future mathematics teachers provides for the study of such systems as MathCAD, MatLab, Matematica, etc., an analysis of the scientific and methodological literature shows that the level of use of IT tools

by teachers of mathematics in the educational process is low. In the best case, teachers of mathematics in separate lessons use educational software to solve local pedagogical problems. One of the reasons for the emergence of such a situation is the unpreparedness of a mathematics teacher for the systematic use of IT tools in the process of teaching. In addition, the low quality of electronic teaching aids and the teacher's lack of preparedness in the field of the correct choice of these tools makes it difficult to use them to achieve the specific methodological goals of the lesson. But the most important thing is that in modern pedagogy there are currently no generalized approaches to the implementation of IT capabilities, focused on the study of the laws of the subject area, on the development of cognitive interest among students. In this regard, it is important to teach mathematics teachers knowledge: on the implementation of IT capabilities in the field of constructing various screen images of mathematical objects, their dynamic presentation; on the automation of the processes of computing and information retrieval activities, as well as the collection, processing of data on the studied objects, phenomena, processes; on the implementation of the applied orientation of teaching mathematics using IT; on the requirements for educational electronic devices intended for the study of mathematics and their expert evaluation; on the use of computer testing and diagnostic methods for establishing the level of training. Thus, the research problem is caused by the contradiction between the established practice of training mathematics teachers in computer science and information technology, which does not adequately ensure the realization of the capabilities of information technology in the teaching process in terms of the development of students' cognitive interest and the current level of theoretical and practical developments in this field.

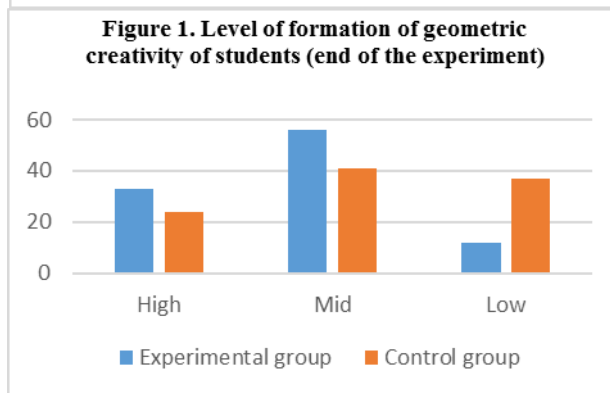
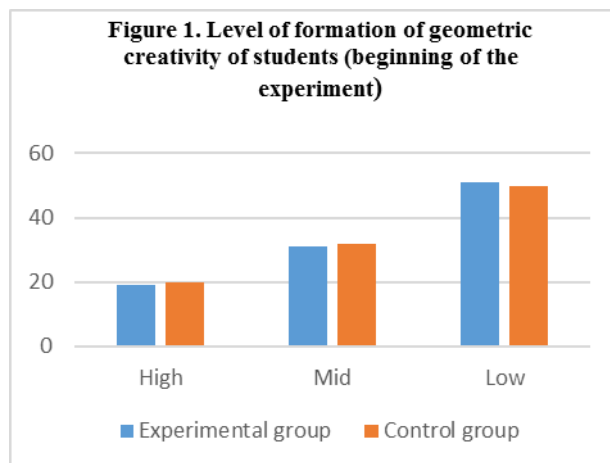
**3. EXPERIMENTAL RESULTS**

1. Scientific, educational, psychological and pedagogical literature on the topic of dissertation research was studied and analyzed, the real state of the practice of the development of geometric creativity of students in secondary schools was analyzed, and a stating experiment was conducted;
2. The conceptual provisions for the development of geometric creativity of students in secondary schools using computer-based learning technologies were determined, methodological materials were developed, and their initial testing was carried out;
3. A training experiment was conducted, the results of the dissertation research were tested, an abstract and dissertation work were drawn up.

For the experiment, test groups of the Chirchik State Pedagogical Institute were selected. 205 respondents participated in the experiments, and below the empirical data were presented in tabular form.

Table 1. The dynamics of the level of knowledge of students at the beginning and at the end of the experiment

of Groups Number respondents n=203	Arithmetic expression	Level indicators					
		At the beginning			In the end		
		High	Mid	Low	High	Mid	Low
Experimental n <sub>i</sub> =103	X <sub>i</sub>	19	32	52	33	57	13
Control n <sub>i</sub> =102	Y <sub>j</sub>	20	32	50	24	41	37



At the end of the tests, the effectiveness of the developed methodology was experimentally confirmed.

**4. CONCLUSION**

1. During the study, the tasks of the physics teacher in the 1. An analysis of scientific and methodological developments in the field of realizing IT capabilities in the process of teaching mathematics at school showed the need for their systematic and systematic application to perform graphing of various functions on the screen, creating screen images of geometric objects, dynamically representing mathematical objects, and constructing diagrams describing the dynamics studied patterns, automation of computing and information retrieval activities.
2. Based on the analysis of the capabilities of mathematical information systems, the methodological goals of their use in the educational process in the

aspect of the development of cognitive interest in students are identified:

- the formation of ideas about computer modeling, the study of mathematical models and the creation of their own models based on "computer visualization";
- the formation of knowledge in the field of dynamic representation of geometric objects on the screen, the ability to build a two-dimensional stereometric image from the data of a three-dimensional object (and vice versa);
- the formation of the ability to interpret and use formulas and mathematical expressions that display certain laws;
- the formation of the ability to put forward assumptions and hypotheses, to develop methods for testing them, to highlight general statements in terms of ensuring an interactive dialogue between the user and the system.

It has been established that the pedagogical expediency of using mathematical information systems in teaching mathematics in the aspect of the development of students' cognitive interest in conditions of personality-oriented learning contributes to the implementation of self-contained creative activities with a meaningful understanding of the essence of the representation of mathematical models and their geometric interpretation on the screen; the need to master the capabilities of IT to study mathematical theory and use it in practice), analytical focus (research of mathematical models; analysis of an array of static data; search for mathematical information), applied focus (creation of geometric objects; construction of graphs, diagrams; automation of obtaining the result of mathematical calculations and finding optimal solutions to mathematical problems).

3. Formulated requirements for the structure, content of educational material presented using IT in mathematics: educational material is divided into theoretical and practical, as well as to control and adjust knowledge. In each case, the material is selected so that it is adequate to the purpose, content and purpose of the lesson. In this case, it is necessary that the teacher takes into account the age characteristics of students, as well as the abilities and interests of each.

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