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## **Realization of active teaching methods in mathematics lessons**

The article considers the problems of personality activity in teaching as one of the topical issues in psychopedagogical science, and in educational practice. The authors singled out the issues of personal activity in learning as the leading factor in achieving the goals of education and the overall development of the individual. Mathematical education occupies one of the leading places in the system of general human education, since mathematical models describing the interrelation of the quantitative characteristics of various phenomena and processes are now an integral part of research in any field of knowledge. The ways of organizing a lesson in mathematics on the basis of modern active teaching methods are shown. Classifications of active teaching methods and features of their application in the design of a training session in mathematics are shown. The types of active teaching methods are analyzed, which is a systematic and purposeful orientation of students towards actively motivated mastering of the system of knowledge and methods of activity.

*Keywords:* mathematics, active teaching methods, methods, didactic games, brainstorming, method of association, mathematical dominoes, sinkwein, feedback method, teaching results, corner.

The goal of modern education is the development of the child's personality, the identification of his creative abilities, and the preservation of physical and mental health. In modern education, many positive trends have emerged: the variability of pedagogical approaches to the teaching of schoolchildren develops; teachers have the freedom to search creatively, author schools are being created; foreign experience is actively used; parents are given the opportunity to choose a pedagogical system. The teacher is given more and more serious tasks. Every year, the amount of information that students have to «digest» increases. At the same time, the possibilities of the students themselves are not limited. In this regard, new requirements are presented not only and not so much to quantitative, as to the quality side of training. The focus is on the use of modern educational technologies. The traditional ways of teaching before our eyes are gradually disappearing into the past. On the first place there are active methods of teaching, which give the students the opportunity to actively participate in the educational process. Interest in active teaching methods is caused by an acute need to improve the modern didactic system and do this with the least risk, that is, due to the skill of the teacher, and not overload of schoolchildren.

The implementation of the state standard of basic general education is based on the system - activity approach. Today, the main task of the teacher is not only to give students a certain amount of knowledge, but also to develop interest in the teaching, to teach to learn, to apply knowledge in practical activities.

Mathematics is widely used in the study of other subjects in school, it is used in the practical work of future workers, engineers, technologists, economists, and in everyday life. Knowledge of the basics of mathematical science is necessary for all students.

How can one instill an interest in mathematics? How to motivate students to study the subject and stimulate their activity throughout the lesson? Through independence and activity, through the search activity in the classroom and at home, the creation of a problem situation, the diversity of teaching methods, through the novelty of the material, through the use in the learning process of active methods and forms of work in the lesson.

Active methods of teaching are methods that encourage students to actively think and practice in the process of mastering the teaching material. Active learning involves the use of a system of methods that focuses primarily not on the teacher's presentation of finished knowledge, their memorization and reproduction, but on the independent mastery of students' knowledge and skills in the process of active mental and practical activity. Using active methods in math lessons helps to form not just knowledge-reproductions, but skills and needs to apply this knowledge for analysis, assessment of the situation and making the right decision [1].

When choosing active teaching methods, a number of criteria should be followed, namely:

- compliance with goals and objectives, principles of educating;
- compliance with the content of the topic;

- compliance with the abilities of the trainees: age, psychological development, level of education and upbringing, etc.
- compliance with the conditions and time allocated for training;
- matching the capabilities of the teacher: his experience, desires, the level of professional skill, personal qualities.

Thus, the task of the teacher is to create conditions for the practical application of abilities for each student, to choose methods of instruction that would allow each student to show their activity, and also to activate the cognitive activity of the student in the process of teaching mathematics. The correct selection of types of educational activities, various forms and methods of work, the search for various resources to increase the motivation of students to study mathematics, the orientation of students to acquire the competencies necessary for life and activity [2].

Methods of active teaching can be used at various stages of the learning process:

Stage 1 - the primary mastery of knowledge. This could be a problem lecture, a heuristic conversation, an academic discussion, etc.

Stage 2 - knowledge control (fixing). Methods such as collective thought activity, testing, etc. can be used.

Stage 3 - formation of skills and skills based on knowledge and development of creative abilities; It is possible to use simulated training, game and non-game methods [3].

Active forms of teaching in the teaching of mathematics:

*Didactic games* are a type of training sessions organized in the form of educational games that implement a number of principles of game, active learning and differ in the existence of rules, a fixed structure of gaming activity and the evaluation system, one of the methods of active learning.

It is most advisable to use didactic games and game situations when checking the results of training, developing skills, forming skills.

For example, *the game «Hot chair»* - the student sits on a chair, and the students ask examples for the oral solution until he collapses, then he is replaced by the one who suggested the last example, the game continues. The winner is the one who solved more examples.

*Game warm-ups.* Workouts are exercises that help to defuse the atmosphere, relieve fatigue and tension, encourage students, move from one activity to another, update knowledge, consolidate skills. They are dominated by the mechanism of active and psychologically effective recreation.

*Brainstorming* is a widely used method of producing new ideas for solving scientific and practical problems. Its purpose is to organize collective thinking activity in search of non-traditional ways of solving problems.

The problem formulated in the class on brainstorming techniques should have a theoretical or practical relevance and induce active interest of schoolchildren [4].

To determine how well a particular topic is mastered in mathematics, various forms of knowledge control are applied. One of them is tests.

*Test tasks* are convenient to use when organizing independent work of students in the self-control mode, when the educational material is repeated.

Tests provide an opportunity for an objective assessment of students' knowledge and skills in balls according to common criteria. This allows you to determine who mastered it at a minimum level, who confidently owns knowledge and skills at a higher level than that provided by the program. The task should provide verification of knowledge and skills on three levels: recognition and reproduction, application in a familiar situation or creative use.

*Method of association.* Much easier to assimilate the course of the decision, if some of its moments are related to life, the stages of the decision are compared with the concepts of the surrounding world. In this case, the mathematical inference is associated with representations of reality, or visual association occurs.

For example, in order to better remember the values of trigonometric functions in geometry classes, I familiarize students of grade 8 with «Trigonometry in the palm of your hand» [5].

– Guys, the values of the sines and cosines of the corners «are» on your hand (see Table).

**Trigonometry on the palm**

Finger number	Corner		
0	0	$\sin 0^{\circ} = \frac{\sqrt{0}}{2} = 0$	
1	30	$\sin 30^{\circ} = \frac{\sqrt{1}}{2} = \frac{1}{2}$	
2	45	$\sin 45^{\circ} = \frac{\sqrt{2}}{2}$	
3	60	$\sin 60^{\circ} = \frac{\sqrt{3}}{2}$	
4	90	$\sin 90^{\circ} = \frac{\sqrt{4}}{2} = 1$	

*Mathematical Domino* - consists of 12-30 cards, each card is divided by a line into two parts - one contains a task, on the other - an answer to another assignment.

In geometry lessons, you can suggest the «Theorem - puzzle» method. Students are invited to collect a theorem from 4 fragments. One contains the formulation of theorems, the other contains a blueprint for the theorem, the third contains what is given and what needs to be proved, on the fourth, the proof. All the theorems of the course are collected in one package.

Methods of obtaining feedback. «Unfinished sentences».

Participants are invited to complete the following proposals:

The most important question that was raised today ...

The most difficult for me in today's class was ...

Today I understood (...) that ...

*The Sinkwein* reception is a poem that is a synthesis of information in a laconic form, which allows us to describe the essence of the concept or to implement reflection on the basis of the knowledge gained.

To write it, the following rules exist:

Title - 1 noun, description - 2 adjectives, actions - 3 verbs, feeling - a phrase of 4 words, repetition of the essence - a synonym (1 word). For example:

Triangle

Isosceles, equilateral

Constructs, solved, called

The sum of the sides of the triangle is the perimeter.

Problem learning training, in which the teacher, systematically creating problem situations and organizing the activities of students to solve problems, provides an optimal combination of their independent, search activity with the assimilation of ready-made conclusions of science. Problem training is aimed at the formation of cognitive independence of students, the development of their logical, rational and critical thinking, and also involves not only the assimilation of the results of scientific knowledge, but also the very path of cognition, ways of creative activity. At the heart of the organization of problem learning is the personality-activity principle, i.e. discovery by students under the guidance of a teacher, conclusions of science, ways of acting, the invention of new subjects or ways of applying knowledge to practice. The content of the problem situation is a learning problem that creates the need for solving an intellectual problem, the desire to think and operates with such concepts as a problem problem, a problem question, a problem task, problematic as a learning principle.

A problem task means a learning problem with clear conditions given by the teacher or some of the trainees, and therefore has a limited search field. Here the content is a contradiction between known and unknown knowledge and puts the learner in a problem situation, depriving him of the opportunity to receive a ready answer. He must find it by means of thought processes, using as a means previously acquired knowledge

The problematic question is part of a problematic or individual educational task (question-problem) that requires a response to it through thinking. Questions that stimulate thinking begin with such question words and phrases as «why», «why», «how to explain this», «how to understand it», «how to prove (justify)», «what follows from this (what a conclusion), and so on.

The problem assignment is a training task, which is made up in the form of a problem task or a problematic issue (a question of a problem) in order to set trainees in a problem situation. They can be different in their content: some are built on the contradictions of real life (real psychological collisions) or contradictory statements of well-known authors, others - on the contradictions in the development of the psychological science itself, connected with the yet unsolved problems and different points of view of scientists on them.

Methodical methods of creating problem situations:

- the teacher brings the students to a contradiction and invites them to find a way to solve it;
- confronts the contradictions of practical activity;
- sets out different points of view on the same question;
- suggests to consider the phenomenon from various positions (for example, commander, lawyer, financier, teacher);
- encourages pupils to make comparisons, generalizations, conclusions from the situation, to compare facts;
- raises specific questions (on generalization, substantiation, concretization, logic of reasoning);
- defines problematic theoretical and practical tasks (for example, research);
- poses problematic problems (with insufficient or excessive initial data, with uncertainty in the formulation of the question, with conflicting data, with deliberately admitted errors, with limited decision time, and others) [2].

The «*round table*» is a method of active learning, one of the organizational forms of students' cognitive activity, which allows to consolidate the knowledge gained before, to fill up missing information, to form skills to solve problems, to strengthen positions, to teach the culture of discussion. A characteristic feature of the round table is the combination of a thematic discussion with a group consultation. Along with an active exchange of knowledge, students develop professional skills in articulating their thoughts, arguing their arguments, justifying proposed solutions and upholding their beliefs. At the same time, the information obtained as a result of listening to lectures and independent work with additional material is fixed, as well as the identification of problems and issues for discussion. The method of «*round table*» can be carried out:

- educational interdisciplinary, problematic and thematic seminars;
- training discussions;
- round table meetings;
- intersubject meetings, conferences and others.

The brain relay race is a method of generating ideas that differs from the brainstorming by the fact that its participants, within a certain time (5-10 minutes), offer their recommendations for solving the problem and record them on an individual sheet. In the second round of the brain relay race, each participant reads out their proposals, and the rest of them expose them to scores, for example, on a five-point system. Myself is not valued. To repeat or not to repeat similar advice - the participant of a brain relay solves. It is better to repeat, since completely identical proposals practically do not exist, and the most insignificant differences of the options lead to sharply different estimates.

Pedagogical game exercises - a kind of entertaining games (quizzes, competitions, competitions, crossword puzzles, cryptograms, etc.), in which the educational material is used as a game.

A presentation is usually understood as representing an interested audience of some new or little-known information, products or services. The technology of presentation in the context of the application of active teaching methods is a form of presentation and protection of the design solution. This technology helps to master the skills of presenting information, techniques of public speaking, persuasion, the ability to answer questions from the audience and get out of difficulties [5].

Necessary requirements: observance of time rules, meaningfulness, visual presentation of material (handouts, presentation of PowerPoint), style of speech. The Olympics or the scientific and practical confer-

ence act as active methods of training if the independence of the students' preparation is controlled and guaranteed, and the work itself is of a research nature.

Practice shows that active methods and forms of training are a very powerful tool in the hands of the teacher. Methodically well-organized, they require students to actively cognitive activity, not only at the level of reproduction or transformation, but also at the level of creative search, promote the cooperation of the teacher and students in the learning process.

Without well-designed teaching methods, it is difficult to organize the mastery of program material. That is why it is necessary to improve those methods and means of teaching that help to involve students in cognitive search, in the work of teaching: they help to teach students actively, independently to extract knowledge, excite their thought and develop interest in the subject.

Ability to engage students in their work, teach them to learn, and there is pedagogical skill, to which all teachers always strive for it. And I want to finish my article with the words of I.G. Pestalozzi: «My students will not recognize the new from me; they will discover this new themselves. My main task is to help them open up, develop their own ideas».

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### Математика сабағында белсенді оқыту әдістерін жүзеге асыру

Мақалада психологиялық-педагогикалық ғылым мен білім беру тәжірибесінде ең өзекті мәселелердің бірі ретінде білім беру саласындағы жеке тұлғаның белсенділік мәселесі қарастырылған. Авторлар оқыту мақсаттары мен жалпы тұлғалық дамуға қолжеткізудегі жетекші факторы ретінде оқытудағы тұлғаның белсенділік мәселелерін атап көрсеткен. Жалпы білім беру жүйесіндегі жетекші орындардың бірі математикалық білім алады, себебі әртүрлі құбылыстар мен процестердің сандық сипаттамаларының өзара байланысын айқындайтын математикалық модельдер білімнің кез келген саласында зерттеудің ажырамас бөлігі болып табылады. Қазіргі заманғы белсенді оқыту әдістерінің негізінде математикадан сабақ өткізу тәсілдері көрсетілген. Математикадан оқу сабақтарын дайындау кезінде белсенді оқыту әдістерінің классификациясы және оларды қолдану ерекшеліктері атап айтылған. Талданған белсенді оқыту әдістерінің түрлері оқушылардың білім жүйесін және іс-әрекет әдістерін белсенді ынталандыруға бағытталған жүйелі және мақсатты бағдарлануы болып табылады.

*Кілт сөздер:* математика, белсенді оқыту әдістері, дидактикалық ойындар, миға шабуыл, ассоциация әдісі, математикалық домино, сиквейн, кері байланыс әдісі, оқытудың нәтижелері, бұрыш.

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### Реализация активных методов обучения на уроках математики

В статье рассмотрены проблемы активности личности в обучении как один из актуальных вопросов в психолого-педагогической науке и в образовательной практике. Авторами выделены вопросы активности личности в обучении как ведущий фактор достижения целей обучения и общего развития личности. Математическое образование занимает одно из основных мест в системе общего образования человека, так как математические модели, описывающие взаимосвязь количественных характеристик различных явлений и процессов, сегодня являются неотъемлемой частью исследования в любой области знаний. Указаны способы организации урока математики на основе современных активных методов обучения. Показаны классификации активных методов обучения и особенности их

применения при конструировании учебного занятия по математике. Проанализированы типы активных методов обучения, которые являются систематической и целенаправленной ориентировкой учащихся на активное мотивированное овладение системой знаний и способов деятельности.

*Ключевые слова:* математика, активные методы обучения, методы, дидактические игры, мозговой штурм, метод ассоциации, математическое домино, сиквейн, метод обратной связи, результаты обучения, угол.

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