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Psychological and pedagogical technologies of stimulating cognitive activity of schoolchildren

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Abstract. The present study was conducted to determine the effectiveness of psychological and pedagogical technologies that contribute to the increase of cognitive activity of schoolchildren. In the course of theoretical analysis the main concepts were defined. The most significant approaches are defined as: cognitive, emotional, social, activity, information and communication, differentiated and personality-oriented. The most effective current psychological and pedagogical technologies are: project, discussion, game, problem-based and integrated learning

In the course of questioning teachers and students the necessity of stimulating cognitive activity of schoolchildren was established, which was confirmed by the initial diagnostics of the level of cognitive activity. We developed a methodology aimed at stimulating cognitive activity of students, which includes a set of active psychological and pedagogical technologies that promote the development of students' interest, independence and critical thinking. This methodology allows to use it in general in school education, as well as in the study of individual subjects. In our work the approbation was carried out at math lessons. We used math games and competitions, mini projects, interactive lessons, problem-based learning, feedback. At realization of the designated technologies special psychological and pedagogical conditions were created: differentiated approach; flexibility; creation of positive learning environment on the basis of support and encouragement; formation of emotional comfort and internal motivation. The results of the control diagnostics showed that after the application of active technologies the pupils have a significant increase in motivation. The obtained data testify to the effectiveness of the used methodology, as in practice there was noted an increase in the stimulation of cognitive activity due to the integrated approach in the implementation of psychological and pedagogical technologies and conditions in mathematics lessons.

Keywords: cognitive activity of schoolchildren, stimulation of cognition, psychological and pedagogical technologies, psychological and pedagogical conditions, teaching methods.

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Introduction

Modern educational system in our country is actively developing and constantly updated, special attention is paid to stimulating cognitive activity in schoolchildren. Such at-

tention to this issue is due to the fact that it is necessary to form in them both hard and soft skills that contribute to the stimulation of cognition. In addition, it should be noted that the activation of learning and cognitive activity in schoolchildren seems to be one of the problems of modern pedagogical psychology and pedagogical science, in general. While it is psychological and pedagogical technologies, aimed at stimulating cognitive activity, are recognized by many other scientists and researchers as an effective means, as they allow to achieve the set goals.

The relevance of this study is determined by the growing need to use more effective teaching methods in school education in order to activate learning activities and engage students in the cognitive process. The importance of this topic is also due to the search and need to develop more appropriate psychological and pedagogical technologies as a means of activating learning and cognition. When solving the problem of cognitive activity activation, the solution is seen in the fact that it is impossible to be limited only to the transfer of knowledge. Since schoolchildren should be shown how to find information, analyze it and apply it in life. In general, to teach not only “what”, but also “how”. And for this purpose it is necessary to familiarize them with methods of cognition activation based on methods of independent work in the field of cognition.

In recent decades, there has been a great deal of research in the fields of psychology and pedagogy on various aspects of cognitive engagement. Scientists such as C. Montuori [1] and O. Kostaschuk [2] emphasized the importance of active participation of students in the learning process to achieve a deep understanding of educational material. Modern Kazakh scientists A. Akhmetova, Z. Karmanova [3], Sh. T. Taubaeva, S. T. Imanbaeva, A. E. Berikkhanova [4], B. S. Alzhanova, A. S. Bisengazieva [5], S. Abaeva, A. Kunduzkairova [6] emphasized the importance of developing cognitive interest in schoolchildren. Cognitive independence in Kazakh pedagogy as a condition of activation through the use of active psychological and pedagogical teaching methods is reflected in the works of A. E. Abylkasymova [7], G. S. Abildaeva [8] and others. However, despite the significant contribution of previous works, many problems that require the use of an integrated approach, including at the expense of psychological and pedagogical technologies that are aimed at stimulating cognitive activity, remain understudied.

The purpose of the study is to determine the effectiveness of psychological and pedagogical technologies that contribute to increasing cognitive activity of schoolchildren.

Research objectives:

1. Analyze existing theoretical concepts, approaches, and technologies for stimulating cognitive activity of schoolchildren;
2. Conduct a questionnaire survey of students and teachers to assess the currentstate of cognitive activity stimulation in secondary school;
3. Diagnose the initial level of learning motivation and cognitive activity of 7th grade students;
4. Develop a comprehensive methodology based on active psychological and pedagogical technologies and create necessary psychological-pedagogical conditions for its implementation;
5. Conduct a formative experiment in mathematics lessons comparing experimental (with active technologies) and control (with traditional methods) groups;
6. Evaluate the effectiveness of the implemented methodology through control diagnostics and statistical verification of the significance of differences between groups;
7. Compare the obtained results with previous research findings and determine the practical significance of the study.

The research involves the use of both quantitative and qualitative methods, including literature analysis, pedagogical experiment, as a result of which is conducted questionnaire survey and observation of the learning

process, as well as statistical and analytical analysis of the results obtained.

The significance of the study lies in the expansion of theory and practice on the research topic. In addition, the obtained results can be used in the creation of training programs to stimulate cognitive activity of schoolchildren. And also can be used for further research.

Materials and Methods

The research was conducted in the form of theoretical analysis and pedagogical experiment aimed at determining the effectiveness of psychological and pedagogical technologies that contribute to increasing cognitive activity of schoolchildren. The materials of the study were monographs and various kinds of published scientific publications, to a certain extent related to the topic of the study.

The main methods of research are defined: literary analysis; survey methods: questionnaires and testing; pedagogical experiment; analytical and statistical analyses.

At the first stage, a literature analysis based on content analysis, synthesis and comparative analysis was conducted, which allowed us to establish the existing concepts, provisions, basic approaches and technologies operating in practice, allowing to provide stimulation of cognitive activity of schoolchildren and to develop new methodological approaches in this area.

At the formative stage of the experiment in the experimental group classes based on a set of active psychological and pedagogical technologies were conducted. The formative stage lasted 12 weeks (3 months) from September to November 2024, during the first academic semester. Mathematics lessons were conducted 4 times per week, with each lesson lasting 45 minutes according to the standard school schedule. Over the entire formative stage, 48 mathematics lessons were conducted in the experimental group using active psychological and pedagogical technologies.

During the same period, the control group (7B class) continued their mathematics studies following the traditional teaching approach. The control group had the same number of lessons (4 times per week, 45 minutes each) and covered the same curriculum topics as the experimental group. However, in the control group, traditional teaching methods were employed, including: teacher-centered explanatory-illustrative instruction; frontal classroom work with the whole class; solving standard textbook exercises; conventional homework assignments; traditional assessment methods (written tests and oral questioning). The control group teacher did not implement game-based learning, project activities, problem-based learning, interactive technologies, or other active pedagogical technologies that were used in the experimental group. This traditional approach served as a baseline for comparison to evaluate the effectiveness of the active psychological and pedagogical technologies implemented in the experimental group.

At the control stage, diagnostics is conducted to compare the results of the experimental and control groups to assess the effectiveness of the program of psychological and pedagogical technologies that contribute to increasing the cognitive activity of schoolchildren.

In the second stage, a survey was conducted to determine the importance of stimulating cognitive activity in schoolchildren. The survey was conducted among students and teachers of Secondary School No. 33 in Astana. A total of 120 students and 48 teachers were surveyed. The survey was conducted online. The questionnaire for students included 10 closed-ended questions using a five-point Likert scale (very often – often – sometimes – rarely – never). The questionnaire provides the following information:

- level of interest in school subjects;
- motivation to do homework;
- activity in class;
- level of support from teachers;
- use of additional sources of information;

- impact of school activities on stimulating students' cognitive activity;
- frequency of participation in school activities aimed at developing cognitive activity;
- the extent to which the school creates conditions for creative and intellectual development.

The questionnaire for teachers had a similar structure consisting of 10 questions, but was formulated from the perspective of pedagogical observation of students. The same five-point scale was used to assess the frequency of the characteristics under study.

The survey results were processed as follows:

1. Initial processing: counting the frequency of each answer option for each question;
2. Conversion to percentages: calculating the proportion of respondents who chose each answer option out of the total number of respondents;
3. Categorical analysis: grouping of responses by level of expression of the characteristic (high level – "very often" and "often"; medium level – "sometimes"; low level – 'rarely' and "never");
4. Comparative analysis: comparing the results of the student and teacher surveys to identify differences in the perception of the educational process.

As part of the pedagogical experiment, the level of stimulation of cognitive activity in schoolchildren was tested at the initial and control stages. For this purpose, the method of testing according to the methodology for diagnosing the cognitive activity of schoolchildren by N.G. Luskanova was used.

N.G. Luskanova's methodology allows for the assessment of the level of school motivation and the degree of cognitive activity of students. The diagnostic toolkit includes a series of statements to which one must indicate agreement or disagreement regarding various aspects of educational activity:

- interest in school subjects;
- attitude towards school;
- completion of homework assignments;
- participation in school events.

The initial diagnosis was conducted as follows:

1. Preparation of materials and instruction of students: explanation of the testing objectives and the procedure for completing the diagnostic materials;
2. Formation of experimental and control groups: 24 people (7A class) in the experimental group and 24 people (7B class) in the control group. Students were divided into groups using random sampling to ensure representativeness;
3. Initial diagnostics: simultaneous testing of both groups under standardized conditions;
4. Statistical and analytical analysis of the results obtained;

Interpretation of the results obtained at the ascertaining stage allows us to establish the level of motivation to learn:

High level (25-30 points): pronounced academic motivation, high cognitive interest;

Average level (15-24 points): positive attitude towards school, but extracurricular interests prevail;

Low level (less than 15 points): low motivation for school, negative attitude towards learning activities.

The diagnosis also allows us to identify problem areas that need to be addressed.

The following statistical methods were used to process quantitative data and assess the reliability of the differences between the experimental and control groups:

The following were calculated for each group:

Absolute frequencies: the number of students who showed a certain level of cognitive activity;

Relative frequencies (percentages): the proportion of students with each level out of the total number of test subjects in the group;

Average scores: the arithmetic mean of the scores according to Luskanova's method for each group;

Standard deviation: an indicator of the dispersion of individual values relative to the mean.

Pearson's χ^2 criterion was used to compare the distribution of students by levels of cognitive activity in the experimental and control groups. This nonparametric criterion allows us to assess the statistical significance of differences between distributions in two independent samples.

Results and discussion

Results of the literature analysis. The main concepts allowing to conduct a case study are defined. Cognitive activity of schoolchildren, in pedagogical psychology is considered on the basis of two approaches to understanding its essence:

- cognitive activity in school education is a special kind of activity that includes a set of driving moments determined by the person himself for formation, realization, development and modification in the field of cognition [9; 10];
- quality expressed in the personal formation and allowing a person to describe his active "Self", through a system of attitudes, orientations and meaning formations. Provided that they regulate the output of his behavior from initial plans to new higher ones [11].

According to C. Reina-Reina, stimulation of cognitive activity of schoolchildren is based on learning and cognitive activity, which manifests itself as a certain position of students as a person, which is developed in the system of secondary education. Educational and cognitive activity is manifested in the generalized attitude of pupils to learning activities, regarding the cognition of themselves and the surrounding world [12].

In the Republic of Kazakhstan, the issues of stimulating cognitive activity of schoolchildren are reflected in the Concept of development of preschool, secondary, technical and vocational education of the Republic of Kazakhstan, adopted for the period 2023-2029 [13] and in the national project "Quality Education "Educated Nation" [14]. Psychological and pedagogical technologies and conditions for the development of motivation in modern schoolchildren are considered in Kazakhstan in recent times through the updated content of training. They are usually characterized as factors used for motivational development of schoolchildren and are presented as indicators of the system of effective school management [15].

The existing approaches on the research topic are identified as:

1. Cognitive approach aimed at developing students' cognitive processes such as thinking, attention, memory, perception and imagination. It is implemented on the basis of methods that activate students' thinking activity. These include: problem-based learning, project-research activity [16].
2. Emotional approach, based on the emotional involvement of students in the learning process. This approach includes the important role of emotions in learning, as they help students to learn faster and more successfully the educational material and keep them interested in learning. Emotional methods are aimed at creating a positive atmosphere in the learning process and encouraging successes, applying game techniques and competitive elements.
3. The social approach is based on ensuring interaction between all actors of the school system: students, teachers, parents and classmates. This approach is aimed at creating conditions under which students can receive support from teachers and parents, as well as

interact with classmates.

4. The activity approach consists in the fact that students' knowledge and skills are formed through active practical activities. For this purpose, such methods and technologies are used that allow involving students in solving real-life problems. The solution of such problems promotes cognitive activation, as well as the development of critical thinking and independence.
5. The information and communication approach is based on the use of modern information and communication technologies. This approach allows making the educational process in secondary school more accessible and interesting. The use of new technologies at school helps to adapt school education to the individual needs of each student.
6. The differentiated approach will allow to take into account the individual characteristics of each student, including stimulation of cognition, through the improvement of the level of preparation, growth of interests and abilities. According to this approach, the teacher should ensure individualization of the educational process and adapt teaching materials and methods to the specific needs of all or individual students.
7. Personality-oriented approach is aimed at forming a more active interest in learning in pupils. It is implemented through methods that help students realize the value of the learning process for their personal growth. The personal approach implies the use of technologies and methods based on attention to the needs and interests of each student, their creative self-expression and support of all cognitive initiatives.

The most famous current technologies of stimulating cognitive activity of schoolchildren identified by foreign authors are:

1. Project-Based Learning, in which students work on long-term projects to investigate real-world problems and find practical solutions.
2. The Flipped Classroom technique is based on changing the traditional structure of lessons, as students study even theoretical material independently at home, and in the classroom they solve problems, with discussions and other practical work.
3. Discussion-Based Learning based on the active use of discussions and debates and active participation of students in them.
4. Game-Based Learning is increasingly being introduced into the educational process of schooling, as educational games promote interest, rapid learning, and help to create a fun atmosphere develop strategic thinking in the classroom.
5. Cooperative Learning technologies consist in organizing learning activities in small groups, which allows to achieve common goals by helping each other.
6. Problem-Based Learning techniques challenge students to find ways to solve a problem within a new topic.
7. Integrated Learning technologies allow to study different subjects in one class, which increases motivation to study different areas of knowledge.
8. Blended Learning technologies with elements of online learning. They are based on the use of digital tools in the classroom.
9. Technologies of Innovative Learning Environments (Innovative Learning Environments) are used by innovative schools that support active forms of learning (non-standard classrooms, digital laboratories and etc.).

All the above technologies are aimed at increasing the cognitive activity of schoolchildren by creating psychological and pedagogical conditions in which students feel themselves and ready for active work, responsible and interested.

In Kazakhstan, many modern psychological and pedagogical technologies of stimulating cognitive activity of schoolchildren are

already actively used: case-study and others [17].

The results of the questionnaire survey of schoolchildren are shown in Table 1.

Table 1 – Results of schoolchildren questioning (120 people), in percentages

Question	Very often	Often	Sometimes	Rarely	Never
1. How often do you feel interested in the subjects you study?	18%	25%	35%	12%	10%
2. How interested are you in doing your homework?	12%	16%	40%	15%	17%
3. How often do you ask questions in class?	10%	24%	36%	20%	10%
4. To what extent do you feel supported by your teachers in your pursuit of knowledge?	24%	36%	30%	5%	5%
5. How often do you use additional sources of information (books, internet) to deepen your knowledge of subjects?	18%	23%	30%	21%	8%
6. To what extent do you think that school activities (Olympiads, contests, projects) stimulate your cognitive activity?	10%	20%	34%	20%	16%
7. How often do you participate in school activities aimed at developing cognitive activity?	12%	28%	36%	14%	10%
8. To what extent do you feel that the school creates conditions for your creative and intellectual development?	24%	30%	33%	8%	5%
9. How often do you feel satisfied with your academic achievements?	10%	20%	35%	10%	25%
10. How well do you feel the school program meets your interests and needs?	14%	16%	32%	10%	28%

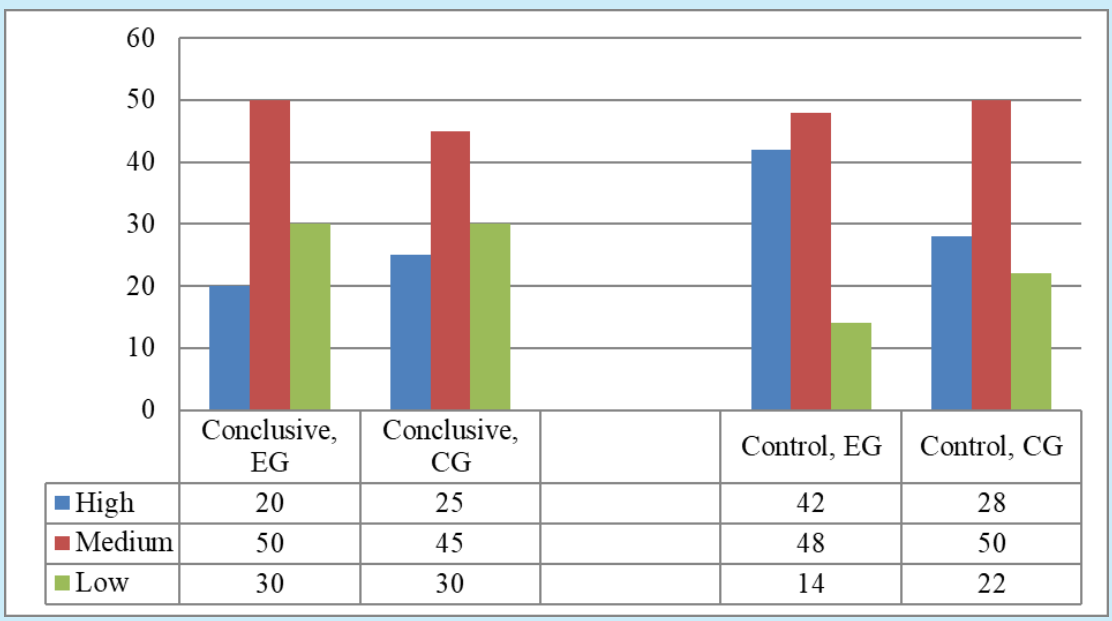
The results of teachers' questionnaires are reflected in Table 2.

Table 2 – Results of teachers' questionnaire survey (48 persons), in percentages

Question	Very often	Often	Sometimes	Rarely	Never
1.How often do you notice students showing interest in the subjects they are studying?	10%	20%	50%	20%	
2. How interested do you think students are in doing homework?	16%	24%	40%	20%	
3. How often do students ask questions in class?	10%	20%	40%	20%	10%
4. To what extent do you feel you support students' pursuit of knowledge?	30%	40%	20%	10%	
5. How often, in your opinion, do pupils use additional sources of information (books, Internet) to deepen their knowledge of subjects?	18%	32%	24%	12%	14%
6. To what extent do you think that school events (Olympiads, contests, projects) stimulate cognitive activity of pupils?	20%	30%	30%	10%	10%

7. How often do you think pupils participate in school activities aimed at developing cognitive activity?	14%	26%	40%	12%	8%
8. To what extent do you think that the school creates conditions for creative and intellectual development of pupils?	25%	25%	30%	10%	10%
9. How often do you think students feel satisfied with their academic achievements?	20%	24%	36%	10%	10%
10. To what extent do you think that the school program meets the interests and needs of pupils?	20%	30%	35%	15%	

The results of diagnostics of learning motivation and cognitive activity of 7th grade students according to the method of N.G. Luskanova are shown in Figure 1



	Conclusive, EG	Conclusive, CG		Control, EG	Control, CG
High	20	25		42	28
Medium	50	45		48	50
Low	30	30		14	22

Figure 1 – Results of comparative diagnostics of learning motivation and cognitive activity of 7th grade students

We have developed a program aimed at stimulating cognitive activity in students of 7A (EG) class, which includes a set of active psychological and pedagogical technologies that promote the development of students' interest, independence and critical thinking. It has common indicators and some peculiarities, provided that it is used in the study of a separate subject. It includes such active technologies as games, project activities, project-based learning, interactive technologies and feedback.

It has been tested at math lessons. So in mathematics it is aimed at developing interest in mathematics, improve understanding of basic mathematical concepts and develop interest in solving problems in mathe-

matics. The following technologies were used.

Playful: math games and competitions where students compete with each other by solving problems, developing independence and creativity.

Project activities: creation of mini projects related to practical application of mathematics in everyday life (calculation of budget for purchasing goods and others); group assignments, in which tasks are solved jointly, developing skills of teamwork and mutual assistance.

Interactive lessons, using interactive whiteboards and digital applications to visualize mathematical concepts and problem solving.

Problem-based learning, in which applied problems with open ends are solved, which stimulates interest and the development of creative thinking. It involves the discussion of problem situations based on real-life situations that require the application of mathematical knowledge.

Feedback, carried out as part of individual work with the teacher, involves giving feedback based on regular discussion of the pupil's progress.

Technologies based on self-assessment are also used, for this purpose special assignments are designed to allow students to evaluate their work and progress, which also helps to stimulate cognition.

The following psychological and pedagogical conditions are included in the technologies used:

- differentiated approach, based on taking into account the individual characteristics and level of preparation of each pupil;
- flexibility, based on the adaptation of methods and forms of work depending on the needs and interests of students;
- Creating a positive learning environment based on support and encouragement. Since it is important to create situations of success at the lesson, so that each student successful and confident in his/her abilities;
- formation of emotional comfort, to minimize stress and anxiety related to learning through the use of game elements, creation of a friendly environment and exclusion of excessive pressure on students from the teacher;
- formation of internal motivation to study the study material by emphasizing its importance, interest and usefulness to pupils. For this purpose, examples from real life were used, as in such cases practical tasks significantly increase interest in learning the subject.

Let's show them on the example of the math game "Shop of Numbers", which is held to develop the students' (sellers and buyers) skills of addition and subtraction of integers, as well as training of quick reaction. The game continues until all the shoppers have completed their purchases. At the end, the results are summarized: who coped with the task the fastest and received the most goods and money Psychological and pedagogical conditions in this game are:

- 1) Motivation and interest: the learning tasks become part of a fun process, which increases students' engagement and enthusiasm for mathematics;
- 2) Communication skills development: students work in pairs and groups, which develops their ability to exchange information, cooperate, and support each other;
- 3) Self-regulation: students themselves control the correctness of their calculations, which provides opportunities to develop mathematical computationskills and build confidence in their knowledge and abilities;
- 4) Competitive element: the game format with "sellers and buyers" creates a healthy competitive atmosphere that motivates students to perform calculations quickly and accurately;
- 5) Practical application: the simulation

of a real-world shopping scenario helps students understand the practical relevance of mathematical operations in everyday life.

In the project “My Budget”, practical application of arithmetic operations in real life and development of children’s financial literacy were practiced. And psycho-pedagogical conditions are defined as: determining the connection of mathematics with everyday tasks, which strengthens motivation and shows the importance of mathematical knowledge; development of critical thinking, as pupils learn to analyze and compare different options of expenses, make optimal decisions; joint work on the project develops skills of interaction and distribution of responsibilities within the group.

Conclusions based on the results of pupils’ questioning. It was found that 18% of pupils experience high interest in subjects, and 25% - often, which indicates that most pupils do not always find academic subjects interesting. A total of 35% of pupils only sometimes experience such interest, 12% rarely and 10% never. Only 12% of pupils often experience interest in doing homework, and 16% - often, which indicates low motivation for independent work. As 40% of students do homework sometimes, the rest rarely and never, which, our opinion, requires special attention from teachers and school education in general. Only 10% of students often ask questions in lessons, while 24% of students ask questions frequently, which may indicate the lack of students’ involvement in the learning process. As the majority of students (36%) sometimes ask questions and the rest rarely or never, which indicates the need to create conditions for more active participation in lessons. According to the majority of students (60%) feel different levels of support from teachers, which is a positive factor. However, 5% of students each rarely or never feel supported, which requires special attention. Only 18% and 24% of students use additional sources of information very often and frequently, which indicates the need to stimulate independent work and deepening of knowledge. As more than one third of pupils (30%) sometimes use additional sources, which also requires work on the development of cognitive activity. Only 10% of students believe that school activities often stimulate their cognitive activity, which emphasizes the need to review and improve school activities. More than a third of students (34%) sometimes feel stimulated, which also requires attention to the organization and delivery of activities. Only 12% of students frequently participate in school activities designed to promote cognitive engagement, indicating low engagement in such activities. More than a third of students (36%) sometimes participate, which requires work to involve more students in such activities. The majority of students (54%) believe that the school creates conditions for their creative and intellectual development, which is a positive factor. However, 8% of students rarely and 5% never feel such conditions, which requires attention and work to improve the conditions for development. Only 10% of students often feel satisfied with their academic achievements, which indicates the need to strengthen motivation and recognition of students’ successes. More than a third of students (35%) sometimes feel satisfaction, which also requires work to improve self-esteem and motivation. A small proportion, only 14% of students feel that the school program often matches their interests and needs, indicating the need to review and adapt the school program. While more than one third of students (32%) sometimes consider the program to be appropriate, which also requires work to improve the relevance of the program to students’ interests and needs.

Analysis of the results of teachers’ questioning allows making the following conclusions. Teachers note that pupils show interest in the studied subjects only sometimes (50%), rarely (20%) or never (10%). This indicates insufficient motivation and involvement of pupils in the learning process. The majority of teachers believe that pupils are either indifferent (40%) or not interested (20%) in doing homework. Only 16% noted high interest, which also emphasizes the problem of low motivation. The majority of pupils ask questions in lessons sometimes (40%) or rarely (20%). Only 10% do it frequently, which indicates a low level of active participation in the learning process. Most teachers feel

that they support pupils' pursuit of knowledge (70%, including 'very often and often'). However, 10% admit to providing insufficient support, which requires attention. Although a significant proportion of teachers note pupils' use of additional sources of information (sometimes - 24%, rarely - 12%), this figure is below the desired level. More than half of pupils rarely refer to additional sources, which limits the depth of their knowledge. About one third of teachers believe that olympiads, contests and projects sufficiently stimulate cognitive activity (50%, including "very often and often"), but a considerable number of respondents (40%) hold a neutral position or think that such activities are not effective enough. 40% of teachers indicate that pupils participate in school activities sometimes, there is still a significant group of those who do it rarely (12%) or do not participate at all (8%). Half of teachers evaluate school conditions for creativity and intellectual growth positively (50%), but the other half (50%) see the need to improve these aspects. The majority of teachers note that pupils feel satisfaction from their successes sometimes (36%) or rarely (10%). This result confirms the low level of emotional involvement in learning. Responses regarding relevance of school program to pupils' interests and needs were evenly distributed between positive (50%) and neutral/negative assessments (50%), which indicates ambiguity of perception of relevance of the program to pupils' interests.

The general conclusion is that teachers see that the level of stimulation of pupils' cognitive activity leaves much to be desired. At the same time, according to the obtained data, it is possible to identify that the main problems are related to insufficient interest in academic subjects, low level of independent work and rare participation in additional activities. All this suggests that it is necessary to develop more effective methodologies based on the strategy of increasing students' interest in learning, involving them in active forms of learning and providing opportunities for self-expression and self-development.

The results of establishing diagnostics of cognitive activity of 7th grade students, obtained according to the method of N.G. Luskanova (according to the data of Figure 1).

Experimental group (EG): at the initial stage a high level of motivation was observed in 20% of pupils, average level - in 50%, low level - in 30%. Control group (CG): at the initial stage a high level of motivation was observed in 25% of pupils, an average level - in 45%, a low level - in 30%. The results show that pupils have an overall average level of motivation to active cognition, besides, in both groups there is a large share of children with a low level. Such indicators testify to the necessity to stimulate cognitive ability in schoolchildren. Besides, the obtained data show that both groups have approximately the same indicators, which allows us to consider it possible to use them in the experiment.

After conducting classes, with the use of active technologies that increase the level of stimulation of cognitive activity, in the experimental group, the high level of motivation increased (according to Figure 1) to 42% (+ 22%), the average level remained almost at the same level (48%) (- 2%), and the low level decreased to 14% (- 16%).

In the control group, the high level of motivation increased slightly, at increased to 28% (+ 3%), the medium level 50% (+ 5%), and the low level decreased to 22% (- 3%).

The results of diagnostics show that in the experimental group after the application of active technologies there is a significant increase in the high level of motivation and a decrease in the low level of motivation. In the control group there is also an improvement of indicators, but not significant. The obtained data indicate the effectiveness of the measures taken to increase the stimulation of cognitive activity through a set of implemented psychological and pedagogical technologies.

After implementing a set of psychological and pedagogical techniques in the experimental group, a control assessment of the students' motivation and cognitive activity was conducted. The comparative results of the control stage of the experiment in the

experimental and control groups are shown in Table 3.

Table 3 – Comparative results of control diagnostics

Group	High level	Average level	Low level	Total
Experimental group (7A)				
Number of students	10	12	2	24
Percentage	42	48	10	100
Control group (7B)				
Number of students	7	12	5	24
Percentage	28	50	22	100

The results of the control diagnostics presented in Table 3 demonstrate significant differences between the experimental and control groups after the formative experiment.

The experimental group (7A) showed a significant improvement in cognitive activity indicators: 42% of students (10 people) achieved a high level of motivation, 48% (12 people) showed an average level, and only 10% (2 people) remained at a low level. These results indicate that the use of a set of active psychological and pedagogical technologies had a positive effect on stimulating the cognitive activity of schoolchildren.

In the control group (7B), where traditional teaching methods were not significantly changed, the results were less impressive: 28% of students (7 people) demonstrated a high level of motivation, 50% (12 people) demonstrated an average level, and 22% of students (5 people) remained at a low level.

A comparative analysis shows that the proportion of students with a high level of motivation in the experimental group is 14 percentage points higher than in the control group (42% versus 28%). Particularly indicative is the decrease in the proportion of students with low motivation in the experimental group to 10%, while in the control group this figure is 22%, which is 2.2 times higher.

The χ^2 (chi-square) criterion was used for statistical verification of the hypothesis about differences in the distribution of students in the experimental and control groups by levels of cognitive activity. This criterion was chosen because of the need to compare nominal data (distribution by categories: high, medium, and low levels of motivation) in two independent groups. The calculation of the χ^2 criterion for comparing the results after the completion of the formative experiment is presented in Table 4.

Table 4 – Calculation of the χ^2 criterion for comparing the results of the EG and CG after the experiment

Motivation level	EG (observed)	CG (observed)	Sum	Expected EG	Expected CG	$(O-E)^2 / E$ (EG)	$(O-E)^2 / E$ (CG)
High	10	7	17	8.5	8.5	0.265	0.265
Average	12	12	24	12.0	12.0	0.000	0.0
Low	2	5	7	3.5	3.5	0.643	0.643
Total	24	24	48	24	24	0.908	0.908

To assess the statistical significance of the differences between the experimental and control groups after the formative experiment, the χ^2 (chi-square) criterion was applied.

The calculated value of the χ^2 criterion was 1.816 with two degrees of freedom (df = 2). To determine the statistical significance, the results obtained were compared with the critical values:

- χ^2critical at a significance level of $p < 0,05$ is 5.991
- χ^2critical at a significance level of $p < 0,10$ is 4.605

For a more visual representation of the dynamics of changes in the levels of motivation and cognitive activity of students in the experimental and control groups at the initial and control stages of the experiment, a comparative Table 5 was compiled.

Table 5 – Dynamics of changes in the experimental and control groups

Indicator	EG (beginning)	EG (end)	Change in EG	CG (beginning)	CG (end)	Change in CG
High level	20	42	+22	25	28	+3
Medium level	50	48	-2	45	50	+5
Low level	30	10	-20	30	22	-8

The data in Table 5 demonstrate significant differences in the dynamics of change between the experimental and control groups.

The experimental group showed pronounced positive dynamics across all indicators. The proportion of students with high motivation increased by 22% (from 20% to 42%), indicating a significant increase in cognitive activity. The average level remained virtually unchanged (a decrease of 2%), which is explained by the transition of some students to a high level. The most indicative is the 20% reduction in the proportion of students with low motivation (from 30% to 10%), which confirms the effectiveness of the psychological and pedagogical technologies used.

In the control group, the changes are less pronounced. The high level of motivation increased slightly, by only 3% (from 25% to 28%). The average level increased by 5% (from 45% to 50%), which may be due to the natural course of the learning process. The low level decreased by 8% (from 30% to 22%), but this change is significantly less than in the experimental group.

Thus, a comparative analysis of the dynamics of changes convincingly proves that the use of a set of active psychological and pedagogical technologies in the experimental group led to significantly higher results compared to the control group, where traditional teaching methods were used.

A comparative analysis of the results of this study with the results of previous studies conducted on these problems showed the following. S. Larisa studying the stimulation of cognitive activity of high school students in the conditions of interactive learning, focuses on the role of individual methods and technologies of teaching and emphasizes that they in practice help students to better learn the material and develop critical thinking [18]. G. Autova studying the correlation between achievement motivation and the need for achievement of Kazakhstani schoolchildren, shows that due to high intrinsic motivation it is possible to ensure success in educational achievements. At the same time, the author notes that schoolchildren's desire for success is important for maintaining their high cognitive activity, which is important in the conditions of school education [19]. This confirms your idea that external stimuli are important, but it is also important to take into account the inter-

nal psychological motivations of students. This study adds a new understanding of the problem under study, as it involves the application of a set of psychological and pedagogical technologies and conditions, which has not been examined in detail in previous works. The original techniques and methods that have not been addressed in other studies are proposed: the integration of different technologies with the mandatory organization of psychological and pedagogical conditions in order to stimulate cognitive activity of schoolchildren. Thus, this study complements, develops and continues the ideas of previous works. At the same time, it focuses special attention on modern psychological and pedagogical techniques and conditions, taking into account the specifics of modern school education, implemented in Kazakhstan, which have not yet received wide coverage in the scientific literature.

Conclusion

Modern psychological and pedagogical technologies of stimulating cognitive activity of schoolchildren represent a complex of different approaches, each of which has its own specificity and area of application.

Modern psychological and pedagogical technologies are aimed at making learning as effective and motivating as possible. They are aimed at increasing cognitive activity of schoolchildren by creating special conditions in which students feel interested, responsible and ready for active learning.

The integrated approach, including game methods, project activities, problem-based learning and other active forms of learning, based on psychological and pedagogical conditions, in practice allows to significantly increase cognitive activity of students. Since these technologies are the basis for successful cognitive activity of schoolchildren and learning in general, as they help to develop children's interest in the subject of study, form their critical thinking and develop skills of independent search for information and some others.

The statistical analysis using the chi-square test, while not reaching conventional significance at $p < 0.05$ ($\chi^2 = 1.816$, $p > 0.05$), revealed substantial practical differences between groups. The effect size analysis (Cohen's $h = 0.29$) and the magnitude of changes in the experimental group (+22% high level, -20% low level) compared to the control group (+3%, -8%) demonstrate the practical effectiveness of the implemented methodology. The lack of statistical significance is attributed to the limited sample size ($n = 24$ per group), while the consistent positive dynamics across multiple indicators provides strong evidence for the intervention's effectiveness.

Assessment of the effectiveness of using new methodological approaches in practice is confirmed by the results of diagnostics, as in the experimental group after the application of active technologies there is a significant improvement in the level of motivation. The obtained data indicate that due to the complex of realized psychological and pedagogical technologies and conditions it is possible to increase the stimulation of cognitive activity of schoolchildren.

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Оқушылардың танымдық белсенділігін ынталандырудың психологиялық-педагогикалық технологиялары

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Аңдатпа. Бұл зерттеу оқушылардың танымдық белсенділігін арттыруға ықпал ететін психологиялық-педагогикалық технологиялардың тиімділігін анықтау мақсатында жүргізілді. Теориялық талдау барысында негізгі ұғымдар анықталды. Ең маңызды тәсілдер анықталды: когнитивті, эмоционалды, әлеуметтік, белсенділік, ақпараттық-коммуникативті, сараланған және тұлғаға бағытталған. Ең тиімді заманауи психологиялық-педагогикалық технологиялар: жобалық, пікірталас, ойын, проблемалық және интеграцияланған оқыту.

Мұғалімдер мен оқушылардың сауалнамасы барысында оқушылардың танымдық белсенділігін ынталандыру қажеттілігі анықталды, бұл танымдық белсенділік

деңгейінің бастапқы диагностикасын растады. Біз оқушылардың танымдық белсенділігін ынталандыруға бағытталған әдістеме әзірледік, оған оқушылардың қызығушылығын, тәуелсіздігі мен сыни ойлауын дамытуға ықпал ететін белсенді психологиялық-педагогикалық технологиялар кешені кіреді. Бұл әдіс оны жалпы мектепте де, жеке пәндерді оқуда да қолдануға мүмкіндік береді. Біздің жұмысымызда апробация математика сабақтарында жүргізілді. Біз математикалық ойындар мен конкурстарды, шағын жобаларды, интерактивті сабақтарды, проблемалық оқытуды, кері байланысты қолдандық. Белгіленген технологияларды іске асыру кезінде арнайы психологиялық-педагогикалық жағдайлар жасалды: сараланған тәсіл; икемділік; қолдау мен көтермелеу негізінде оң оқу ортасын құру; эмоционалды жайлылық пен ішкі мотивацияны қалыптастыру. Бақылау диагностикасының нәтижелері белсенді технологияларды қолданғаннан кейін оқушылардың мотивациясы едәуір артқанын көрсетті. Алынған мәліметтер қолданылатын әдістеменің тиімділігін көрсетеді, өйткені іс жүзінде психологиялық-педагогикалық технологияларды және математика сабақтарындағы жағдайларды жүзеге асыруда кешенді тәсіл арқылы танымдық белсенділікті ынталандырудың жоғарылауы байқалады.

Кілтті сөздер: оқушылардың танымдық белсенділігі, танымды ынталандыру, психологиялық-педагогикалық технологиялар, психологиялық-педагогикалық жағдайлар, оқыту әдістері.

Психолого-педагогические технологии стимулирования познавательной активности школьников

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Аннотация. Настоящее исследование проводилось с целью определения эффективности психолого-педагогических технологий, способствующих повышению познавательной активности школьников. В ходе теоретического анализа были определены основные понятия. Определены наиболее значимые подходы: когнитивный, эмоциональный, социальный, деятельностный, информационно-коммуникативный, дифференцированный и личностно-ориентированный. Наиболее эффективными современными психолого-педагогическими технологиями являются: проектное, дискуссионное, игровое, проблемное и интегрированное обучение.

В ходе анкетирования учителей и учащихся была установлена необходимость стимулирования познавательной активности школьников, что подтвердила первичная диагностика уровня познавательной активности. Нами была разработана методика, направленная на стимулирование познавательной активности учащихся, которая включает в себя комплекс активных психолого-педагогических технологий, способствующих развитию интереса, самостоятельности и критического мышления учащихся. Данная методика позволяет использовать ее как в целом в школьном образовании, так и при изучении отдельных предметов. В нашей работе апробация проводилась на уроках математики. Мы использовали математические игры и конкурсы, мини-проекты, интерактивные уроки, проблемное обучение, обратную связь. При реализации обозначенных технологий были созданы специальные психолого-педагогические условия: дифференцированный подход; гибкость; создание позитивной учебной среды на основе поддержки и

поощрения; формирование эмоционального комфорта и внутренней мотивации. Результаты контрольной диагностики показали, что после применения активных технологий у учащихся значительно повысилась мотивация. Полученные данные свидетельствуют об эффективности используемой методики, так как на практике отмечено повышение стимулирования познавательной активности за счет комплексного подхода при реализации психолого-педагогических технологий и условий на уроках математики.

Ключевые слова: познавательная активность школьников, стимулирование познания, психолого-педагогические технологии, психолого-педагогические условия, методы обучения.

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