Studies in Educational Management

2019 (4) 44–57

Development of Students' Research Skills Through Problem-Oriented Models

Abdrakhmanova Nurzhamal Aidarkhanovna

Nazarbayev Intellectual School of Physics and Mathematics Kokshetau city, Kazakhstan

Received *7 December 2019* ***Accepted*** *27 December 2019*

ABSTRACT

Development of students' research skills through problem-oriented models. The development of education means to provide a person with cultural and historical values, norms and traditions, selected content and forms. The meaning of effective education is that the student's actions are based on his personality and require that his education is consistent with subjects and fields of study. Mathematics should be able to apply the knowledge gained when making decisions in various life situations. Thus, each subject will be effective only if it is obligatory for other disciplines and is closely connected with life. Diagnostic cards were developed with the help of school psychologists, and these characteristics were taken into account when designing lessons. Through problematic questions at each stage of the lesson, students can develop their ability to express their ideas, the ability to see the main problem and ask questions. Setting goals and assessment criteria in the classroom with the help of the student increases the motivation for the lesson. In addition, students can learn the value of an integrated look at ways to solve real problems. Students have critical thinking skills and creativity if they are used systematically in all disciplines to obtain problem-solving skills. Why is group learning more effective than the personalized type of study? This allows us to review our actions in order to consider new problems, problems arising from the analysis of experience. I believe that the development of students' research skills is especially important in the modern world. In practice, students constantly ask open-ended questions. Thanks to the development of students' research skills, peer education is developed, public speaking skills can be evolved. Through argumentation skills, students will be able to teach each other the basics of their questions using their background knowledge. One way to develop research skills is to structure the material. In individual work, some students are provided with a simplified guide taking into account the students' abilities and the results of their psychological diagnosis. Practical research aimed at achieving the goals and objectives of mathematical education will be effective with constant use.

Keywords: *Problem-oriented Models, Research Skills, Argumentation Skills*

Developing student research skills through problem-oriented models

The development of education means providing a person with cultural and historical values, norms and traditions, selected content and forms. The meaning of effective education is that the student's

Correspond author E-mail address: abdrakhmanova_n@kt.nis.edu.kz

actions are based on his personality and require that his education be consistent with subjects and fields of study. Mathematics should be able to apply the knowledge gained when making decisions in various life situations. Thus, each subject will be effective only if it is compulsory for other disciplines and is closely connected with life. In modern society, higher demands are placed on the student as a person who can independently solve problems of different levels. There is a need for the formation in children of an active life position, sustainable motivation for education and self-education, critical thinking.

Goals of the modern school

Development of independence, initiative, active life position

The formation of the ability to quickly obtain knowledge from various sources of information

Development of the ability to analyze, compare facts, generalize and find a way to solve the problem. The formation of the ability to confirm the theory through practical activities

To develop a creative approach to solving various problem situations.

Practically each person has the ability to all types of human activities: to master natural and humanitarian knowledge, to the fine arts, to singing, music, etc. The only thing is how to develop certain abilities, i.e. what methods to apply in the process of their training and development. Problem-oriented learning - creating a problem situation at the lesson, where the students themselves or with the help of the teacher learn by posing questions and answering them, exploring, discovering everything new for themselves, i.e. self-learning. With this approach, the teacher's thinking should change, the teacher's attitude to the student as equal to himself: he learns the world, and you know it and help him to become a person, a person of the future. An intensive, modern teaching method is not a simple communication of knowledge to a student as indisputable truths, but an independent "building" of knowledge by a student using the method of critical attitude to existing information, data, etc. and self-solving creative tasks. To solve all these problems, the problem learning technology – PBL (Problem-Based Learning) is suitable.

Problem-based learning is the process of education in which the learner goes through the actions available in real life. Real-life experience and learning through a problem are identical. Problematic learning is not a subject, but an approach to educational activity. The teacher poses a problem, but does not provide a way to solve it, as well as does not provide an action plan. By the end of learning through PBL, the student should know how to adapt, how to work together, in a group, he will develop communication skills, and most importantly, he will accept learning through research and independent search. The teacher will not explain the topic, will not present it in a finished form, but with the help of questions will create a situation of search, experience, research. He will not point you to a mistake until you find it yourself. Everything is like in real life. If you want to go ahead faster, help your mates in the group, explain it and then you will move together - it's more fun together!

Key principles for creating problems:

1. The problem should coincide with the results of the program under study.

The problem should be divided into appropriate levels of competence of students and the stage of the curriculum and should include knowledge, skills in this discipline and life;

2. Requires the study of new basic knowledge

The problem should be one that requires the study of new basic knowledge to solve the problem, and children must make sure that they have little knowledge to solve the problem, they need new ones;

3. Adapt students' prior knowledge

It is easier for students to perceive new material if they can recognize something familiar in the problem itself. Therefore, the teacher, modulating the problem, should know about the sufficiency of students' knowledge to solve this problem and take this into account when compiling the problem;

4. Present the problem in a context close to the student's future profession.

The problem should represent the real situation that students will face in their present life or in their future profession: this will cause genuine interest in the student;

5. The problem should stimulate the development of mental thinking through signals in it.

Students understand and remember information better when they have several opportunities for working through it: it can be a discussion, clarification, raising questions and answers to them, as well as in the processes of applying mental thinking skills such as analysis, synthesis and evaluation. In the process of study, children expand and present more detailed information about what they are studying and this ensures that the new information is understandable. The problem situation should contain signals that encourage development.

1. Stimulating self-study by generating study and research problems.

Learning is more effective when students are actively involved in determining what they need to know and how to get this knowledge. Therefore, the problem scenario should stimulate them for independent study by finding the necessary information. The problem does not have to be directive or structured, because it prevents students from creating various learning questions.

2. Stimulate interest in the subject.

The problem should not personally concern the student and should reflect the current situation, should be interesting to the student. It should stimulate the student to study the problem further and in the end, it can arouse the child's interest in the subject.

Here it should be emphasized that not all the tasks of the lesson are problematic, but only those which involve solutions, albeit managed by the teacher, an independent search for laws, methods of action and rules that are still unknown to the student. It is precisely such tasks that stimulate active mental activity, supported by interest, and the discovery made by the students themselves brings them great emotional satisfaction and is much more firmly fixed in memory than the knowledge presented by the teacher in a finished form. A sign of students creating a problematic situation in the lesson is an emotional reaction: surprise, difficulty.

The main stages of the PBL process:

Stage 1. Group creation

Not any joint execution of a task in a lesson by a group of students can be called a group form of organization of work. The class is divided into groups for solving specific educational problems, ideally - students themselves are divided into groups depending on their likes and tasks; in a group with maximum efficiency for the team, the training opportunities of each member of the group should be realized; the composition of the group cannot be unchanged, it can change; the group can have a collectively chosen leader and its leadership must develop the rules for the work of the group and all members of the group adhere to them. The contribution to the assignment of each member of the group should also be considered.

Stage 2: Identify the Problem

The teacher creates a problem situation for students, directs students to solve it, and organizes a search for a solution to this situation. Here the difficulty arises for the teacher in that the perception of the problem situation by each student is purely individual, therefore the use of an individual and differentiated approach from the teacher is required. Thus, the student becomes in the position of his training and as a result, new knowledge should be formed, he must master new methods of action and, most importantly, he must understand and accept it.

After the problem is accepted by the students, they identify and clarify the problem in the form of a list of facts and clarify together with the teacher (or in the group) a scenario or action plan to solve this problem.

Stage 3. Generation of ideas

Pupils delve into a solution or explanation of a problem through asking questions. There is a brainstorming. They generate all kinds of ideas for resolving or understanding the causes and consequences of the problem. In the lessons of mathematics, they remember everything that they need to know to solve the problem posed: what definitions, theorems, statements, formulas, etc. An action plan is also being developed and roles are distributed in the group: some look for resources, some write formulas, and some figure out their graphic ideas in a draft. So, at this stage two things are considered: all kinds of ideas are put forward (even absurd) to study the problem and an action plan is drawn up.

Stage 4. Study of problems

Students stop at the selected ideas, filtering out unnecessary, and act according to the developed plan. An action plan is a step students take to clarify problems or to get more information about the origin of the problem. Studying a problem is a topic that students need to study, or questions that need to be answered to solve or solve the problem.

Stage 5. Independent study

Having found resources (library, electronic textbooks, Internet, etc.), students collect the necessary information, organize, summarize: it will be used in the further discussion.

Stage 6. Synthesis and application

Each group considers its sources of information for cross-checking, reliability and legality. Students then exchange information with other groups. This step will allow students to learn how and why the study is being conducted. There is an independent reflection, the application of the relevant researched knowledge to this problem, the search for ways to find and select the necessary information. Finally, general information is extracted to solve or explain the problem.

Pupils analyze, criticize and add their comments and suggestions to the collective decision of the group to form ways to solve the problem together. If it was not possible to come to something in common, students can break this problem down into smaller problems in order to narrow down new knowledge gaps. They can repeat steps 2-6**.**

Step 7. Reflection and Feedback

Pupils evaluate the work of their group, giving an analysis of how the group followed their basic rules, reflect on their own contribution to the process of solving the problem; they create a map of their understanding of the material studied in order to combine and give an overview of understanding the problem. The teacher at this stage, through dialogue, can check how successful a particular student is in solving a problem and, if necessary, can supplement, clarify, point out shortcomings. The feedback stage is important in terms of the compulsory rethinking by children of the passage of all stages of the path to solving the problem posed, all of the above should grow into the habit of reflecting and providing feedback in the study. And finally, an important point: steps 2 through 6 are repeating. Students can go back and forth in stages to get a solution or explain a problem. Of course, in case that the children are really busy with the PBL process.

Before challenging students, the teacher must explain the role of PBL to them. They should clearly know what the teacher wants from them. Pupils should be able to express their thoughts, skillfully raise questions. And here, the so-called FILA table (Facts, Ideas, Learning Issues, Action Plan) fits perfectly. This table is a model of a systematic approach to solving problems, facilitates student planning and control, as they go through a repeating process of solving problems. The group is given sheets with a table, and students break up the problem and fill in the columns of the table: a powerful thought process is going on: you need to highlight facts, establish ideas Based on them, draw up questions that contribute to solving problems and draw up an action plan to solve the problem.

Table 1. model of a systematic approach to solving problems

Facts	**Ideas**	**Learning issues**	**Action plan**
Information extracted from the problem scenario Group according to topics where possible	Established based on facts Hypotheses Accepted without judgment	Formulated as questions Questions should aid to solve the problem	The action plan should be implemented in such a way that it aids to solve the problem, conduct research, organize interviews Questions should help create a script from the separate parts

In mathematics, the solution of a mathematical problem in some cases can be represented as a problem situation or a problem scenario.

Consider the problem in an isosceles trapezoid, the length of the diagonal is 15 cm. The radius of the circle inscribed in the trapezoid is 4.5 cm. Find the midline and sum of the sides of the trapezoid.

Table 2. Problem scenario

Facts	**Ideas**	**Learning issues**	**Action plan**
The trapeze is isosceles	So its sides are equal	What else do we know about an isosceles trapezoid? Why is its diagonal given?	Learn about the properties of an isosceles trapezoid. Perform the drawing correctly
The radius of the inscribed circle is known.	The radius of the circle and the elements of the trapezoid - some kind of connection exist	Can a circle be inscribed in any trapezoid?	Find the height of the trapezoid
Find the midline of the trapezoid	The centerline of the trapezoid is	Can a circle be inscribed in any quadrangle?	Find the answer to the question, it needs to examine the additional material: to find the properties of a quadrilateral, in which you can inscribe a circle, and test it a practical way
Find the sum of the sides of the trapezoid			Based on the research obtained from the previous paragraphs, perform the calculations and complete the task.

This problem can be taken as a problem situation. To solve it, it is necessary to use not only familiar material, but also, research and come to the conclusion: not every trapezoid can fit a circle, and, if the sums of the opposite sides of the quadrangle are equal, only then into such a quadrangle a circle can be inscribed. Problematic learning is a type of learning that provides creative assimilation of knowledge, because the purpose of problem learning is to develop intelligence and creative activity. In solving each problem, it is necessary to teach students to think, summarize, analyze, consider options, build counterexamples, and draw up their tasks. It is much more useful to consider several ways to solve one, and not the simplest task, than to hastily solve three or four similar problems. It is necessary to systematically equip students with methods of evidence. Evidence by induction, by the method of "contradiction", by enumerating options and others are a powerful means of enhancing the cognitive activity of not only the student - they are useful to adults, and can be used in life situations.

Pythagoras theorem

To my mind, solving the real life problems of practical character, develops my students' critical thinking and creative skills. For example, take a problem on the Pythagoras theorem:

A fire happened on the 9^{th} floor of a 10-story building. There was a small store near the building. Several people were injured, because fire-brigade didn't manage to get to the building, and lean the ladder against it.

Why? As the problem is based on the Pythagoras theorem, students find facts via FILA. New problems were elicited from the ideas. Students scrutinized ways of solving the problems with the help of acquired knowledge.

There were versions that the length of the ladder was not sufficient according the Pythagoras theorem calculations. That is why firemen were not able to get the 9^{th} floor. Besides, the store, which was situated near the building, stayed on the way of the fire brigade.

Another issue had a place: why authorities allow building attached buildings.

Table 3. Pythagoras theorem

F	I	L	A
Facts	Ideas	Learning issues	Action plan
Given: 9^{th}-story building There was a fire on the 9th floor. There is an attached store near where the fire escape staircase. Due to improper installation of the fire escape staircase, the fire was not extinguished Several people were injured	The fire on the ninth floor was due to a shorting of electrical wires Firefighters were unable to arrive on time Because of an attached store, the fire ladder did not get to the 9^{th} floor. Fire extinguishing agents ran out People were not saved	Emergency department did not pay due attention to the to improper installation of the fire escape staircase. That's why did not prevent the fire What physical phenomenon causes a short circuit? Why were fire trucks late? Why the fire escape ladders didn't reach the 9^{th} floor? What is the length of the fire escape ladder and the hight of the 9th floor? Who of the authorities allowed to build the attached store? Why people were not saved?	Revision work in the organizations need to be conducted Study physical phenomenon causes a short circuit searching for info in the Net. Check when the fire truck came after the emergence call Measure the length of the fire escape ladder and the hight of the 9th floor If you measure the cathetus, then the length of the stairs will be hypotenuse. What should be the length of the hypotenuse? Find out why the store was built They could not save people because the calculations were not correct.

Applying the methods of personality-oriented learning in their work in the classroom and extracurricular activities, it is possible:

1. To identify the internal psychophysiological resources of students, allowing them to realize themselves in knowledge of mathematics.
2. To determine the individual pace of educational and cognitive activity of students.
3. To implement the differentiation and individualization of teaching mathematics in lessons, individual lessons, in extracurricular activities.
4. Introduce and improve new programs.
5. To develop students' independence, the ability to organize and manage their scientific and cognitive activities.
6. Develop students' intellectual competencies.

I realized from personal experience, that the formation of interest in the subject occurs according to the following scheme: - at the first stage - surprise and curiosity. This stage of the cognitive orientation of the student's personality is characterized by the fact that the object is not the content of the lesson, but external moments or historical material, or the applied nature of the work.

Thanks to the skills of argumentation, students will be able to teach each other the basics of their questions using their basic knowledge. One way to develop research skills is to structure the material. In individual work, some students are provided with a simplified guide that takes into account the students' abilities and the results of their psychological diagnosis. Practical research aimed at achieving the goals and objectives of mathematical education will be effective with constant use.

Next, use the methods of a differentiated approach.

1) Nothing has a more favorable effect on the learning process than the teacher's desire to help improve the student's self-esteem.

2) The problem of the formation of thinking of students who came to an educational institution with an ambiguous level of knowledge, various subjective experience can be solved through personality-oriented approaches in learning.

It is possible to intensify the learning process when we take into account the psychological and pedagogical features of our students.

3) Extracurricular activities greatly reflect on studying school subjects, the purpose of which is:

- development of interest in the subject;
- development of creative abilities;
- activation of cognitive activity of students;
- formation of the need for knowledge;
- instilling in students the skills of independence and responsibility.

The methods that I use are aimed at creating among students the awareness of the importance of successful mathematics education. Cognitive interest develops when conducting subject games. The result of extracurricular activities is not only an increase of interest in the subject, but also the removal of the psychological barrier between students and the study of the subject.

4) The chosen direction in conducting educational work should take place in the context of the

main goal, namely, to contribute to the formation of communicative skills in the classroom team. Thus, the work associated with student-centered learning stimulates the teacher to be creative, to search for forms, methods, and allows developing the personality of each student.

It must be said that both the teacher and the student can provide conditions for the successful development and self-development of the student's personality. Of course, a teacher, as a charged person provides these conditions, looks for ways, methods and means.

5) A lesson is the most important means to ensure the successful development of the personality of the student, and the teacher himself. The lesson is designed and based on a research approach is one of the ways of a person development.

Firstly, the teacher communicates knowledge in a strict logical sequence and demands the same from the student, believing that they are not yet known to him. However, any new knowledge should be based on the subjective experience of schoolchildren, on their interests, inclinations, aspirations, and individually significant values. The main idea of a personality-oriented educational lesson is to reveal the content of the students' individual experience, coordinate it with the assignment, translate it into socially meaningful content (that is, "cultivate"), and thereby achieve a personal assimilation of this content.

When organizing a personality-oriented training session, the teacher's professional position should be to know and respect any student's statement on the content of the topic under discussion. Under these conditions, students will strive to be "heard", will speak out on the subject, suggest, without fear of mistakes.

Secondly, usually, in preparation for the training session, the teacher selects didactic material (illustrative, handout, etc.), allowing him to use tasks of varying degrees of difficulty during the lesson. The ranking of such tasks is traditionally carried out by identifying the objective complexity of the material, the students' interest in the subject matter and their individual capabilities when performing the training, creative, and problem tasks proposed in the training session.

The selection of didactic material for a personality-oriented educational lesson requires the teacher not only its objective complexity, but also knowledge of the individual preferences of each student in working with this material. The student must be given the opportunity to show individual ingenuity in working with educational material. A set of such material should be flexibly used in the process of a training session; without it, it will not become personality-oriented in the true sense of the word.

Thirdly, it refers to the scenario of the training session, its direction. Traditionally, communication in the classroom is reduced to inviting (forcing) students to do what the teacher provided for according to the requirement of the program (its calendar and thematic planning). Such a professional position is not in doubt. The question is in different. How to build communication in a class so that the student can choose the task that interests him most in terms of content, type and form, and thereby express himself most vividly? To do this, the teacher should refer to the frontal methods of work in the lesson only information (installation, substantive and instructive), and to the individual - all forms of independent, group, pair work.

Diagnostic cards were developed with the help of school psychologists, and these characteristics were taken into account when developing the lessons. Through problematic questions at each stage of the lesson, students can develop their ability to express their ideas, the ability to see the main problem and ask questions. Setting goals and evaluation criteria in the classroom with the help of the student increases the motivation for the lesson. In addition, students can learn the value of an integrated look at ways to solve real problems. Students have critical thinking skills and creativity if they are used systematically in all disciplines to gain problem-solving skills. Why is group learning more effective than individual learning? This allows us to review our actions in order to consider new problems, problems arising from the analysis of experience. I believe that the development of research skills among students is especially important in the modern world. In practice, students constantly ask open-ended questions. Thanks to the development of students' research skills, peer education is developing, public speaking skills can develop.

The significance of the research work in the lens of creativity is practical, theoretically it reveals the self-learning (individual, pair and group work) during lessons and after school hours.

Structuring the content of the project; using research methods: identifying the problem, research tasks arising from it; hypothesizing their solutions; discussion of research methods; presentation of final results; analysis of the data obtained; summing up, adjustment, conclusions.

The development of students' research skills using problem-oriented models was carried out with students aged 15-16. With the help of school psychologists, all the features of this age were taken into account and diagnostic maps were compiled for each student, as they focus on the most important points.

For example, in the section “Vectors in space”, which reflected inter-subject communication in the curriculum “Scalar product of vectors. Actions on vectors. "The theme was based on an integrated long-term plan. Students conducted research at the lesson, and learned to see the main task and developed the ability to ask questions. Students will be able to teach each other with an argumentation strategy. Due to group differentiation, children learn and receive support. Evaluation criteria with discussing descriptors make up together. Develop the students' ability to formulate questions and answer them, that is, based on the classical foundations of argumentation and develop critical thinking skills in students. Why is group learning more effective than individual learning?

It contributes to the formation of a certain worldview of students, since the high independence of knowledge acquisition makes it possible to transform them into beliefs.

It forms the personal motivation of students, their cognitive interests. Develops the mental abilities of students in the group.

Helps the formation and development of dialectical thinking of students, provides the identification of shortcomings of the studied phenomena and patterns.

Group work contributes to a more solid and deeper knowledge acquisition, the development of individual abilities, development of independent creative thinking. Also, when working together, students are accustomed to cooperate with each other in the performance of a common learning

work, and positive moral qualities of the individual are formed. Observations showed that this form of training has a greater advantage compared to the traditional teaching methodology.

Through the strategy of argumentation, students using previous knowledge will be able to teach each other, that is, self-learning will take place. Due to the differentiation of groups, children that are more successful consult others. Students' ability to formulate and answer questions, such as the classic foundations of argumentation, develops students' critical thinking skills, allowing students to interrogate each other, make the right decisions, analyze the situation and draw conclusions. They correct their mistakes, during the course of the proof, they develop the skills of correct mathematical speech, according to the criteria, students make self-esteem and evaluate each other. For example, the task of research “Never, sometimes, always” in order to achieve the goal of the study and consolidation of educational material, they analyze the conclusions in their answers.
One way to develop research skills is to structure the material. In individual work, some students are given simplified assignments according to step-by-step instructions, taking into account their abilities. On the topic “Actions on vectors”, show the interdisciplinary connection with physics and literature, for example, Krylov’s fable “Swan, Crawfish and Pike”, find the resultant force. To achieve the expected result of the study, plan the Effective milestones of the research lesson. As for the differentiated learning strategies are based on the abilities and capabilities of students help them develop their metacognitive skills.

Based on the evaluation criteria, children evaluate each other according to points covering the topic of vectors in space, collinear, scalar product of vectors. In the process of performing the research work “Never, sometimes, always”, critical analyzing and arguing the answers of each other propose their point of view. Thus, the skills to listen to each other, to put forward creative ideas and ask high-order questions are developed.

Here are a few examples showing the gradual complication of problem tasks in mathematics. A lesson in algebra and the beginning of analysis on the topic "Logarithming". “Using the graphic functions $y = \log x$, find the values of log 1.5; log 4 and log 6 ". It is proposed to compare the meaning of the expressions log 1.5 + log 4 and log (1.5 * 4). After checking the results (those participating in the experiment are put forward independently): “lga + lgb = lg(ab), a> 0, b> 0”. This encourages students to theoretical explanation of obvious facts, the search for external discrepancies between them. A lesson in algebra and the beginning of analysis on the topic "Irrational equations." The teacher offers to complete the task: “Check if the number 5 can be the root of the irrational equation $\sqrt{x-6} = \sqrt{4-x}$?” (Answer: “No, with $x = 5$ the equation does not make sense”). Further it is proposed to solve this equation. The students choose a way of squaring the various parts into a square: " $x-6=4-x \Leftrightarrow 2x=10, x=5.$

Geometry lesson on the topic “The relative position of two planes. A sign of parallelism of planes. " After considering the relative position of the two planes and introducing the students to define parallel planes by analogy with the definition of parallel lines, they are invited to perform an exercise: “Is it true that planes are parallel if a) a straight line lying in one plane is parallel to a straight line of another plane? b) two straight lines lying in one plane, respectively parallel to two straight lines of another plane? ”The question arises: “Under what condition are two planes

parallel?" Senior students formulate the problem themselves and, after comparing the facts, put forward a hypothesis about the condition of parallel planes. Geometry lesson on the topic "Perpendicularity of planes". The teacher begins the lesson not with the announcement of a new topic, but with a discussion of a real life situation that cannot be solved without knowledge of mathematics: Let's remember the laying of walls. How important is it to build a wall? ("The verticality of the walls is the rule of builders"). In the world, there are, of course, several striking examples of buildings, built in violation of this condition. They are Inclined towers in Nice, the Ball house in Dresden (the image is shown on a slide or an interactive whiteboard), but it is known what difficulties were associated with their construction and what measures have to be taken now by modern architects and builders, so that these structures do not collapse. How do builders carry out control over the verticality of the walls?

The main goal is to be able to demonstrate the ability to argue the development of research skills, taking into account the characteristics of students.

Especially practical mathematical problems from life with problematic questions have a positive impact on students in the learning process, and also develop creative abilities.

A particularly emotional aspect contributes to the student's motivation, develops skills of dexterity, and develops cognitive activity, personal qualities and allows to realize both level-based learning and differentiation aimed at mastering educational programs in a certain field, taking into account the abilities and cognitive needs of students.

The research task allowed students to make the right decision, analyze the situation, draw conclusions and develop leadership skills. A study of the research shows that students who can find errors by analyzing

Since a student of a profile class needs to acquire a large amount of information, it is advisable to present it in such a way that the active cognitive activity of students in mathematics lessons contributes to a better knowledge acquisition, increases interest in the subject, increases self-esteem, which, in turn, would help high school students feel themselves more comfortable. Therefore, it is important to use the technology of problem-based education and the elements of problem education, types of active learning, in the lessons of mathematics in the profile class. The main criterion for choosing methods and means of problem-based learning is the level of preparedness of students, the formation of learning methods, general educational skills and abilities. Students of different levels of mathematical skills are moving along the path of forming skills at a different pace, with a different form and measure of scaffolding. The core class consists mainly of second-level students who can independently apply generalized techniques in standard situations, and third-level students who are able to transfer generalized techniques to unfamiliar situations and find new ones. Mathematics lessons should contribute to the maximum realization of the capabilities of each high school student and the development of his independence in preparation for the exam.

At the beginning of the study, many schoolchildren had red stickers on the screen, and in subsequent lessons the quality of students' performance increased significantly, this means the method was effective.

"Develop students' skills to prove and defend their ideas, ideas and problems, leading them to learning objectives and bringing expected results." This is proof that each phase of the lesson is effective and students have achieved their learning goals.

The theory of constructive learning requires the teacher to organize his lessons in accordance with the goals of the student's idea and the development of educational skills. Taking into account the peculiarities of thinking of gifted children, our goal is to develop their own ideas, critical thinking and other skills.

Practice has shown that, using problem-solving skills, the student will be able to effectively use his own ideas, ideas and argumentation skills in all lessons. I think that the argumentation strategy helped substantiate the arguments and the children were able to fully reveal their potential.

Based on my research, using a reasoning strategy and comparative analysis based on student feedback and thoughts, I think students have the skills to prove their ideas and hold back their points of view.

It is said, that it will be much more difficult to achieve the goal in the life, but in order to achieve a good result, I need to pay attention to the characteristics of the students and help them in a timely manner, and it is necessary to develop students' metacognitive skills.

At the separate stage of the lesson, the teacher is in the role of a consultant, mentor, developing metocognitive skills and the zone of proximal development (ZBR).

1. Manages the cognitive activity of the student, i.e. passes from the position of the carrier of knowledge (giving knowledge) to the position of the organizer of the cognitive activity of students;
2. Motivates the cognitive activity of the student in the lesson through communication of mutual understanding and seeks a positive attitude towards the subject;
3. Organizes independent work in the lesson, including work with various sources of information;
4. Includes all students in collective creative activity, organizing mutual assistance;
5. Creates a situation of success, ie develops a methodology and offers tasks feasible for each student;
6. Creates a positive emotional atmosphere of educational cooperation, which is implemented in a system of humane educational relationships;
7. Organize self-analysis of the student's own activities and form his adequate self-esteem.

In the course of pedagogical activity, experience was gained in designing and conducting lessons using problem-based learning technology to develop students' research activities:

• mathematics lessons have been developed and tested for students, the use of which in the system way allows you to develop a harmoniously developed, creative personality, who is able to think logically, find solutions in various problem situations, able to systematize and accumulate knowledge, capable of high introspection, self-development and self-correction (meta-subject and personal results).

• the necessary conditions have been created for conducting lessons using the technology of problem-dialogical teaching

• learn to overcome their own emotional barriers that prevent them from making a strong-willed decision; - develop the ability to quickly make decisions that allow them to concentrate their

willpower not on preferring one over the other, but on thinking about the positive and negative properties of the chosen decision;
• learn productive communication, achieving harmony with the environment.

Thus, the technology of problem-based learning in mathematics is a way to achieve the goal through the detailed development of the problem, which should end with a very real, tangible practical result.

The results of my experience can be considered as:
• increased motivation to study the subject;
• increase in the number of participants and winners of Olympiads, mathematical competitions;
• increased quality of student performance.

Today, mathematics as a living science with multilateral connections, which has a significant impact on the development of other sciences and practices, is the basis of scientific and technological progress and an important component of personality development.

We recognize that the modern school educational institution has become more flexible in goals and objectives, varied in forms and methods of teaching, diverse in technical means used by the teacher. Nevertheless, it is not always considered like personality-oriented.

Often, a person-oriented educational lesson is understood as a humane, respectful attitude towards the student, seeing the teacher's task first, to create an emotionally positive attitude of the class to work. However, this is not enough. The teacher is required not only to recognize for each student the uniqueness of his personality, but also to review a number of professional positions.

References

Dolzhenko Yu. A. Methodological support of personality-oriented education. Barnaul. 2003.

Teacher Manual, Third level. Astana: AEO Nazarbayev Intellectual Schools, 2012

Makhmudov M. I. Organization of problem-based education at school. Moscow: "Prosvescsheniye", 1977.

Atanasyan L.S., Butuzov V.F. 7-9 Grade Students' Course Book. Almaty: Rauan, 1992

'Introduction to Problem-Based Learning' Temasek polytechnic, Participation Presented to "Inquiry based Learning" PBL. Singapore: 2013

Yakimanskaya I.S. Personally-oriented education in a modern school. M. September, 2000

Okon V., Fundamentals of Problem-Based Learning - M .: Education, 1968 - 208 p.