

Problem-Based Learning: Content, Essence, Possibilities

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Annotation. In the educational environment, teaching students to understand, perceive, analyze, rather than convey ready-made knowledge; rather than memorizing concepts, rules, increasing attention to the formation of a valuable attitude; inculcate the benefits of working in a team rather than acting alone; rather than control, it is more and more observed to create problem situations, to create conditions for applying knowledge in practice. This article discusses problem-based learning as one approach that ensures that such an environment is created.

Keywords: problem, problematic education, problematic learning, problem-based learning, content, essence, advantages, consultative support, comparative analysis, type of educational practice.

Introduction.

In international practice, a number of researches based on the ideas of cognitive training are being carried out, and their successful application to the process of continuous professional development of teachers strengthens the guarantee of educational results. Because cognitive educational technologies, including problem-based learning considered promising in foreign experiences, stimulate professional growth and continuous development for the teacher, and also enables them to fully understand, understand, process and apply educational content successfully in their activities. In particular, non-traditional approaches introduced into the system, when alternative types are offered, and at a time when attention to independent education in online form is increasing, turning to them serves to ensure the achievement of the intended goals.

Brief analysis of scientific sources on the topic.

In order to explain this concept correctly and not to leave place for disagreements, it is necessary to organize teaching on the basis of "Problem-Based Learning" (PBL), which is widely used in the educational institutions of the USA, Canada, and Western Europe, and "problematic education" or "problematic learning" technologies available in

our national pedagogical practice and also there is a need for comparative analysis of related approaches. Below we present the stops that came as a result of research on them.

In the "Pedagogy" encyclopedia compiled by a team of leading scientists conducting research in the field in our republic, "problem is a problem that has not found its solution in the existing knowledge and the method of solution is unknown"; "problematic education - an educational process in which a problematic situation is created under the guidance of a teacher, and this problem allows creative assimilation of knowledge, skills and abilities, as well as the development of mental activity as a result of active independent activity of students"; it is interpreted as "problematic learning - a teaching process that demonstrates the logic of scientific knowledge by creating problem situations that include problem analysis".¹.

Problematic question, problematic lecture, problematic situations have a special place in teaching. A problematic question embodies a dialectical conflict and for its solution requires thinking, comparing, searching, acquiring new knowledge or creative application of previously acquired knowledge, rather than

restoring known knowledge. In problematic lecture, the student thinks together with the speaker. In the end, problematic issues are clarified. This leads to effective results.² Problematic situations - the process of creating problem situations, moments in the lesson. The use of problematic situations is useful for the subjects of the educational process, it teaches them to think independently on a specific problem, analyze problems, feel responsibility, perform independent activities in solving them, form a personal point of view on this problem, work as a group and team, plan and develop activities.³

In this way, firstly, acquired knowledge becomes the property of students, secondly, the acquired knowledge is kept in deep memory, easily activated (educational effect), has the ability to easily move to new situations (developmental effect of creative thinking), and thirdly, as a unique trainer for developing problem-solving intelligence is visible (development effect), fourthly, the lecture increases interest in the content of science and enhances professional training (effect of psychological preparation for future activities)⁴.

Therefore, it can be concluded that leadership in problematic education is focused on finding a solution by working independently and in groups of problematic lectures set by the teacher and given a solution or problematic situations created by the teacher (presented in the textbook).

Problem-based learning (PBL) attracts attention because of its importance in improving cognitive processes, because it involves a specific activity or project, and because it is studied differently in different studies. In addition, in some approaches it is considered as a problematic education technology, and in some cases it is interpreted as an innovative method of problem-based learning.⁵

In problem-based learning, learners learn, apply, and gain competence in knowledge and skills because the process encourages the pursuit of solutions to specific problems. The relevance of problem-based learning is determined by the degree of understanding of the educational content used for the personal and professional practice of the learners. It is distinguished by the fact that it teaches independent work, and the theories in science are more widely explained through life problems.

"Is problem-based learning worth the problem?" H.Barrows (Howard Barrows)⁶ discusses the question and states that it calls for serious observation, even if no clear structure is found, this technology affects the student's previous knowledge or concepts in the future learning, the development of independent work skills, testing the content and knowledge of science in solving specific problems and in addition, emphasizes that it gives the opportunity to see. In conclusion, he concludes that "problem-based learning is the result of a process of understanding the solution of a problem".

Hmelo-Silver says that problem-based learning distributes the cognitive load, creates conditions for students to learn topics in complex domains, he admits that they work on the problem as a group and teach each other cooperatively⁷, a number of other researchers claim that students in problem-based learning classrooms can achieve more academically than their peers in traditional learning settings⁸. In order to prove this conclusion, they observe and analyze different groups of students in experimental studies conducted as part of their research. Outcomes are measured by criteria such as participants' academic achievement, entrance exams, pre- and post-assessments, and in some cases, students' ability to use technology or other critical thinking skills or tasks. Observations show that their claim is valid, i.e. students in problem-based learning classrooms improve more quickly than their peers studying in traditional classrooms in their

learning, worldviews, and aspirations to understand educational content. According to Y.Doppelt,⁹ in the research, it was found that students who received instruction in this direction, especially among those with low mastery, noted a high level of their motivation.

As a result of his research, Savin-Baden divides the main qualities of the problem-based learning method into 5 types: perception of knowledge and learning, the existence of a problem, the teacher, the learner, the role of assessment. Problem-based learning models are structured as follows: problem-based learning to achieve knowledge; problem-based learning for professional activity; problem-based learning to understand and realize interdisciplinary; problem-based learning for interdisciplinary education; problem-based learning to get important powers¹⁰.

According to H. Barrows and H. Silvers¹¹, one of the founders of the idea of problem-based learning, the primary element of the educational process is the problem, and the focus is not on solving the problem, but on the existence of certain solutions and their importance in the development of other skills and characteristics. And J.Desabi¹² fills the essence of the concept by saying that it is a process used to increase knowledge and understanding of the problems identified within the scenario. In the manual "Problem-based learning lessons"¹³ published by the University of Oxford, a problem is described as a driving force aimed at stimulating the student to acquire new knowledge that represents the basis of professional skills (competencies) for his future field of activity. In

this case, group thinking and finding solutions is the most important aspect.

The purpose of the research is to determine the possibilities of problem-based learning, the current situation in practice, and the attitude of teachers of general education schools.

The object of research is the processes of implementing the problem-based teaching approach to the system of continuous professional development of public education workers.

The subject of research is the content, essence, advantages, disadvantages of problem-based learning, tools of consultative support.

The methods of research are comparison, content analysis, empirical, generalization, network survey.

Main part

Although the problem-based approach to education has a long history, problematic learning in pedagogical theory began to be studied from the middle of the last century. In practice, the trajectory of its development in different countries has acquired peculiarities under the influence of the existing methodological framework, approaches, opportunities and conditions. From this point of view, we will try to compare the differences and similarities of the concepts of "problematic education (problematic learning)" and "problem-based learning" based on the given comments, studied sources and conducted experiments (Table 1).

Table 1. Comparative analysis of the concepts of "Problematic education (problematic learning)" and "Problem-based learning"

Problematic education (problematic learning)	Problem-based learning
Learning objective	
Formation of students' attitude towards problematic situations, acquisition of	Formation of independent study (self-organization of one's own study) skills

competencies as a result of independent activities, development of flexibility, independence, critical and creative thinking and mental activity.	(metacompetence) of learners on the basis of understanding the problem, finding a solution by referring to the appropriate resources, and encouraging teamwork.
Approach to the problem	
A problem is a theoretical or practical problem that needs to be studied and solved.	A problem is a driving force aimed at stimulating the acquisition of new knowledge.
Problem setting	
A problematic situation is presented.	A problem-related task is given.
Creating a problematic situation and finding a solution to it in the process of intellectual (research) activity.	It is important for professional (or future) activity and presentation through cases that are as close as possible to the real situation (or in the real situation), that is, to set problematic cases and find a solution.
Works in partnership.	It is worked and discussed in a team (group).
Activities of the teacher and the recipient (position)	
A separate place or action is not defined for each of the participants in the process.	The place (role) or actions of the process participants are clearly defined.
Educator (teacher) - creates problem situations, observes their various solutions with students, encourages and activates them to choose the right one through independent thinking, analyzes the progress and results of the process. The teacher is the leader of cooperative activities and the creator of problem situations.	Educator (tutor) - supports the learning process (in and out of class) as an assistant, consultant, coordinator, feedback provider, does not provide ready-made knowledge, directs students to problem solving by asking various questions, activating and observing. The tutor is also a participant in the cooperative activity organizer.
A learner is a participant who actively applies his creative and critical thinking skills and mental capabilities in solving problematic situations. The learner is an active participant in solving the problematic situations set by the teacher.	The learner is an important participant who is empowered not only to solve the problem, but also to determine how to solve it and influence the outcome. The learner is a partner, a participant with influence and influence over the outcome.
Organization of the learning process	
It is not required to make serious changes to the educational process, it will be enough to make small modifications to lectures, practical, laboratory classes, the lesson schedule will not change.	Changing the educational process requires special forms of organization, 2-3 hours of tutorials (training) are organized 2-3 times a week, the content and direction of lectures are changed, practical trainings are held in the workplace, laboratory, workshops, quasi and real professional situations are created.
The term is not strictly defined, usually limited to class time or homework period.	It requires a long-term, continuous process, organized on the basis of separate educational programs.

Works in the audience, group and small groups.	Working in a small group is considered a key element.
In most cases, the problematic situation is solved during the lesson and theoretically analyzed based on the knowledge of the learner.	To solve the problem, a certain process is scripted, time is set in advance to study relevant resources, and solutions are tested in real conditions.
Approach to problem outcome	
The educator already knows the solution to the problematic situation, as well as the answers to the questions.	The solution to the problem can be predicted but not certain in advance, and different solutions are reached depending on the participants.
The learner does not have full responsibility in solving the problematic situation, because the teacher has the solution and can show the way.	Full responsibility for problem solving rests with the team.
Recommendations and conclusions related to the solution of the problematic situation are developed.	Recommendations related to the problem, methodological manuals, guidelines for managing and conducting the process, and conclusions are developed.

The mentioned ideas and comparative analysis allow to understand problem-based learning as an approach that incorporates problematic education, problematic learning and similar technologies, is aimed at testing solutions in practice, is focused on understanding one's own activities, and is organized on the basis of a specially prepared special program, which requires a period of time according to the scale of the problem. This means that the whole process (educational goal, plan, content, forms, tools, lesson schedule, consultative activities, monitoring, evaluation) of understanding problem solving is expressed. Notably, the fact that teaching is now a whole process means that it can be seen beyond the boundaries of "technology" and from the perspective of "a type of educational practice."

As important and valuable as problem-based learning is many researchers recognize that it can do more harm than good when used incorrectly. Therefore, the greatest risk appears to be the lack of skills in careful planning, project creation and implementation, research, team work, and practice orientation.

In this regard, in the educational practice of countries such as the USA, Canada,

Germany, the Netherlands, and Great Britain, problem-based learning (PBL) used in combination with concepts such as Project-Based Learning, Research-Based Learning, Team-Based Learning and Work-Based Learning. It can be said with confidence that this approach serves to achieve the goal of education in these countries and to strengthen the guarantee of expected results.

We will dwell in more detail on its application in educational practice, its essence, advantages and disadvantages in order to expand the imagination of problem-based learning and also to have clear evidence of it.

The essence of problem-based learning involves the participants in the learning process to reflect, structure their own knowledge, identify problem(s), brainstorm, structure, hypothesize, learning objectives, independent study, and synthesis of solutions. In problem-based learning, the necessary conditions are created for learners to understand the problem, to determine how and where to learn new information that they need to know about the subject, to find the most optimal solution independently, and to justify it in thought and practice. Critical and creative thinking, non-standard thinking, avoiding conservatism,

openness to the diversity of solutions, not being satisfied with knowledge, striving to develop it, working in a team, listening to others, justifying one's opinion, responsibility and diligence reflect the chain of skills that lead to success.

Based on the analysis, it was found that problem-based learning differs from other technologies in its own aspects. Training programs are aimed at building individual knowledge, skills or competences, which are aimed at ensuring the emergence of a certain "base" for the practical application of the acquired knowledge. However, it is known from practice that learners (students, teachers) have difficulties in understanding how to generalize acquired knowledge, direct it to the effectiveness of their activities, and use them to perform real tasks. Problem-based learning is based on a real situation, task, problem that learners face in their

professional activities. In turn, this process is divided into tasks leading to the final result. The fact that the process of achieving the set goal requires implementation on the basis of a specific algorithm and project requires the tutor to have the design methodology and the ability to use it effectively. The fact that this skill is well formed in group members has a multiplying effect on the success of problem solving.

The inherent advantages or disadvantages of arbitrary theories, approaches, and technologies used in pedagogical practice do not exclude the problem-based learning process. Below, based on industry research and personal research, we present a table that represents the nature, advantages, disadvantages, and consultative support of the process of problem-based learning (Table 2).

Table 2 The essence, advantages, disadvantages of problem-based learning and consultative support for the process

PROBLEM-BASED LEARNING	
ESSENCE	<p>learners independently build their own knowledge structure; identify, understand, synthesize the problem, find out how and in what order they can absorb the existing knowledge, as well as the new information that they need to know, leading to a stop, and go to the most optimal solutions;</p> <p>critical and creative thinking, research activity, design, orientation to practice, non-standard thinking, avoidance of conservatism, openness to a variety of solutions, dissatisfaction with one's own knowledge and striving to develop it;</p> <p>working in a team, listening to others, justifying one's opinion, responsibility, diligence, creating a chain of skills leading to success;</p> <p>facilitate learning by supporting, managing and coordinating the educational process, creating the necessary conditions for reasoning and practical justification of solutions.</p>
ADVANTAGES	<p>supports lifelong learning and enhances person-centered learning; activates cognitive processes representing thinking, memory, perception, imagination, attention, speech;</p> <p>expands cognitive abilities such as receiving, understanding, storing in memory, turning into knowledge, processing, transferring;</p> <p>develops responsibility, independence, a sense of responsibility, adequate assessment of the situation, the importance of understanding, not evidence, planning, implementation, diligence, logical, creative, critical, professional, productive, non-standard thinking, flexibility and mobility;</p>

	<p>research and the need for a long period of time give "effect of unfinished actions"* and cause deep study of knowledge;</p> <p>knowledge, opportunities, confidence in making changes are strengthened;</p> <p>promotes communication skills, team work, feeling of being an integral part of it, valuable attitude, effective interaction;</p> <p>high quality of education is achieved as a result of active assimilation of educational material (knowledge) rather than passively;</p> <p>increases the guarantee of achieving educational goals and a deep understanding of the nature of professional activity (current or future).</p>
DISADVANTAGES	<p>a long period of time is required to achieve the set goals;</p> <p>difficulties are encountered in designing the process (adjustment to the level of knowledge of learners, creation of authentic tasks, etc.);</p> <p>it is observed that students are weak in controlling their cognitive activities (restricted, as a result of encouraging independent activity);</p> <p>less material is covered in terms of volume compared to the traditional teaching process;</p> <p>problems with the correct distribution of cognitive load create the possibility of a negative impact on the interest and creativity of learners.</p>
ADVISORY SUPPORT (tutor activity)	<p>to develop the ability of learners to study independently (to organize their own learning), to gain confidence, to encourage thinking and discovery;</p> <p>interest them, increase their motivation, create an intense, encouraging, creative atmosphere in the process;</p> <p>providing ready-made knowledge, formulating questions leading to solutions or avoiding expressing one's own point of view, participating in the process as an assistant, consultant, coordinator, feedback provider and participating in evaluation;</p> <p>how to evaluate knowledge and skills in cases where students do not have enough experience, acquire new ones, provide scientific-methodical support for effective use of information sources, participate as a participant in necessary situations;</p> <p>determining the level of knowledge of the group participants and relying on it when setting the problem (otherwise, the expected results will not be achieved, interest and creativity of learners will fade);</p> <p>explain that any idea can be proven or disproved by collecting relevant information and testing it in practice;</p> <p>creating an environment for working in a team, listening to the opinions of teammates, making a reasonable statement of one's own, realizing one's mistakes (which means that there is a high risk of failure when working alone).</p>
ADVISORY SUPPORT (problem setting)	<p>orientation to activation of cognitive processes;</p> <p>specific to the activity of the learner, sufficiently complex, interesting and focused on motivation;</p> <p>development of research, independent finding of information, comparison of previous and new knowledge;</p> <p>be specific to real problems in life (professional activity);</p> <p>allows to work in a team, divide the task into parts;</p>

it is necessary to encourage the learner to fully mobilize his cognitive processes and cognitive abilities.

*The concept of "effect of unfinished actions" was introduced by B.V.Zeigarnik¹⁴, according to which actions that have been started, but not completed, are better remembered. Because the learner acquires deep knowledge, skills and abilities as a result of thinking about one problem for a long time until he finds a solution.

Based on the analysis, we would like to state that in order to achieve the effectiveness of problem-based learning in the continuous professional development of teachers, it is necessary to implement problem-based learning in the organization of the educational process of general education schools. However, it should not be overlooked that the process is complex and requires large resources, programmatic planning and organization in a separate direction. In our opinion, the step-by-step, high-quality implementation of the following requirements will allow to achieve the expected results and make a "soft landing":

- ✓ training, retraining, upgrading of teachers, as well as directing changes in the teaching system in schools;

- ✓ formation of an authorized structure (working group) for the creation of educational programs for problem-based

learning, establishment of cooperation relations with experienced foreign specialists, establishment of mutual consultations;

- ✓ process planning, organization, ensuring proper management, training of problem-based learning trainers and implementation of clearly targeted actions;

- ✓ designing problem-based learning educational programs, their level of relevance to problems, determination of educational results, consultative support of teachers, focusing on teaching in the cluster method;

- ✓ change the training, professional activity assessment, monitoring, attestation processes in accordance with problem-based learning training programs and analyze the results;

- ✓ encourage feedback from academic advisor, trainer and teaching team, self-direction and management of learning resources and tools that support learning.

Survey results. During the research, a survey was conducted to study the state of understanding of the problem-based teaching approach in practice and to determine the possible aspects of the process (Table 3).

Table 3. A problem-cognitive questionnaire (problematic questions) to determine the opinion of teachers about the problem-based learning approach and their personal attitude towards its implementation

№	Problematic questions	Option 1	Option 2	Option 3	personal opinion (attitude)
1.	What role does the student take during the lesson?	Listener	Speaker	Participant	
2.	What is the purpose of students attending the class?	I don't know	Gaining knowledge	Self-distraction	
3.	Who is audience of students?	Comrades	Classmates	Parents	
4.	How can different types of education (fields) work together?	I don't know	Can't work	Depends on the types of education	

5.	What kind of support does each student need individually?	I don't know	Does not need help	Psychological	
6.	What do students "need to know"?	I don't know	Subject	Problematic situations	
7.	Who gives students feedback on learning?	I don't know	Their parents	People around them	
8.	What is a designed lesson that a student will never forget?	I don't know	What is design?	I did not design	
9.	What should be the pace of the lesson to maintain the student's pace of learning?	I don't know	Interesting	I have to think	
10.	How can assessment, revision, and metacognition improve student understanding?	I don't know	It doesn't get better	It depends on the application	
11.	How can a student engage himself in the lesson?	I don't know	Through self-discipline	By reading a book	
12.	What is the quality of logical criteria?	I don't know	Depends on consistency	Depends on the application	
13.	How to organize a project lesson that students will never forget?	I don't know	By designing	Depends on the teacher	
14.	What is most important to the success of the lesson?	I don't know	Organization of the lesson	Knowledge	
15.	Have you tried problem-based learning?	I don't know	I have not used	What is it?	

In the survey, it is necessary to take into account that the essence and the level of study of the problem-based learning approach, unlike technologies such as problem-based education and problem-based situations in the pedagogical practice of our republic, are not covered much when assessing whether teachers have a sufficient outlook on problem-based learning, and whether

they can independently solve problems. From this point of view, it can be accepted as a partial situation that the teachers do not have a complete understanding of this approach. In the analysis of the problem-cognitive questionnaire, the attitude of the participants to the content of the questions was determined (Figure1).

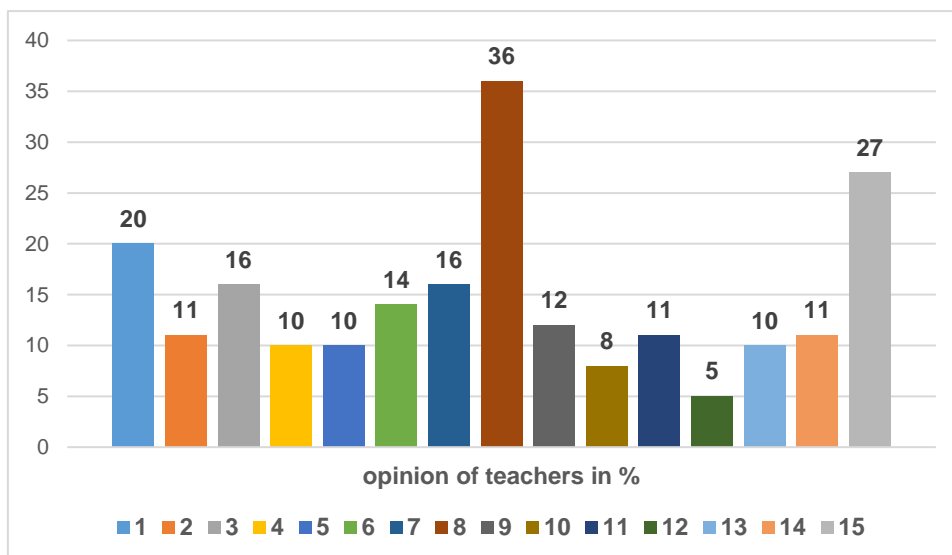


Figure 1. Teachers' attitudes towards problem-based learning approach

There are four options for responding to the problematic questions presented in this questionnaire, three of which are general responses to the problems, and the fourth allows the teacher to write his or her own opinion. Based on the purpose of the research, in the course of the analysis, when analyzing the teachers' independent views on the problems and the guidance they provided, it was found that on average 14.4% of the 653 respondents had the motivation to express their opinion. Importantly, 79% of the participants were teachers, while the remaining 21% were deputy directors of academic affairs by position, who constituted the main indicator of the teachers who expressed their opinion (for example, 16% in question 1, 9% in question 2, 3 12 % in the problem, etc.). This situation points to relatively high cognitive capabilities (especially in thinking) of deputy directors and to a certain extent their suitability for their positions. Another conclusion is that it is possible to rely on them in the formation of working groups for the implementation of problem-based learning in school practice.

The problematic questions presented in the questionnaire reflect the daily activities of the process and teacher-related situations in general secondary schools. In fact, since such questions are practical problems that require scientific-theoretical, scientific-practical foundations and study based on a specific program, as well as teachers' instructions are considered important for the implementation of a problem-based learning approach, the words and sentences listed in the answer options in the questionnaire are for the attitude was not enough. However, the majority of participants (for example, 80% in the first problem, 89% in the second problem, 84% in the third problem, 90% in the fourth problem) found it necessary to be satisfied with the given answer options and not to express their attitudes. This situation shows that the teachers do not have enough understanding of problem-based learning technology, the skills of thinking, personal approach or expressing their attitudes are not formed enough.

Even when analyzing according to the presented answer options, the general conclusion is that the problem-based learning approach should include teachers in the process of continuous professional development, each problem should be studied and applied in practice on the basis of a separate program, and only independent understanding of the problems of pedagogues related to their professional activity can lead them to concrete scientific solutions.

Conclusion and suggestions.

In general, the introduction of problem-based learning into the system of continuous professional development of teachers not only inculcates the principle of lifelong learning into the activities of pedagogical staff, but also causes a significant change in the quality of education in general education schools. Because it is this approach that motivates to change the attitude towards the teacher's activity and to find a solution to the problems of the education system. The following conclusions make it possible to evaluate problem-based learning as a positive pedagogical phenomenon with high efficiency and effectiveness:

The requirement to cover the entire process of understanding problem solving in problem-based learning (educational goal, plan, content, forms, tools, lesson schedule, consultative activity, monitoring, evaluation) means that it can be viewed from the perspective of "type of educational practice" and beyond the boundaries of "technology".

the teacher's role changes, he supports the learning process (in and out of class) as an assistant, consultant, coordinator, feedback provider, does not provide ready-made knowledge, directs students to the solution of the problem by asking various questions, activating, observing;

the fact that the educational material represents real situations typical of professional (educational, life) activities, is aimed at learning, understanding, analyzing, understanding the

problem, develops the skills of students to fully master it, strengthen their self-confidence, take responsibility, and successfully solve complex (voluntary) tasks;

due to the need for new and large-scale knowledge in the process (related to different disciplines depending on the nature of the problem), aiming for interdisciplinary communication, finding the necessary information, relying on the latest achievements of science, using various sources, sorting, analyzing, processing, transferring, exchanging information happens;

the priority of working in a team is that the learner develops social flexibility and communication skills based on expressing his opinion, arguing, listening to others, expressing a constructive attitude, respecting collective conclusions;

It is important to be careful when implementing problem-based learning, and it is important to develop the skills of careful planning, project creation and implementation, research, teamwork, and practical orientation. Otherwise, not only the expected results will not be achieved, but also the students may lose interest and need for learning;

from this point of view, in order to achieve the effectiveness of problem-based learning, it is necessary to implement it not only in professional development courses, but also in the educational process of general education schools.

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