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Review Article

PROBLEM-BASED LEARNING TECHNOLOGY IN TEACHING AUXILIARY PROJECTION TECHNIQUES

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Abstract

This article provides several examples that can be solved using auxiliary projection methods for organizing descriptive geometry lessons. There are also some instructions and teaching methods on how to organize lessons.

Key Words: Technology, projection, position, metric tasks, frontal, horizontal, projection, creative activity, plane, point.

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INTRODUCTION

It is the initiative of the President of the Republic of Uzbekistan Shavkat Miromonovich Mirziyoyev that the ongoing reforms and changes in our country are continuing.

In the address of the President of our country Shavkat Miromonovich Mirziyoyev to the Oliy Majlis, “We have started to reform all spheres of education. Where there is no knowledge, there is backwardness, ignorance and misguidance. We need knowledge and higher enlightenment. The best legacy is a good upbringing.”

I want to say to our people, "It's time to correct the mistakes we made in education." As the sages of the East have said, ‘‘ The greatest wealth is intelligence and knowledge. The greatest legacy is a good upbringing. The greatest poverty is ignorance. ” He proposed reforming the sector and revising education laws, and reiterated the importance of the focus on education, with a proposal to double government grants in higher education.

The organization of the process of training teachers in higher education in non-traditional forms, aimed at teaching the basics of engineering graphics in higher education institutions, can be a guarantee of achieving the ideal design of the educational process, the ability to rationally use these projects of thorough, deep assimilation of theoretical knowledge, the formation of practical skills and competencies by students. One of the most important requirements for the organization of modern education is to achieve high results in a short time without spending too much mental and physical effort. In a short period of time to provide students with specific theoretical knowledge, to develop in them the skills and abilities in a particular activity, as well as to monitor the activities of students, to assess the level of knowledge, skills and abilities acquired by them requires high pedagogical skills and a new approach to the educational process.

In recent years, a number of credible interactive methods and approaches to developmental education have been sought to enrich the content of education.

The study focuses on three areas: problem-based, programmed, and differentiated learning. Problem-based approaches to education are becoming more prevalent, especially in higher education practice.

Effective teaching technology in education is problem-based learning. Problem-based learning is one of the goals of a creative, active person.

In the process of problem-based learning, the student's independence increases relative to the reproductive forms of learning.

There are various definitions and descriptions of problem-based learning in today's pedagogical literature. A relatively complete and accurate description of M.I. Given by Makhmutova, problem-based learning is interpreted as a system of rules for the use of teaching and learning methods that take into account the activities of logical thinking (analysis, generalization) and the laws of student research activities.

The essence of problem-based learning is that the teacher manages the students' learning activities by creating a problem situation in their academic work and learning new knowledge by solving learning tasks, problems and questions. This creates a scientific way of learning.

An analysis of the current educational process, as well as the opinion of psychologists and educators that the problematic situation begins with unexpected surprises and delusions, shows that it is close to the truth. In the learning environment, the mental and emotional state of a person serves as an incentive for his thinking and mental research.

This is a state of mental tension that requires a specific set of cognitive goals. At the heart of this situation are traces of previously acquired knowledge and ways of mental and practical action to solve a new problem.

The essence of a problem situation is the conflict between information that is familiar to the student and new facts and events (which lacks prior knowledge to understand and explain them). This conflict is the driving force behind the creative acquisition of knowledge.

Symptoms of a problematic situation include:
- the presence of a fact unknown to the student;
- instructions given to the student to complete the tasks, their personal interest in solving the learning difficulties.

The problem consists of three components: based on a known or given task, unknown or finding them leads to the formation of new knowledge, and previous knowledge is the student experience. These are necessary for search operations to find the unknown. First of all, the task of a learning problem that is unknown to the student is determined, and its methods and results are also unknown, but students learn the expected result or solution based on their previous knowledge and skills.

In addition, the problem that students know and how to solve it on their own cannot be a learning problem, and secondly, if they do not know how to solve the problem, it cannot be a learning problem.

Important symptoms of a learning problem include:

- the introduction of the unknown, which leads to the formation of new knowledge;

- Students should have a certain amount of knowledge needed to carry out research to find the unknown.

A necessary condition for problem-based learning is to instill in students a positive attitude towards the process of searching for the truth and its results.

The research period of a person's cognitive activity can be expressed in special schemes: problem situation - learning problem - research to solve a learning problem - problem solving.

The organization and conduct of problem-based learning requires that the teacher be well aware of both its educational and pedagogical function. The teacher should never give students a ready-made problem, but should motivate them to acquire knowledge, to help them process in their minds the information, events, times, and events they need in class and in life activities.

In problem-based learning, the teacher organizes the cognitive activity of students so that students independently solve intellectual problems based on the analysis of disciplines, draw conclusions and generalize, formulate patterns, apply the acquired knowledge to a new situation.

- The first condition for the organization of problem-based learning is a system of improving educational information
- The second condition of problem-based learning is problem-based learning, in which information is given the opportunity to choose how to solve it as it is transferred to the learning task.
- The third condition of problem-based learning is the subjective position of the learner, their ability to understand and make informed learning goals, and to evaluate the means at their disposal to solve the problem and achieve the result..

n problem-based learning, the student must be creative in the process of identifying the problem. *The creative method* fully realizes the creative independence of the learner. In it, the student performs the task assigned by the teacher, while at the same time forming the learning problem, trying to solve an independent hypothesis, conducting research and achieving a provard result. The creative method requires a long time and special conditions for the learner.

The creative work of students is formally diverse. These are the preparation of the text of the lecture and the preparation for practical training, the study of the theoretical state of the issue (individual work with the literature, the study of documents in the archives), the preparation of visual aids, didactic materials, etc.

The creative method is used to break down a complex problem into parts, to identify its convenient problems step by step, and each step (step) solved in it serves as a basis for solving the next stage of the problem. In doing so, students take an active part in setting the mummy, guessing and proving the hypothesis. Their work includes reproductive and creative elements.

Solving graphic problems in the field of descriptive geometry, we will consider issues related to the motivation of the process of teaching the auxiliary projection method to find a solution to an existing problem.

It is represented by a triangular *ABC* curved prism and a *a(a',a'')* straight line projections based on the *H* plane. Find the projections of the points of intersection of *a* straight line with the sides of the prism and determine its invisible parts. (Figure 1)

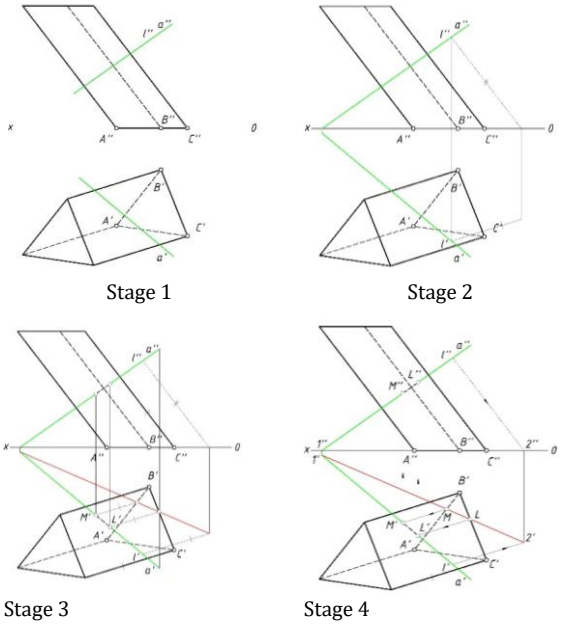

Figure 1

Such issues serve as a first step in developing students 'creative abilities. Encouraging students to find other ways to solve a given task is another way to engage the student in creative activities. In Figure 2, we consider the process of solving this problem using the auxiliary projection method, depending on the conditions of the above problem.

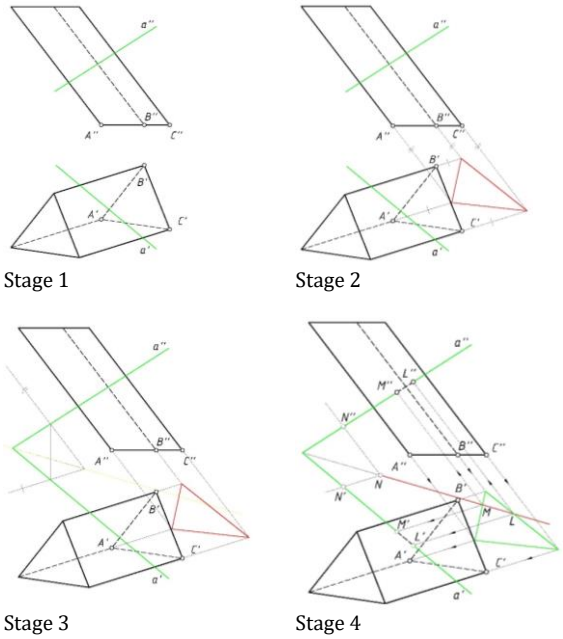

Figure 2

The pedagogical literature focuses on three levels of problem: in the *first level*, the teacher poses the problem, shapes it, and directs students to search for a solution independently.

At *the second level*, the teacher only creates the problem situation, and the students formulate and solve the problem independently.

The third level is the higher level, in which the teacher implies the following rule: he does not point to a specific problem, but "meets" students and directs them to independent creative activity, directs them and the result evaluates. Students, on the

other hand, understand the problem independently, shape it, and explore ways to solve it.

Developing a system of problem-solving questions involves forcing students to think and the probability of their answers In this regard, the lesson scenario should reflect a variant of the lesson, the reality of which depends on the level of knowledge of the teacher about the level of basic thinking skills of students. However, even if there is a well-developed scenario, there will be deviations from the previously thought plan during the course of the lesson, as the individual characteristics of the students, the level of knowledge, and the breadth will vary. As a result, the teacher must have a high level of mastery of the material relevant to the topic in order to conduct the lesson effectively.

As the teacher moves on to organizing the search for a solution, he or she first identifies the problem, then asks the problem questions and discusses the answers, encouraging students to look for a solution, that is, to look for the first intermediate conclusion. Then, in this case, searches for a solution to the next problem, which should be completed by solving the problem as a whole and expressing the conclusions..

Problem-based learning technology is used not only in higher education, but also in teaching students in secondary schools. The problem-based approach to education is one of the leaders in the educational process and is gaining momentum.

The modernity of problem-based education is characterized by a number of advantages in the successful implementation of school tasks.

The idea of management in pedagogy is reflected in programmed learning, but a number of studies have confirmed that the same problem-based learning is the basis for the rational management of students' learning activities.

Problem-based learning creates a favorable environment for the formation of such qualities as curiosity, creative activity and communication, which are necessary for the personal qualities of the modern future specialist. It is important to note that communication tactics are the basis of problem-based learning.

There are verbal and nonverbal forms of communication, verbal communication means interacting with words, nonverbal communication means information and emotion using means other than words, gestures, facial expressions, body movement, intonation, timbre, stress, etc. sharing also means interaction. Scientists estimate that people receive about a third of their information and emotions through words and two-thirds through nonverbal means. With this in mind, it is important to learn how to use nonverbal tools effectively to influence your audience. It is important to remember that the human psyche is made up of three main layers in order for communication to be effective, and that it is necessary to influence all three layers in order to be highly effective. These layers are:

a) consciousness;
b) subconscious;
c) motility

It is possible to get results when each layer is exposed separately, but the result will not be high. High results can only be achieved by simultaneously applying all three layers. This means that the teacher must take into account the importance of communication in the process of imparting new knowledge and information to students, the formation of skills and competencies, that is, in creating a challenging learning environment.

Creativity is not only an innate human trait, but its formation and development depends on the conditions and opportunities available.

According to psychologists, mental ability can be developed only in the process of thinking. Development requires the learner not only to model or assimilate the reality of others, but also to think independently of the nature of the research. So, development depends on the results of the student's independent and active work.

It is well known that the acquisition of new knowledge, rules and regulations is carried out in two main ways. The first method allows to acquire the required amount of knowledge in a short time (reproductive method). The second method is the most effective and helps the student's mental development (productive method), but it takes more time. This creative approach helps to develop students' deep knowledge, a serious attitude to learning, and independent creative skills.

Any human activity, especially mental activity, cannot be effective without psychological preparation. To do this, in the preparation of students for intellectual activity in the classroom, it is necessary to create in them such moods as curiosity, passion and desire. There are many tools, methods and techniques to do this, and problem-based learning, which is one of the methodological systems for preparing students for intellectual work, is of great importance.

Many problem situations arise from practical exercises or problem solving.

Problem-based learning consists of a system of educational tests, new knowledge and information, examples and problems, and in the process of solving them, students' cognitive activity is formed. Problem-based learning is also a methodological system that consists of the combination of word and exhibition.

Creating a problem situation, setting a problem, solving it in stages, making a hypothesis, proving it, testing it - these are all control elements that are specific to problem-based learning.

Creating a chain of problem situations in the management of students' activities to solve learning problems independently is the essence of the problem-based learning process.

The content of a problem-based lesson depends on the content of the cognitive activity inherent in the research activity. The problem situation involves the various stages of the knowledge acquisition process and provides a systematic research activity. Therefore, in problem-based learning, the principles of modern teaching and the development of students' cognitive abilities are fully enhanced.

The role of such a system may be in the organization of individual lessons, in the themes of learning, or in the combination of other methods in the learning process.

Organizing students' learning activities in descriptive geometry classes is one of the most difficult tasks for a teacher. Observations show that in drawing geometry lessons, the initiative is often only on the teacher's side: the teacher sets the goal of the lesson, and shows how to solve it. In such an educational environment, there is no opportunity for students to think independently, logically, there is no chance for creative thinking, no initiative is required. Student activities are limited. Obviously, such activities do not produce the expected results.

Sequential processes and the choice of directions in a problem-based education system allow students to work independently and freely. Achieving this activity requires a great deal of scientific potential and experience from the teacher.

The peculiarity of the science of descriptive geometry is that there are many different approaches to the teaching of this science. The development of students' spatial imagination, that is, memory and imagination, and graphic thinking, is at the heart of the whole course.

Requirements and rules of state standards, division of space into octants, finding traces of the plane, rotation, gluing,

providing general information about the intersection of surfaces - the problem is the same for all through the new knowledge and direction of materials in the passage of topics discarded.

Methods of creating a problem situation in the classroom.

The basic concepts of problem-based learning are "problem situation", "problem" and "problem problem".

The challenge is the student's conscious difficulty in creatively exploring new knowledge, new methods, new modern technologies, and action.

If a student is not given the basics of creative research to overcome a problem, there is no food to think about. This means that the student will not accept it for solution.

Student thinking begins with describing and identifying the problem. Now, in this case, the problematic situation becomes a problem.

The problem does not indicate the direction of the solution, nor does limit it. A problem with some parameters for the solution will be a problem.

During the course of the lesson, the student will be able to think logically about the topic, and problem situations will arise that will motivate them to search for and master scientific conclusions. Problem situations can be natural or artificial. For example, what is the position of the surfaces when they intersect, and some of the sides of the surfaces may be smaller or larger. Why did this happen? Then a natural problem arises. While seeking the causes, one needs to solve the problem. To do this, you need to find out where the mistake was made and what caused it.

Studies have shown that the proportions of the intersecting surfaces are not maintained. The result is correct when you redraw.

Another example is the definition of the intersection lines and invisible parts of the triangular planes ABC and DEF in two ways.

In the first method, to find the intersecting lines of the triangular planes *ABC* and *DEF*, a frontal projection plane $P(P_H, P_V)$ is drawn through any lines, for example, *FD (F′F′, F″D″)*. The P_V frontal trace of the converted plane *P* intersects the *A′′C′′* side of the *ΔABC* plane at *1′′* and the *A′′ B′′* at *2′′*. So *P∩ΔABC → 12*. A *1′2′* horizontal projection of the *12* intersecting lines is made using the connecting line and it intersects *F′D′* at point *T′*. The *T′′* frontal projection of the point *T* is found. At the point *T (T′, T′′) ABC* and *DEF* belong to the line of intersection of the triangular planes. Now the horizontal projection plane $Q\ (Q_H, Q_V)$ is passed through the *AC (A′C′, A′′C′′)* side of the *ΔABC* plane. The Q_H horizontal trace of the converted plane *Q* intersects the *E′F′* side of the *ΔDEF* plane at *3′* and the *E′D′* at *3′*. So, *P∩ΔDEF →34.* The *3′′4′′* frontal projection of the intersection line *34* is made using the connecting line and it intersects *A′′C′′* at point *N′′*. The horizontal projection *N′* of the point *N* is found. The points *T (T′, T′′)* and *N (N′, N′′)* are connected to each other and form a cross section *TN (T′N′, T′′ N′′)* (It is recommended to solve the problem and highlight the presentation in separate colors). The section *TN (T′N′, T′′ N′′)* is the line of intersection of the planes *ΔABC* and *ΔDEF (Figure 3).*

In the second method. To find the intersection lines of the triangular planes *ΔABC* and *ΔDEF*, we can see that the solution of the problem can be achieved by any arbitrary example, *ED (E′D′, E′′D′′) (Figure 4).* A student who has studied the process of working with problem with *method 1* will be able to work on such problems without hesitation in *method 2*. These positional and metric issues encourage students to engage in creative activities. Students who fully understand the practical significance of the auxiliary projection method will have the opportunity to use their time efficiently by using this method in science Olympiads. By using this method, they will be able to take honorable places in science olympiads, and researchers will be able to give them extra points by expressing their reaction to the options developed in this way. The main reason why most students do midterm or graphic work in Method 1 is because the science teacher is not familiar with these methods or has little class time.

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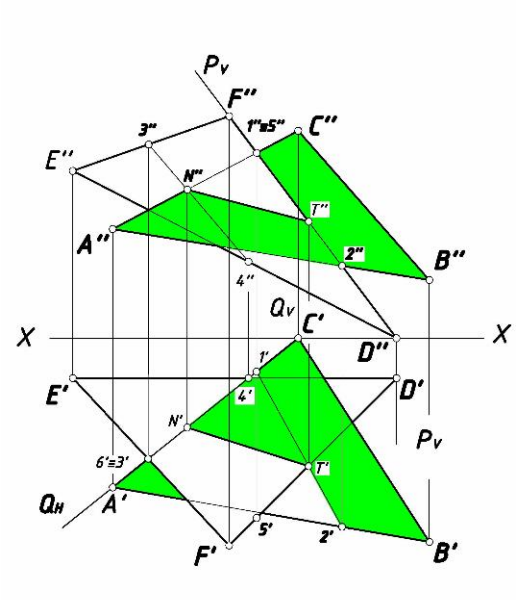

Figure 3. The problem to be solved in the first method.

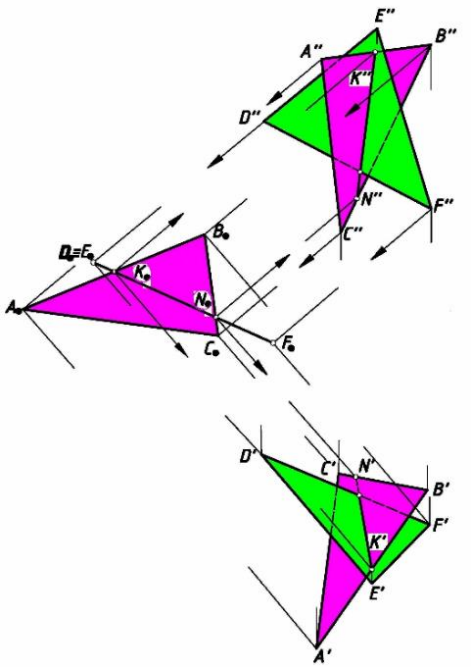

Figure 4. The problem to be solved in the second method. .