

Section 3. Mathematical Education

<https://doi.org/10.29013/EJEAP-20-1-11-16>

*Zulfikarov Ilkhom Makhmudovich,
Andijan branch of Tashkent State Agrarian University
E-mail: izulfixarov@mail.ru*

*Tajiev Mamarejab,
Center for Higher Education Development Research
and Implementation of Advanced Technologies
under the Ministry of Higher and Secondary Special Education
of the Republic of Uzbekistan*

METHODS OF EFFECTIVE ORGANIZATION OF TEACHING MATHEMATICS AND SELF-SYUDY IN THE PROBLEM-BASED TEACHING

Abstract. In this article: strengthening the material-technical and informational base of higher education institutions, further improving the quality of teaching and learning processes in mathematics and independent learning by providing high-quality educational literature, modern teaching methods and educational technologies; the stages of changing of the student's perceptual activity related to solve problematic situations in the effective organization of math classes are analyzed.

Keywords: teaching process, modern teaching methods, teaching methods and techniques, effective organization of teaching, teacher professionalism, comparative analysis, content and essence of problem-based teaching, cognitive activity, student's independent learning.

Widespread use of modern science and technology in the educational process of foreign countries, and based on this the organization of teaching is putting new tasks for higher education. Based on a thorough analysis of the results of international best practices and studies on sustainable development education, the development and prospects of education in the Republic are connected with major changes in economic, social, political and cultural spheres. In order to participate in such changes, people will need a high level of general and specialized knowledge, high culture, spirituality and a wider

world view. Preparing personnel on these requirements is one of the most important tasks of today.

At the same time, the Decree of the President of the Republic of Uzbekistan dated July 27, 2017 № PD-3151 "On measures to further increase the involvement of branches and sectors of the economy in improving the quality of higher education specialists" defines the goals, objectives and directions of educational activities. The implementation of these tasks depends, first of all, on the teacher, his or her level of knowledge and professionalism. How the teacher performs the tasks assigned to him or her with conscient-

tious, intelligent, and professional skills is an important factor that ensures the future of society.

Strengthening the material and technical base and information background of higher education institutions, further improving the quality of effective training activities on the basis of high quality educational literature, modern teaching methods, and educational technologies are becoming more important. That is why one of the most important requirements of today is to further improve the professional skills of teachers, to organize training sessions using educational technologies in the educational process.

This article demonstrates the organization and implementation of teaching methods in mathematics based on the educational technology in higher education institutions of the Republic, using the comparative analysis of educational institutions of foreign countries and universities.

It should be noted that the role and importance of problem-based teaching in improving the methodology of effective teaching of mathematics are one of the factors that contribute to the increase of students' participation in the lessons.

At this point, it is important to focus on the content and essence of problem-based teaching. Problem-based teaching is based on the ideas of John Dewey, an American philosopher, psychologist and educator. J. Dewey and Bruner believed that the main purpose of teaching was to develop logical thinking.

At the beginning of the 20th century, American philosopher, psychologist and educator John Dewey proposed his own didactic system that was in contradiction to Gerbart's didactic system and tested it in a Chicago school. John Dewey argues that a student, not a teacher, should be active in the classroom, and that the knowledge provided in the lesson is consistent with the needs of the students and he thinks that memorizing the knowledge of the book in vain will not lead to anything, but will discourage the students from reading and blunt their thinking.

John Dewey's main contribution to education is "a complete process of reasoning". This is because

the leading circle of the whole process of reasoning is the emergence of the problem. Once the problem has arisen, the student gets in trouble, seeks out its solution, and after a series of considerations, he finds and tries to solve the problem, and again, if he is wrong, re-evaluates it and after a few repetitions of the process, it eventually finds its solution.. As a result, a complete process of thought is realized, and later such a didactic system has become known as a problematic lesson [2, P. 66.].

Indeed, the math learning process has its positive effect on the perfect mastering of math only if the "full process of reasoning" is represented by the students. For example, at the beginning of the lecture, problem-based questions are raised and according to students respond to them the new topic will start and during the lesson the student will understand what the issue is.

As a result of psycho-pedagogical research on problem-based teaching in order to develop students' creative thinking, a common technology of problem-based teaching was developed. In other words, V. Okono concludes that teaching is "a unit of problem-solving, expression the problem with words, helping students solve problems, checking their solutions, and guiding them in systematizing and consolidating the acquired knowledge."

It is important to recognize that during math teaching, a teacher can increase student activity in the classroom by expressing a topic problem in words. Based on this, I. Y. Lerner argues that the essence of teaching is that the student participates in the guidance of the teacher in solving new educational and practical problems that are new to him.

In our view, problem-based teaching refers to the learning process that involves the organization of independent activities aimed at creating and resolving problematic situations in the minds of students under the guidance of a teacher during the course of teaching. As a result of this process, knowledge acquisition, creative acquisition of skills and the development of students' thinking are achieved.

The effective organization of math classes goes through a number of stages as the perceptual activities associated with solving the student's problematic situations.

The first step is to see, formulate and express the problem. In order for the problem to function as an impulse, it must be accepted as a subject of the solution, which requires only some initial information, knowledge, abilities and so on. The availability of intellectual tools to carry out operations on the subject matter of the situation is possible. Only then the problem will be reversed to the extent of the problem. From this point of view, the ability of the teacher to see and reformulate the problem in the course of the training can be seen as one of the important qualities of a modern mathematics teacher.

The second step is understanding and accepting the problem. This phase begins with the process of articulating the problem. In order to solve it, it is necessary to define the problem itself: what are its conditions, what is known, whether this problem has not been encountered before, whether there is a similar or related problem, and whether there is a need to add auxiliary elements to make use of the previous problem; can the problem be described differently, and so on?

The third stage is researching. The students move forward in their thinking, feeling their sequence of actions partially reflects the solution to the problem. As a result, ideas and hypotheses about the principles of problem-solving emerge on the basis of other problem-solving skills, existing knowledge and intuitive thinking. Among many such propositions, the student chooses a hypothesis. The student's cognitive or learning activity becomes more active in the search for the right hypothesis related to the promotion of propositions, which include debates and conclusions.

The study shows that students having experience of independent activities do analytic-synthetic thinking: problem solving begins with the data of the problem and continues until the next steps of

the solution are clear. Then synthesis occurs. According to Yu. N. Klutik, S. L. Rubinstein, A. M. Sohor and others, at this stage, re-expression of the terms and conditions of the problem is carried out. As a result of re-expression, the problem is re-perceived, which leads to the discovery of new relationships and new connections between the elements of the problem.

The fourth stage is controlling. By distinguishing between unnecessary actions and necessary ones, useful actions and useless ones, the student represents the problem at this stage. During the controlling phase, the general hypothesis is corrected, refined, and categorized. The initial idea is transformed into a hypothesis that is specific to a particular solution method.

The basic objectives of problem-based teaching can be clarified in the effective organization of training sessions based on the stages of addressing the student's problematic situations discussed above. That is:

- the acquisition of knowledge, skills, abilities by the learners;
- increasing firm knowledge;
- development of independent activities;
- formation of research skills and abilities;
- development of cognitive and creative abilities.

At the same time, the student has a number of difficulties related to performing certain actions in solving the problem of mathematics. Specifically:

- actualization of a group of problems, including a defined component of the problem;
- selecting from the problem group what is needed for its solution;
- detecting the event of the problem by its signs and symptoms;
- defining the features expressed in the problem, and so on.

In problem-based teaching, learning content is organized as a set of problematic situations. The best way is to include problematic situations in the traditional description of the teaching material.

From this, Kudryavtsev considers the essence of problem-based teaching as a didactic problem for students, its solving and mastering of generalized knowledge and principles of problem-solving, while Makhmutov considers that problem-based teaching is a developing form of teaching, he also considers a combination of systematic independent research activity of students and the development of readable conclusions in the subject.

Summarizing the above, it is worth noting that one of the main factors of effective organization of teaching process in higher education today is the improvement of the methodology of efficient organization of the learning process in mathematics.

Pedagogical and psychological aspects of the organization of teaching activities that contribute to the effective organization of the educational process in higher education are given in the works of the scientists of the our Republic such as M. G. Davletshin, E. Goziev, P. T. Magzumov, F. R. Yuzlikaev, Sh. Sharipov and others from CIS M. I. Makhmutov, V. A. Slastenin, V. S. Lednev and others. On studying the methodological aspects of teaching mathematics to students in educational institutions are given in the works of scientists of our Republic J. I. Ikromov, N. R. Gaybullayev, T. To'laganov, T. Tojiev, G. V. Zlotsky, S. Alikhanov, M. Raemov, D. Yunusova, N. Eshpulatov, Ch. Mirzaev and others, in the CIS were researched by Y. I. Kalyagin, Y. N. Markarichev, A. A. Stolyar, V. I. Mishin, V. S. Cherkasov, A. G. Mordukovich, G. I. Sarantsev and others. Research works on the organization of training courses for students in higher mathematics in higher education institutions are done by a number of Uzbek scholars, such as T. A. Azlarov, H. T. Mansurov, A. Sadullaev, G. Khudoyberganov, R. Gulomov, x. and others.

The evidence from the authors of the above studies shows that students studying in higher education have a deep knowledge of mathematics, they are well acquainted with pedagogical situations, teaching methods, but at the same time there is no method

of teaching mathematics lessons based on modern technology and teaching methods.

In this regard, to study and analyze the current state and psychological aspects of mathematics teaching in higher education institutions, and to determine the specifics of the organization of mathematics lessons using modern teaching methods and techniques; to develop a classification of the topics of math lessons and, based on this, to draft specific topics of math lessons; to create a new generation of educational-methodical complex, which is the basis for the organization of practical activities in mathematics; to develop and implement the methods of organization of mathematical studies using educational technologies and modern methods of teaching can be considered as the basis for high-level organization of math classes in higher education institutions.

While the current flow of information is increasing day-to-day, it is necessary to pay more attention to the independent work of students to improve the effectiveness of the educational process. Independent learning work is now widely used in all stages of the educational process, including the acquisition of new theoretical knowledge.

Teaching methods play an important role in shaping students' ability to learn independently from math and consider what, why, and how to achieve greater efficiency in improving the quality of their mathematical teaching. In this case, it is important to use teaching methods as well as the correct choice of students for effective organization of independent learning processes.

Currently, the system of higher education in the country is based on the use of "non-traditional", "interactive" and modern teaching methods and the process of student self-education. This, in turn, has its effect.

Also, the organization of the independent learning process of students using modern education and information technologies will have the following positive results:

As we know from history, the new generation will always have more than any previous generation in every field, including new knowledge, especially technical knowledge, skills and abilities. In the mid-twentieth century, the development of science, technics and technology were processed as evolutionary and gradual. Therefore, the level of scientific progression of successive generations up to this point was not so different. However, by the second half of the twentieth century, scientific and technological progress has reached a high level and is rapidly developing. This requires from today's generation deep knowledge, skills and habits, as well as self-improvement. Because future technology is replacing tomorrow with a more sophisticated technological innovation.

One of the main issues on the agenda is the problem of accelerated training of competitive personnel with the education system in the conditions of information flow rate. It is well-known that in the traditional system of education a teacher is represented as a single subject, and students serve as objects. In this system, teaching is compulsory and the teacher is the leader.

While using traditional teaching methods, students' independent learning skills are developed, but skills development is slow. As a result, they lack the ability to think independently and critically. This may encourage them to maintain a positive attitude towards their future independent work.

It is necessary to pay special attention to the organization of independent learning process of students on the basis of modern teaching methods. Specifically:

- formation of motivation for students to master the learning material independently;
- encouraging aspirations for independent thinking;
- relying on students' independence and initiative in organizing the learning process;
- broad opportunities for student self-government;
- formation of each student based on their abilities and independent aspirations (refusal to provide the same education to all);

- search for and develop the personal qualities of each person;
- the teacher should have the confidence that every student is gifted, based on that, respecting him/her, respecting each and every thought;
- to encourage, support each student's achievement, create favorable circumstances and, thus, to strive for greater knowledge acquisition;
- to provide opportunities for each student to demonstrate his or her independence skills in the learning process.

It is evident that today's students need to be encouraged to pursue independent learning based on the development of their independent thinking, given the opportunities available to them to achieve effective results in education. To do this, students will be required to organize an independent learning process using the following modern methods of learning, including their level of knowledge, level of proficiency, source of learning and didactic tasks in the independent development of learning content by introducing modern education and information technology:

Based on the principles of pedagogical technology, it is desirable to use the following three categories to help students develop their own learning and develop their independent work skills.

The first category is called 'Traditional Methods' whereby the transfer of knowledge to students is based on the 'Delivery' principle. They are: informative – receptive or illustrative – explanatory; reproductive; problem statement; heuristic or semi-research and research, "telling", "presenting", "demonstration", "presentation of the report", "question-answer" and others.

The second category is called "non-traditional" or "Interactive methods", which relies on the principle of "Activating" students when they acquire knowledge. They include: "Shatalov's Intensive Training", "Problem Lesson", "Intellectual Attack",

“Brainstorming”, “Working with Small Groups”, “Roundtable”, “Cluster Method”, “B.B.B.”, “6×6×6”, (“3×3”, “4×4”...), “boomerang”, “black box”, “controversy relation”, “seesaw”, “staircase” and many other methods.

The third category is called “Advanced or Modern Methods,” which is based on the principle of “Accelerating and Increasing Effectiveness”. These include “focused text”, “programming”, “technol-

ogy mapping method”, “modular learning method” and “design method” and “Pedagogical technology”, which combines the advantages of all methods [3].

It is clear from the above that teaching methods are a set of methods for teachers and students to collaborate, which will help them gain new knowledge, skills and abilities, develop a student’s outlook and develop independent learning skills and abilities.

References:

1. The Decree of the President of the Republic of Uzbekistan dated July 27, 2017. № PD-3151. “On measures to further increase the involvement of branches and sectors of the economy in improving the quality of higher education specialists”.
2. Ziyomuhhammadov B., Tojiev M. Pedagogical Technology – Modern Uzbek National Model // – Tashkent: “Ishonch MS”, 2009.
3. Tajiev M., Tolipov U. K., Seitkhalilov E. A., Ziyomuhhammadov B. Pedagogical technology is basis of modern science and theory // – Tashkent: “Ishonch MS”, 2008.– 186 p.
4. Jan Amos Komensky. Great Didactics // – T.: “Teacher”, 1966.
5. Makhmutov M. I. Modern lesson.– M.: Pedagogy, 1985.
6. Pimbley G. “Periodic solutions of predator-prey equations simulating an immune response” J. Math. Biolci, 1974.– V. 20.– P. 27–51.