

**“SCIENTIFIC PROGRESS”
ILMIY JURNALI**

**«O‘zbekistonda innovatsion
ilmiy tadqiqotlar va metodlar»
mavzusidagi respublika 1-son
ko‘p tarmoqli ilmiy masofaviy
konferensiya materiallari**



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**«O‘ZBEKISTONDA INNOVATSION ILMIY
TADQIQOTLAR VA METODLAR»
MAVZUSIDAGI RESPUBLIKA 1-SON
KO‘P TARMOQLI ILMIY MASOFAVIY
KONFERENSIYA MATERIALLARI**

TOSHKENT – 2020

**«O‘zbekistonda innovatsion ilmiy tadqiqotlar va metodlar» mavzusidagi
respublika 1-son ko‘p tarmoqli ilmiy masofaviy konferensiyasi**

**«O‘zbekistonda innovatsion ilmiy tadqiqotlar va metodlar» [Toshkent;
2020]**

« O‘zbekistonda innovatsion ilmiy tadqiqotlar va metodlar » mavzusidagi
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PERCULARITIES OF ORGANIZATION OF LEARNING PROCESS IN THE CONTEXT OF STEAM EDUCATION TECHNOLOGY

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Annotation In this research work about the problems of the learning process mathematics for students in the STEAM education is investigated. The STEAM technology of education allows creating in schoolchildren skills in conducting a laboratory experiment, understanding of fundamental scientific concepts and laws, ability to apply modern tools of activity, critical thinking and creativity.

Key words: STEAM technology, learning, young schoolchildren, laboratory experiment, mathematical knowledge and skills

The benefits and relevance of STEAM education today are obvious to many specialists. The most important psychological and pedagogical conditions of the program «STEAM education for young schoolchildren" is the professional development of teachers who work in this STEAM. According to STEAM pedagogy, a schoolchildren should be interested in learning, knowledge should be applied in practice and directly related to practice, the learning itself should be entertaining in form, captivating the child and bring real results in the future, primarily in the profession [1]. It is practice that combines disparate natural science knowledge into a single whole. All these advantages of STEAM education are obvious for schoolchildren, but how realistic is the simple mechanical transfer of STEAM pedagogy into preschool childhood? First of all, it should be noted that the problem of education STEAM-fully satisfies to modern requirements. So, it can be say that "schoolchildren shows curiosity, interested in cause-and-effect relationships, tries independently invent explanations of natural phenomena and enrolled stone people; inclined to observe, experiment:

- has initial knowledge about himself, about the natural and social world in which he lives;
- knows working with children's literature, has a basic pre representations in nature, natural history, mathematic;
- is capable of making his own decisions, relying on his knowledge and skills in various activities.
- takes the initiative and autonomy in various activities - the game, overall .

All these qualities are developed in the process of implementing the STEAM education for primary schoolchildren program. The schoolchildren learns to cultivate curiosity, explore engineering skills and way of thinking, develops teamwork skills. The vital activity of a child before school cannot be simply preparing him for schooling. This is the first time the acquisition of cultural identity of experience, development initiatives, nucleation of creative activity, self-reflection and the needs [2]. The teacher, who works on the program «STEAM-education" should reconsider the course of interacting with the schoolchildren. The teacher gives the schoolchildren the opportunity to bring their own new concepts of experience and probing questions of the teacher. This requires a lot of patience and tact from the educator. Activity based on the principle of the experiment, from the formulation of objectives, through the discussion of the methodology and the course of experience, observation of and experimentation for the evaluation and the story of what he saw.

Telling develop in schoolchildren the ability to clearly express his thoughts, hearing possible different opinion, through dialogue to be able to defend their right to this or to admit the truth of the other. The teacher in this situation reflects with the children, cuts off wrong judgments, maintains the interest of the children in the problem of the experiment. This is a complex technology that must be mastered by a STEAM educator. Research activity also develops elementary mathematical skills - one of the components of the STEAM. Children often need to assume measure, to compare, to

determine the shape and size, which gives a mathematical representation of the real significance and contribute to their realization.

Objectives of natural science education, particularly mathematics in basic school is to form:

- interest in science and knowledge of the surrounding world;
- skills in conducting a laboratory experiment;
- understanding of fundamental scientific concepts and laws;
- the ability to apply modern tools of activity;
- critical thinking; creativity;
- teamwork experience and collaboration skills;
- research and design skills;
- willingness to study natural sciences in English.

As we know that in grades 5-6, the mathematical sciences are studied in the framework of the integrated second subject of "Natural Science (Mathematics)", whose purpose - to introduce the concepts and phenomena, as well as form a basic mathematical skills. The mathematics studied 5 hours per week: twice for two hours (steam), in which most of the time takes laboratory practice, and additional hour, focused on individual learning (training of laboratory reports, etc.) [3-6].

In grades 7-9 subjects are taught in the educational area "Mathematics" held in schedule 7 hours a week: three double hours, including laboratory practice, and one hour individual self-study on the subject. In grades 7-8, each of the natural science subjects are taught in the training modules format: 2-3 weeks all 7 hours are devoted to the study of one of the subject. The sequence of items throughout the year builds in the logic of interdisciplinary connections (example: before studying geography theme "Atmosphere", students of the 7th grade are engaged in within 2 weeks physics, mastering concepts: buoyancy force, atmospheric pressure, thermal expansion, convection ...).

The study of the natural sciences or mathematics is based on the sySTEAM-activity approach and understanding of constructionist learning process: each person builds his own knowledge and understanding on the basis of personal experience; This process occurs after successive increment knowledge; the knowledge mastered by a person develops and becomes clear in interaction with other people. Such education has about problem character [7,8].

Most of the time, students solve practical problems in small groups (2-4 people) using laboratory experiments. They perform tasks, answer questions, design tools, constructed installation, and plan to conduct simple investigations with them. Students receive assignments through the information environment (LMS) of the school, using personal digital devices (laptops). The basic form of evaluation is formally: schoolchildren receive task in order to verify the availability of knowledge and skills, and for their formation. Accordingly, the error is normal for it and their appearance meets not a negative evaluation and positive feedback: what needs correction and how to do it. Operational feedback is given directly to the implementation of practical work time (in each group separately and individually).

An ongoing assessment of the performance of each student occurs every lesson. It can be evaluated only those results that are teaching placed in the information environment. The basic form of the result - a report on laboratory work, which recorded: answers to millet, the results of the task, do the experiment the children, plants, appliances. The report is the subject of a qualitative assessment (an inverse relation), because it allows you to evaluate the knowledge and understanding of the subject and the level of formation of subject skills and universal educational activities (competencies). Evaluation reports occur within the one day (before the next session).

So what are the educational advantages of STEAM from a pedagogical point of view?

1. Stimulating students to scientific knowledge.
2. Inclusion of students in active creative activity.
3. Development of students' interest in technical creativity, programming.
4. Formation of schoolchildren's logical and algorithmic thinking.

The target component of the model for the formation of research skills is represented by the goal and naturally derived elements from it: tasks, principles and approaches. The main goal of the model is to form research skills in younger schoolchildren in extracurricular activities. To achieve this goal, the following tasks were derived:

- 1) ensuring the motivation of junior schoolchildren for research activities;
- 2) the organization of extracurricular activities that ensure the formation of research skills in younger schoolchildren;
- 3) the creation in the classroom of extracurricular activities of pedagogical conditions that increase the level of formation of research skills;
- 4) diagnostics of the course and results of skills formation.

The pedagogical experiment was carried out in the STEAM-center of the "Lyceum". The study involved 4 grade schoolchildren attending educational robotics classes. For the reliability of the experiment, identical groups were identified: experimental and control. The groups involved an equal number of schoolchildren - 4 people each. A total of 8 schoolchildren participated in the experiment. After analyzing the quantitative results of pedagogical observation in the experimental group, we can conclude that after the emerging experiment the level of research skills among students increased significantly.

Schoolchildren	Ball	Level
Nodira	14	High
Ulugbek	10	Average

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Rustam	8	Low
Dilbar	12	Highest

The typical tasks on mathematics for 7-8 grades within the International program of STEAM.

Find the area of a rectangle with given sides.

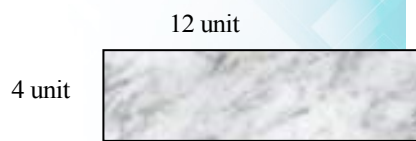


Figure1

It only requires knowledge of the formula for the area of a rectangle and the simplest calculation!

Research assignment

What are the rectangles with an area of 48 sq. food can you offer?

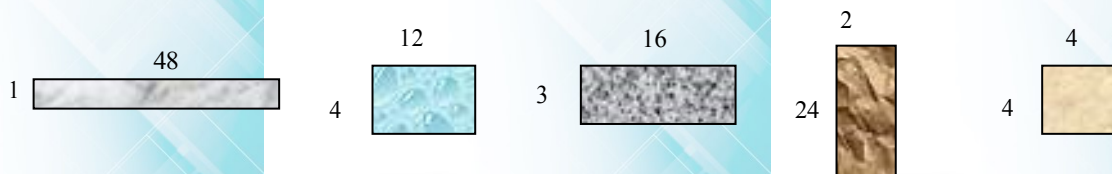


Figure2

Requires imagination, an idea of what a rectangle is, knowledge of decomposing a number into factors, using brute force strategy ...

Assignments with visual templates

Benefits of assignments:

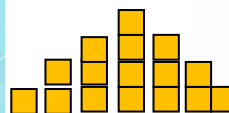
- The visual nature of the tasks, rather than operating at once with numbers and readymade sequences
- The ability to translate the problem from everyday language into formal by the student himself
- The freedom of the student to choose their own strategies for counting squares
- Ability to discuss and reason, rather than “execute”



Case1



Case2



Case3

Figure3

Activity structure

Construct a square

Activity from Desmos has an interesting construction: in the first task, students are asked to build a square, in the next one - to analyze how he came to his solution. For the technical implementation of such a possibility, the teacher - provides for the possibility of "embedding" the solution that any student finds in the next screen.



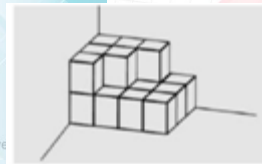
Square

Figure4

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The tasks on mathematics for 7-8 grades within the International program of STEAM.

1. Nodira is stacking the boxes in the corner of the room. All boxes are the same size. How many boxes did he use?



25	<input type="checkbox"/> A	<input type="checkbox"/> C	18
19	<input type="checkbox"/> B	<input type="checkbox"/> D	13

Figure 5

2. The figure shows a sequence of 6 figures.

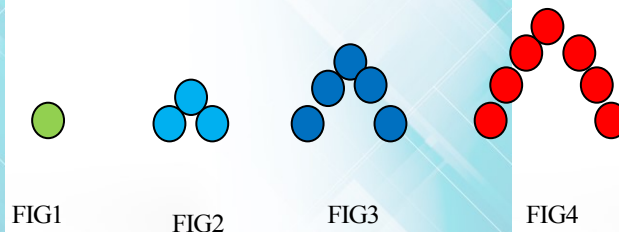


Figure. 6

Complete the table by entering the data specific to Figure 6.

	FIGURE	NUMBER
1		1
2		3
3		2
4		4

3. The children are watching the shadows fall from the trees at different times of the day. What shadow do they see in half a day?

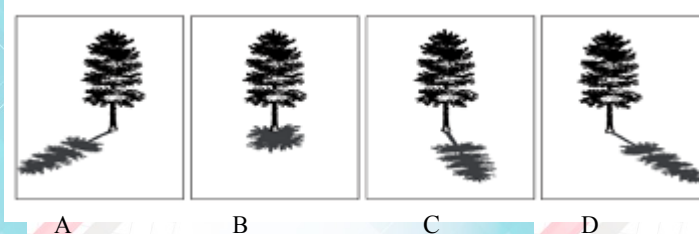


Figure 7

CONCLUSION

Thus, in this paper, the problem of the learning process mathematics for students in the STEAM education is investigated. The STEAM technology of education allows creating in schoolchildren skills in conducting a laboratory experiment, understanding of fundamental scientific concepts and laws, the ability to apply modern tools of activity, critical thinking and creativity.

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