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THE ROLE OF MATHEMATICS IN THE FORMATION OF PUPILS' CREATIVE ACTIVITY

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РОЛЬ МАТЕМАТИКИ ПРИ ФОРМИРОВАНИИ ТВОРЧЕСКОЙ ДЕЯТЕЛЬНОСТИ УЧАЩИХСЯ

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Abstract. The article is devoted to the problem of the development of the creative activity of students in grades 5–6 in the process of teaching mathematics. It is noted that the fulfillment of a creative task requires from students not a simple reproduction of information, but creativity, since the tasks contain a greater or lesser element of obscurity. A creative task is the content, the basis of any interactive method. A creative task (especially practical and close to the student's life) gives meaning to learning, motivates pupils. To develop the creative activity of students, you can use specially developed various software tools (Learning Apps, Mentimeter, Quizizz, etc.) in the lesson. With the help of a huge number of online services, you can create a whole collection of interactive tasks of the following nature: study an interactive lecture and answer the questions; answer questions of the test, quiz (with one or many correct answers); build a timeline and others.

Аннотация. Статья посвящена проблеме развитие творческой деятельности учащихся 5–6 классов в процессе обучения математике. Отмечается, что выполнения творческого задания требуют от учащихся не простого воспроизводства информации, а творчества, поскольку задания содержат больший или меньший элемент неизвестности. Творческое задание составляет содержание, основу любого интерактивного метода. Творческое задание (особенно практическое и близкое к жизни обучающегося) придает смысл обучению, мотивирует учащихся. Для развитие творческой деятельности учащихся можно использовать на уроке специально разработанных различных программных средств (Learning Apps, Mentimeter, Quizizz и др.). С помощью огромного количества онлайн-сервисов можно создать целую коллекцию интерактивных заданий следующего характера: изучить интерактивную лекцию и ответить на поставленные вопросы; ответить на вопросы теста, викторины (с одним или множеством правильных ответов); построить ленту времени и другие.

Keywords: creative activity of students, creative assignment, online services, interactive assignments, Learning Apps, Mentimeter.

Ключевые слова: творческой деятельности учащихся, творческого задания, онлайн-сервисы, интерактивных задания, Learning Apps, Mentimeter.

Introduction

The people, who are able to initiative and independently think, actively participate in the creation of material and cultural values, in the management of production, in the improvement of social relation that is people who are creatively independent are required in a renewed society. It was established by science that it is necessary for the society to transfer the next generation the elements of creative activity experience, as a special type of activity aimed at changing and improving reality. The idea of forming the creative independence of students in the history of pedagogical thought has its special place.

K.D. Ushinsky wrote about the need to develop the creative independence of students in the process of teaching. "... It must be constantly remembered that it is necessary to transfer to the pupil not only those or other cognitions, but also to develop in him the desire and ability independently, to acquire new knowledge without a teacher to give the student the means to extract useful knowledge not only from books but from subjects, his surrounding, from life events, from the history of one's own soul "[1].

The psychology scientists B.G. Ananiev, D.B. Bogoyavlenskaya, L.I. Bozhovich, L.S. Vygotsky, P.Y. Galperin, V.A. Krutetsky, N.S. Leites, V.S. Merlin, K.K. Platonov, Y.A. Ponomarev, L. Rubinshtein, and others made a great contribution to the study of the creativity of the individual. Vygotsky precisely divided the boundaries of the reproductive and creative types of activity. According to him, the reproductive type of activity is that "a person reproduces or repeats previously created and developed methods of behavior or revives the traces of previous impressions" [2]

The creative type of activity is characterized by the fact that it is aimed at creating something new, "anyway, whether it will be created by creative activity by some thing of the external world or by a well-known construction of mind or feeling, living and revealing only in the person himself"[2].

According to S.L. Rubinstein, creativity is an activity "creating something new, original, which in addition includes not only the history of the creator's development, but also the history of the development of science, art, etc." [3].

Materials and research methods

The role of the individual in the formation and development of creative ability and independence is quite large. N.S. Leites believes that the child's potential depends not only on the mental data, but also on the properties of his personality. The fast pace of mental development often affects different aspects of the intellect as well as features of personality. Maturation in some respects can be combined with the preservation of infantilism in others [4].

Cognitive independence, the presence of a certain level of the formation of creative abilities are possible with the student only if he is systematically included in independent activity, which in the process of performing domestic or independent work acquires the character of problem-searching and creative activity has been repeatedly pointed out in psychological and pedagogical studies.

Creativity possibilities of the person can manifest itself at different ages – in childhood, teenage, adolescent and adult. D.B. Bogoyavlenskaya believes that the formation of creative abilities does not go linearly, but it has two peaks in its development: the brightest burst of their

manifestation is marked in grade 5 (age 10 years), and the second falls to the youthful age. The first peak corresponds to the first manifestation of the creative level, and the lower age limit of the heuristic level falls on the senior age. Heuristic level is characterized as a manifestation of human activity, which has a way of solving, but continues analysis, which leads to the discovery of new ways of solutions.

Creative level - an independently found empirical pattern that is not used as a solution, but acts as a new problem. The unevenness of manifestation in one age group, in the conditions of one education system is explained by D.B. Bogoyavlenskaya [5], the existing in the traditional school setting on the result, which negatively affects the aspiration of children to research search. According to V.A. Dalinger in the process of training it is available to form such ways of activity of students to develop from them such qualities of the mind and personality characteristics that characterize creative independence; it is possible to select training aids that will increase the creative potential of the student. "If you can say so, creativity is learned. Creativity is not only manifested, but is also formed in the independent activity of the pupil "[6].

Table 1

THE STRUCTURE OF SKILLS TO SOLVE WORD PROBLEMS

| <i>Skill</i> | <i>Operational composition of skills</i> |
|---|--|
| Ability to analyze a task | conduct a primary analysis of the text (presentation of the task situation, highlighting conditions and requirements, key words); |
| | select known, unknown, required quantities |
| | establish links between data and the desired |
| | construct models of the task situation (subject, schematic, graphic) and correlate the elements of the problem with the elements of the model; |
| Ability to search for a plan for solving a problem | decompose a compound problem into simple |
| | translate the dependence of the data and the desired into mathematical language |
| | choose rational ways of solving problems |
| | reasoning analytically and synthetically |
| | activate the theoretical knowledge necessary for solving the problem |
| | establish the adequacy of the constructed mathematical model to the original problem |
| Ability to implement the found plan for solving the problem | rationally choose mathematical relationships between quantities |
| | establish the correspondence of intermediate and final results |
| | formulate a solution to a problem |
| | determine the correspondence of the obtained results to the original problem |
| | check the solution in different ways |
| | find other ways to solve the problem |
| Ability to control and correct decisions | evaluate the results obtained in the solution |
| | summarize solution results |

Especially it is important to pay close attention to the problem of developing creative independence for students in grades 5-6, since the age from 11 to 14 years is a critical period of development in psychology as considered by many scientists. L.I. Bozovic believes that the adolescence crisis is associated with the emergence of a new level of self-awareness in this period, which is characterized by the emergence of the adolescent's ability and the need to know himself as a person who, unlike all other people, has inherent qualities [7].

The goal of the process of developing the creative independence of the individual is the self-realization of the personality, the identification of uniqueness in any sphere of human life as theoretical analysis of scientific research has revealed.

This follows from the fact that in the structure of the self-realization function of personality such essential characteristics distinguishes as independence (universal ability to plan, regulate, purposefulness of their activity, to reflect themselves and others), freedom (the universal ability of the individual to autonomous behavior, self-regulation, will and intersubject interaction), creativity (universal ability to concentrate creative efforts, creativity in activity, independence in judgments and responsibility for one's own actions and doing) [7].

Thus, the creative independence of the individual is a dynamic integrative property of the individual, which is the creative activity that determines the individual's ability to self-realization. The main condition and the means of developing students' creative independence is learning activity based on active teaching methods. Personal results in the development of creative independence for teenagers are the ability to implement creative activity, actualization, the needs in self-development, individual style of activity and self-expression, self-organization, a variety of creative manifestations of personality.

Discussion results

Development of creative independence of students in the process of studying mathematical disciplines will be effective if: a) it is carried out with the help of a specially developed system of cognitive tasks that are designed according to predetermined parameters: the purpose of the lesson; the complexity of the educational material; focus on the development of components of creative independence; b) the principles of constructing a system of tasks are singled out: a gradual increase in the complexity of assignments; focus on the development of all components of creative independence. We can conclude that the modern system of teaching mathematical disciplines in high school has tremendous means of developing the creative abilities of schoolchildren based on their experience.

To develop the creative activity of students, you can use specially developed various software tools (LearningApps., Mentimeter, Quizzz, etc.) in the lesson. With the help of a huge number of online services, you can create a whole collection of interactive tasks of the following nature: study an interactive lecture and answer the questions; answer questions of the test, quiz (with one or many correct answers); build a timeline and others (Figure 1-4).

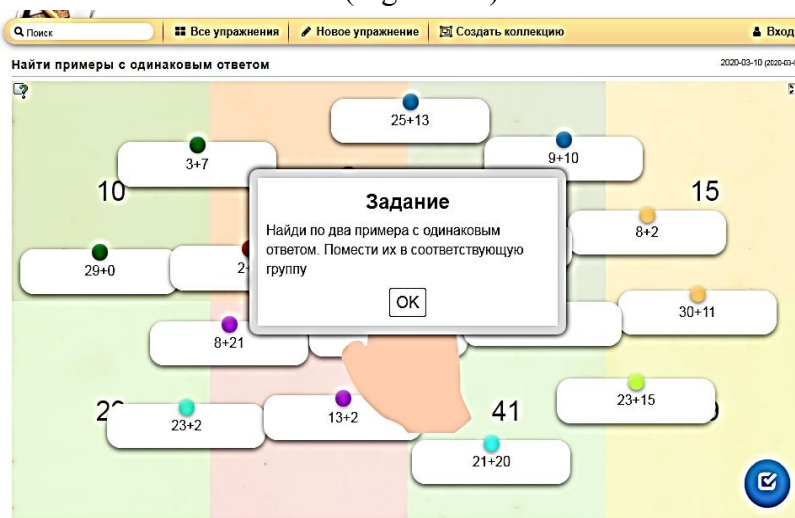


Figure 1. Classification assignments (<https://learningapps.org/view9392331>)

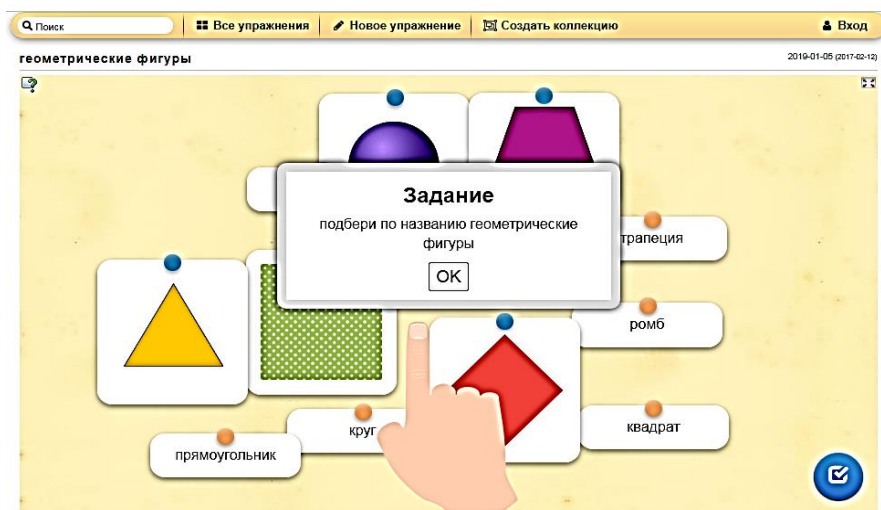


Figure 2. Tasks to find a pair (<https://learningapps.org/view9392331>)

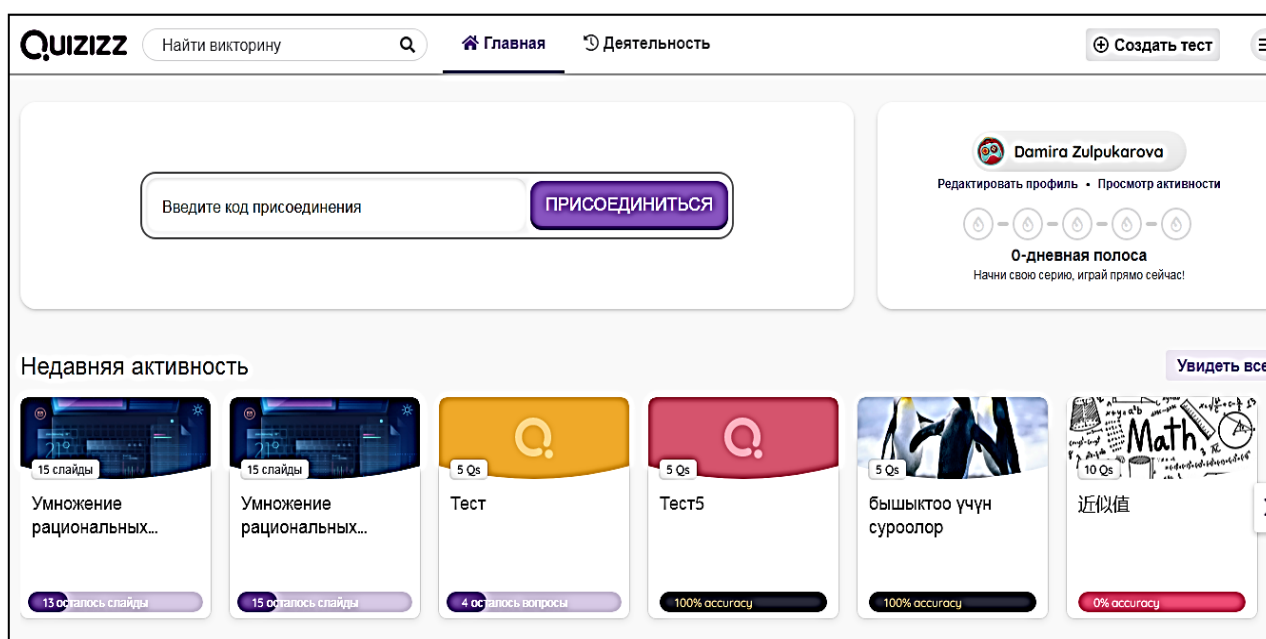


Figure 3. The main quizizz screen (<https://learningapps.org/view9392331>)

Regular use of special tasks and assignments aimed at the development of cognitive opportunities and abilities increases the creative abilities of schoolchildren, promotes personal development, improves the quality of creative readiness, allows children to more confidently navigate in the simplest laws of their surrounding reality and more actively use creativity in everyday life.

Homework of a creative nature presupposes a high level of creative independence of pupils. In the process of performing such works, pupils discover new aspects of the material under study and most fully reveal their mathematical abilities; not a "learning" of the educational material, but its creative application takes place.

Under creative assignments, we will understand such study assignments that require pupils not simply to reproduce information but creativity, since tasks contain a more or less element of

suspense and usually have several approaches. The creative task is the content, the basis of any interactive method. The creative task (especially practical and close to the life of the student) gives the meaning to learning, motivates students. Uncertainty of the answer and the opportunity to find their own "right" decision, based on their personal experience and the experience of their friend, allow creating a foundation for cooperation, co-learning, communication of all participants in the learning process, including teachers. The choice of a creative task is in itself a creative task for the teacher, since it is required to find a task that would meet the following criteria: it does not have an unambiguous and monosyllabic answer or solution; is practical and useful for students; is connected with the life of pupils; is of interest to pupils; serves the special purposes of training as much as possible. Thus, the effectiveness of the choice of tasks requires the teacher to be competent.



Figure 4. Pear deck – online service for creating interactive presentations (<https://learningapps.org/view9392331>)

We determine the content of creative assignments as follows. Consider creative tasks designed in accordance with the program requirements and textbooks "Mathematics - 5" and "Mathematics - 6", as creative tasks should help assimilate the theoretical course of mathematics.

Among the tasks that we regularly apply, we underline the following:

- pupils drawing up of tasks on the studied topics of the program with a specific purpose for their content - ecological, moral, related to local problems, etc. (all the more it is important because of the content of the problems in the textbooks that does not always correspond to the real life) ;
- writing fairy tales, stories on the studied sections of the program, which in helps to solve problems of a holistic generalization of the topic covered the methodological aspect;
- writing poems on the studied rule or law;
- creative practical tasks for the geometric material of the program (inventing figures, names to figures, making up stories and tales from graphs and diagrams, both from teaching aids, and self-depicted), etc.;
- writing essays on mathematics is the highest form of written work, which reflects the pupils' experience, their ability to observe, see, represent, systematize, clearly state their thoughts, fantasize.

During the academic year, contests for the inclusion of short stories, tasks, fairy tales and other products of creative activity in a self-made collection were conducted, which was further effectively used in the whole pedagogical process (in extracurricular work on the subject, in parent meetings, in school mathematical olympiads, in the educational process on following classes). It should be noted that if creative tasks were performed by about a third of the pupils in the class at the beginning of our work, then in the future this number almost doubles, and weak pupils are actively participating in such creative work. As we can see, the motivation for creative cognitive activity rises dramatically. At the final stages of the work, almost all the pupils in the class are actively involved in creative work. It should also be noted that part of the assignment was carried out directly in the lesson at its most varied stages: it is a series of tasks performed orally; tasks for the repetition of educational material; tasks in explaining the new material; tasks for developing an algorithm of actions, developing skills and skills, to consolidate knowledge; tasks for independent works of a creative nature; tasks with game moments.

For example, let's consider the tasks from the subject "Signs of divisibility" for the 6th class.

It is impossible to conduct the lesson by using only creative tasks in the whole educational process, it is necessary to alternate creative activity with the activity of algorithmic, stereotyped. In this regard, trainings that facilitate repeated repetition of tasks of the same type for better consolidation of the material and quick learning of the skill are provided in creative tasks. Elements of training in creative assignments are included with the following requirements: from simple to complex. The main thing in the tasks-training is the presence of a creative element. At the final stage of the training the pupil is invited to come up with a similar task and solve it. For example: think up a number, give your example on the topic, create a task for certain content (with a fantastic or fantastic story, ecological or historical, etc.). Further, to make up his/her chain of examples of "ladder", "chamomile", etc., to come up with his/her own consistent pattern and another.

Examples:

On 4 divide numbers, which end in two zeros or in, which the last two digits are a number that is divisible by 4.

189512 is divided completely into 4 as the last two numbers are 12.

Answer the questions:

A) are they divided by 4 numbers and why: 315668; 109814748; 400044014; 578600?

B) will they be divided by 4 numbers if instead of * put any numbers?

** 32; ** 76; **16; ** 70; ** 48; ** 61; **50; **20? Explain your answer.

C) think up your multi-valued numbers which will be divided into 4.

We see on this example how the creative task solves a number of previously identified problems in the complex. There is an update of previously learned knowledge as the assignment carries new information for the students, at the same time it is based on the available knowledge, and skills (signs of divisibility by 2, by 5, by 10, by 3, by 9, etc.). We also see training with the presence of a new element - division by 4.

Let us analyze as an example, one more task on the topic "Decomposition of a number into simple multipliers" grade 6.

"Simple chamomile".

A) write down the simple numbers in the petals of chamomile so that the result of all these numbers is 240.

B. Draw a "simple chamomile" for number 144. How many petals will it have?

C) Is it possible to draw a "simple chamomile" for the number 47? Justify the answer.

D) Choose any number; draw a "simple chamomile" for it if possible.

We see that this task is of an entertaining nature. During the lesson, this task can be beaten. Steps a), b), c) can be used during a small competitive moment in the lesson. Depending on the goals and objectives of the lesson, the task of "simple chamomile" can be used both on revision, on consolidation, and in a homework assignment. As the experience in solving creative problems increases, it is necessary to teach pupils to formulate tasks themselves. Drawing up the tasks of pupils is of great importance not only for testing the knowledge they have learned, but also contributes to the development of pupils' creative activity. The ability of pupils to critically approach the task condition, analyze data in the job condition and the relationship between them is one of the features of creative activity.

Conclusions

We give examples of problems that were invented by the pupils of the 6th grade.

1. How it can be brought exactly six liters of water from a river if only two buckets are available for measuring it - one with a capacity of 4 liters, the other with 9 liters?
2. Marat had a collection of icons 99 pieces, 30% of these icons he gave to his sister Vera. How many icons did he give to Aisha? How many icons does Maxim have left? (B, pupil 6V class).
3. Before, there were 15 chutes in the Aquapark. It became 25 of them in the following year. How many % of them have increased in number? (A., the pupil 6B class.)
4. The bicycle costs 2500 rubles, and the scooter is 30% cheaper. How much does the scooter cost? (C, pupil of 6V class).
5. Buratino had 45 balloons. He prepared them for the holiday. He began to inflate balls and pierced 13% with his sharp nose. How many balls are left for the unlucky Pinocchio? (M, pupil of 6V class).

Thus, the use of creative tasks in the lessons of mathematics really contributes to the formation of a new type of pupil, who has a set of skills and experiences of independent creative work, who owns the methods of purposeful intellectual activity.

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