

## CONDUCTING LESSONS IN INVENTIVE METHODS

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#### Abstract

The brainstorming method includes the opportunity to combine the efforts of several people and develop each other's ideas. Using the brainstorming method has the following advantages: development, creative and analytical thinking, communication skills, fantasy and imagination, positive, adequate criticism.

**Keywords:** Teacher, Student, Idea, Method, Creative Activity, Problem, Task, Participant, Stage, Idea, Interest.

#### INTRODUCTION

Human history is a long evolution of amazing discoveries and inventions that have greatly influenced people's lives. The first inventions appeared about 2 million years ago. Then people mastered stone processing and taming fire.

Over time, people invented axes, spears, clothing, bows, and pottery. About 10,000 years ago, man developed the idea of animal husbandry and plant cultivation. Since then, the number of inventions has grown by hundreds and thousands [1].

Almost everything that surrounds us is the result of some kind of invention. Plumbing and soap, forks and spoons, door locks, pencils and erasers, light bulbs and switches, elevators and cars—all these were once invented by curious inventors. Surprisingly, many inventions were not used immediately. Sometimes it took decades or even hundreds of years for people to get used to the innovation, improve it and make it usable.

Man always faces problems and difficulties. Inventions help to solve these problems and find a way out of difficult situations. An invention is a new device or a new way to solve a problem. However, the main achievement of an invention is not its novelty, but the fact that it was invented by a person. This is what distinguishes it from discovery, because discovery is finding something that exists in nature [3].

People have been inventing since ancient times. They watched the world around them and tried to adapt it to their needs. For example, after noticing that the wind drives the boat, people invented the sail. Sometimes the unusual use of familiar things led to invention. For example, a man invented a spear by attaching a stone to a stick. Another man invented the bow by bending a stick and tying the ends together with leather string. The arrows shot from it flew farther and more accurately than ordinary spears. Gradually, the number of inventions increased. Plow tools, pottery tools, paper, clocks and many other inventions appeared, as a result of which they made people's lives much easier and more comfortable [2].

In our time, inventions appear almost every day, but this does not mean that inventing has become an easy task. Even now, inventing is a long and arduous task, sometimes associated with danger and risk.

## **METHODS**

The oldest method of invention is trial and error, which is also called learning by doing. This is considered the simplest form of inventiveness, in which an inventive solution can be found gradually or accidentally without any creative thinking. Incremental invention is done through physical human actions, that is, through first making one thing, then another, and testing it over and over again. Random invention, on the other hand, can be found as a result of random surprise, intuition, innate ability, or luck while trying many slowly discovered solutions.

Even now, many inventions are discovered through the use of this "Trial and Error" method - as if this method is the only inventive method. For thousands of years, the idea that there are no other ways and that there cannot be has prevailed. This is how people have been solving inventive problems for thousands of years. The concept of invention eventually became a technology of manual selection of options in problem solving.

The advantages of the "trial and error" method are [3]:

1. It is not necessary to learn this method;
2. Methodological simplicity of the solution;
3. Normal issues are resolved satisfactorily.

The disadvantages of the method are as follows:

1. Moderate and complex problems are difficult to solve in practice;
2. There are no creative solutions.
3. There is no algorithm of thinking and the process of thinking is not controlled. There is an almost random list of options.
4. It is not known when a solution will be found and when it will not be found at all.
5. There are no criteria for evaluating the strength of the decision, so it is not clear when to stop thinking.

One of the next unconventional methods of invention is the "Brainstorming" method, which was invented in the late 1930s by Alex Osborne, a copywriter and one of the founders of the BBD&O agency. This method is still widely used by all pedagogues and inventors.

Brainstorming is a method of finding new ideas, solving a problem or task based on stimulating creative activity. During the brainstorming, the participants express a large number of solutions, and then the most promising, successful and practical ones are selected from the expressed ideas. Its application can significantly increase the engagement of students in all educational institutions, because all students have different mindsets. While using the method, students will have the opportunity to demonstrate their knowledge and think about possible solutions to the problem. At the same time, they learn to express and analyze their thoughts as concisely as possible. The brainstorming method includes the possibility of combining the efforts of several people and developing each other's ideas [4].

"Brainstorming" is one of the methods of critical thinking aimed at activating the mental activity and creative activity of students. When it is used, activity and person-centered approaches are implemented.

The teacher must first decide on the topic and purpose of the lesson and determine the task of teaching according to the method. Then the general plan of the lesson, the time allotted for each stage is planned. Also. It is important to prepare a set of creative questions and develop criteria for evaluating and selecting the "Best" proposal.

One of the options for organizing the work in the lesson is to divide the group into 2 groups. In the first group, students put forward ideas and assumptions and create a bank of ideas. Those in the second group analyze ideas and assumptions. Accordingly, the groups work in turn.

There may be another form of brainstorming. In this, all students simultaneously act first as creators of ideas and then as critics [5].

- 1- Stage. Create a bank of ideas. Estimated time is 10-15 minutes. At this stage, possible solutions are developed. The more of them, the better. It's important that students don't be afraid to express themselves, even if they seem incredible, fantastic! Criticism and comments are not allowed. All suggestions are written on the board by the teacher. Students should know that each of their ideas can and should contribute to the idea bank.
- 2- Stage. Analyzing thoughts. This will take up most of the lesson. All proposals are subject to group discussion, analysis and criticism. It is desirable to find something positive, significant in each idea and consider the possibility of applying it in other conditions. Maybe it needs some tweaking, filling and improving.
- 3- Stage. Processing the results. This step can be done in a separate lesson. Among all proposed and reviewed ideas, the most interesting and practical ones are selected [6].

In order to use brainstorming, it is necessary to choose topics and tasks that are interesting for students and are able to develop their research potential. For this, it is important that the problem has many possible solutions. Thus, new approaches to the study of the subject appear.

## RESULTS AND DISCUSSION

Experts say that when working with students, especially younger students, they can repeat the same idea together and express it in their own way. The teacher should guide them in the right direction, asking them to come up with something of their own.

If students are not active, one of them should be approached personally. For this purpose, it is appropriate to choose the most active student.

Using the brainstorming method has several advantages. They consist of the following [7,8]:

- Mental development of a person;
- Creative and analytical thinking;
- To express one's thoughts fluently;
- Fantasy and imagination;
- Positive, adequate criticism;
- Developing the ideas of others.

The disadvantages of the method are as follows:

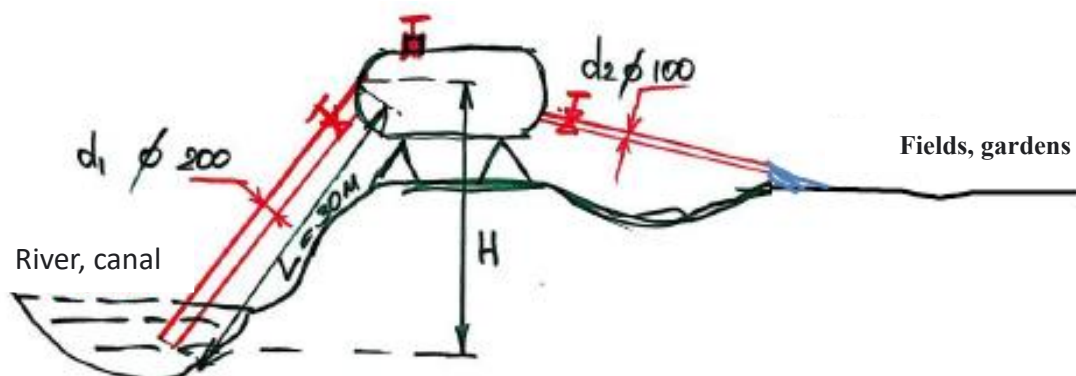
- Impossibility of application to complex controversial issues;
- The difficulty of managing the process;
- It is almost impossible to direct to the desired solution;
- Lack of criteria for evaluating opinions;
- The presence of difficulties in choosing the most promising and interesting offer.

"Brainstorming" method can be used in any field of knowledge. In this case, there are no age restrictions for participants. It will be equally interesting and effective in kindergarten, school, higher education institution.

The teacher can choose any topic both within a specific subject program and for an extracurricular program. For example: "What is an engine?", "How can you move a vehicle with it?", "What can used items and products be used at home?", "Cooking".

Also, a person (teacher, student, etc.) can use this method to solve their individual problems. For example, "Heating houses in winter without electricity, gas, coal and firewood", or "Watering crops when there is no water network in the yard" and so on.

In this case, draw a diagram of the problem on the board or on the screen. Students offer a variety of creative ideas orally or schematically. For example, using underground water for heating houses, obtaining biogas from food waste, obtaining hydrogen gas from water, etc. The use of a hose, siphon, vacuum, air lift, empty plastic containers and pipes, etc. for watering crops in the yard [9].



1- picture Extraction of water by vacuum method

Brainstorming helps to generate interest in the topic and determine the goals of its study. At the same time, teaching becomes more interesting and effective, and students show their creativity. In the process of teaching in this way, students should come to appropriate conclusions about the possibility of connecting various physical effects, details, nodes and mechanisms with each other- as a result, a new device can be made.

In short, the use of the "Brainstorming" method allows students to show that the same problem can have several different solutions, each of which can be appropriate for alternative devices depending on different conditions. The ability of students to express their opinion helps to free their minds, develop critical thinking and creative abilities.

Currently, the method of "Brainstorming" has been improved, and its following types have been created: "Reverse Brainstorming", "Shadow Brainstorming", "Board Council", "Conference of Ideas" and "Synektiks " [10,11].

Among them is the "Synektiks " method The most effective method is an American scientist W.D. Gordon developed. Gordon's to his opinion according to "Sinektika" group 5-7 members consists of to be can. This people different occupation owners or different sciences representatives, different age and skill too differently has been from people is made. Synektiks based on mental attack he lies, only he constant groups by is held because this groups special methods mastered and experience gained without random assembled from people more productive they work.

Invention in this way to solve the tasks stranger thing familiar to something, usual thing and usually except gida n to something must be converted, that is this problem on the surface new point of view look search n without psychological inertia should be reduced. Stranger thing get to know turn around this the problem learning and to him it's getting used to. The opposite and the process is usual thing usually except to something rotate the following four similarities using done is increased [12]:

**Correct analogy (similarity).** Similar objects, situations, techniques, pedagogical, psychological and living nature principles are used to perform the task. Since ancient times, people have used a pier to build a bridge on the bottom of a river. What to do if the river is too

deep or you have to cross a bridge over a cliff? Inventors have worked hard on this problem. One day, the English engineer Samuel Brown, while working on a bridge project over the Tweed River, went out to the garden and saw a spider's nest in the trees. This view leads him to the idea of building suspension bridges. Today, this method of bridge construction is extremely common.

**A personal analogy.** Inventive at that itself some kind of problematic of the situation one part, the object being studied or his one part, for example, machine parts, mechanism moving part with to equalize, to say the same is a calculation. This is the task the one who solves enters the studied subject goes and him to determine, eye forward to bring, to understand nice to do movement does. Let's say he is a turbine blade, clock oscillator or a passing train of the bridge iron construction task doing it nice to do will need to be

Can the container to open ways in search, for example, he himself in the container closed in case the eye forward to bring can.

**A symbolic analogy.** This generalized and abstract is a similarity. This on the ground more poetry image, irony and compare, that is known one the body or process features with equalization for is used. This analogy is usually from a technical point of view uncertain in case manifestation will be

**Fantastic analogy.** This similarity problems imagine to solve possibility gives, i.e. "In a fairy tale like" cannot happen not natural processes (for example, land gravity strength off put, light speed change) or strange He wanted creatures (demon, devil, giant). Work to the model rotate and etc.

Today, in addition to these methods, several other (almost 100) inventive methods are used [13]:

- Catalogue method (F. Kuse, 1926)
- Morphological analysis (F. Tsvikki , USA - 1942)
- Synektiks method (V.Gordon, 1944)
- Control questions method (D. Poe, 1945)
- Organization doer concepts (F. Hanzen, Germany- 1953)
- Control questions method (R. Crawford, 1954)
- Characteristic symptoms method of registration (R. Crawford, 1954)
- "Discovery matrix " method (A. Mol, France, 1955)
- A RIZ (G. Altshuller , Russia,1956)
- Control questions method (S. Pearson, 1957)
- Focal method of objects (Ch .Whiting, 1958 )
- Method of analysis of costs and results (Yu. Fange, 1959)
- Creative engineering construction method (G. Bull, 1960)



- Method of directed thinking (N. Sereda, 1961)
- Sevenfold search method (G. Bush , 1964)
- Control questions method (A. Osborn, 1964)
- Rational construction method (R. McCrory, 1966)
- Fundamental construction method (E. Matchett, England, 1966)
- A complex of issues solution method (S. Vit, Czechoslovakia, 1967)
- Psychological programming (Chavchanidze and others, 1968)
- A method of using a library of heuristic methods (A. Polovinkin, 1969)
- A step-by-step approach to problem solving (A. Fraser, 1969)
- Control questions method (T. Eiloart, 1969)
- Muzey method of experience (Team of authors, 1970)
- Creative method (Team of authors, 1970)
- Functional inventive method (K. Jones, 1970)
- Ideas conference method (V. Gilde and others,- 1970)
- Systematic heuristic method (I. Muller and others, 1970)
- TRIZ (G. Altshuller , Russia, 1971)
- Function - value analysis method (H. Ebert , K. Thomas , 1971)
- System transformation method (K. Jones, 1972)
- Split design method (K. Jones, 1972)
- Method for breaking deadlocks (K. Jones, 1972)
- Approach to solving problems (V. Shubin, 1972)
- A chain of misfortunes and associative method (G. Bush, 1972)
- "Metra" integral \_ method (I. Buven and others, 1972)
- Ten of the search matrix method (F. Povileyko, 1972)
- Generalized algorithmic method (A. Polovinkin, 1976 )
- Automated design system (A. Dvoryankin and others, 1976)
- The invention machine (V. Surikov, 1989)
- Computer design. Analysis . Synthesis (COMPASS) (A. Andreychikov, 1990)
- Expert in the synthesis of physical movement style system method (S. Fomenkov and others, 1990).

The use of these methods as pedagogical technologies led to a sharp increase in students' learning. For example, it was observed that 600 (2023) instead of 250 (by 2020) out of every 1,000 students began to achieve good mastery at Andijan Mechanical Engineering Institute. When this method was used, it was observed that students with average reading began to join the ranks of good ("quality") learners.

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