

# WAYS TO FORM FREE THINKING IN STUDENTS BASED ON INTERACTIVE METHODS

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**Abstract:** In order to provide students of secondary schools and academic lyceums with in-depth and thorough knowledge of chemistry at the level of modern requirements, it is of great importance for the teacher to prepare himself in this subject, to increase his level of knowledge, and to pass each topic on the basis of modern pedagogical technologies is one of the urgent tasks of this day. Modern technologies, teaching methods determine the activities of the teacher and the student in the educational process, how the educational process should be organized and conducted, and what actions students should perform in this process. The selection of modern technologies appropriate to the subject and their appropriate use in the lesson depends on the teacher's professional skills and capabilities.

This article discusses interactive methods in chemistry education and their importance, as well as ways to develop free thinking in students using some interactive methods and their effectiveness.

**Keywords:** Modern technologies, interactive methods, ways to develop free thinking, three-by-four technology, Blitz game, Veer, Pinboard methods

#### **INTRODUCTION**.

The formation of an independent and free-thinking individual is of great importance for the future of independent Uzbekistan, its development as a democratic society. Therefore, today, teachers and educators face responsible tasks.

The most effective way to teach is to encourage students to know the truth, think, communicate freely, and cooperate in classes. If this spirit is absent in classes, such classes will be lifeless, boring, and ineffective.

At the same time, the teacher faces a responsible and difficult task - to teach students to think freely and to form creative thinking.

The changes taking place in the educational process require qualitative improvement in the process of educating the growing younger generation and educating them. In the current era of rapid scientific and technological progress, developing the creative abilities of students is important for preparing competitive, independent-thinking personnel in the labor market, and this has been proven in the experience of developed countries.

Today, in developed countries, extensive experience has been accumulated in the use of pedagogical technologies that increase the learning and creative activity of students and guarantee the effectiveness of the educational process, and interactive methods form the basis of this experience.

#### MATERIALS AND METHODS

Interactive methods, by their nature, are of particular importance in that they allow students to increase their learning and cognitive activity, work in small groups and teams, express their personal views on the topic and problems being studied boldly and freely, defend their opinions,



justify them with evidence, listen to their peers, choose the most appropriate solution from the opinions expressed, and motivate them. Their appropriate, targeted, and effective use by teachers in the educational process creates a wide opportunity for developing communication skills, teamwork, logical thinking, and the ability to analyze ideas in students.

Nowadays, the widespread use of interactive methods in teaching chemistry is also yielding good results. Such methods include "BBB", "Venn Diagram", "Conceptual Table", "Category Table", "Assessment", "Fish Skeleton", "Spinning Wheel" and other methods. With the help of these methods, students have the opportunity to freely express their thoughts, critically perceive information, work in a team, strengthen their position, defend their opinions, and understand their rights. The teacher should use these methods wisely when organizing the didactic process, applying them depending on the complexity of the educational elements on the subject and the time constraints.

#### **RESULTS AND DISCUSSION**

Below we will dwell on interactive methods that help develop free thinking in students and their application to chemistry.

Three by four ("3 x 4") technology

Technology description. This activity teaches participants to think about a specific problem (or topic) individually (or in a small group), find a solution, select the necessary one from many ideas, generalize the selected ideas and form a clear understanding of the problem (or topic) based on them, as well as to be able to approve their own ideas.

The purpose of the technology: to teach the individual to think freely, independently and logically; to work as a team, to research; to collect ideas and form a theoretical and practical understanding from them; to convey their idea to the team, to approve it; to apply the knowledge gained from the topics covered in solving the problem and giving a general understanding of the topic.

Application of the technology: it is intended for individual (or small group) and group work in seminars, practical and laboratory exercises, where the group members change places several times to perform the assigned tasks.

Tools used in the exercise: A-3, A-4 sheets of paper (depending on the number of groups), felttip pens (or colored pencils).

Procedure for conducting the exercise:

• depending on the total number of participants in the exercise, divide into small groups of 3-5 people (it is advisable that the number of small groups is 4 or 5);

• they are introduced to the purpose and procedure of the exercise and distribute to each small group sheets with an inscription at the top of the paper (for example, "Ecology is ...", "Chemistry is ...", "Acids are ...", etc.);

• the instructor tells the small groups that they can continue the main idea written on the handout with only three ideas, that is, three words or combinations of words or three sentences, and sets a specific time for this;

• group members write down the idea given on the handout together;

• after completing the task, group members get up and change places clockwise, that is, group 1 takes the place of group 2, group 2 takes the place of group 3, group 3 takes the place of group 4, group 4 takes the place of group 1 (and so on, if there are other small groups);



• group members who have arrived at a new place get acquainted with the ideas on the handout left there and write down three new ideas of their own on it;

• group members change places again as above, thus small groups change places and add their ideas to the handouts until they return to their places;

• small groups that return to their places carefully read all the ideas collected in the handouts and summarize them into one unified definition or rule;

• one of the group members presents the author's definitions or rules of each small group;

• the instructor explains and evaluates the definitions or rules given by the small groups, and then ends the lesson.

Note: After the groups' presentations, each member of the small groups can individually come up with and present his or her own author's definition or rule based on the definitions or rules they gave.

It is advisable to have 4 small groups. In this case, small groups change places only 3 times, which prevents the learning process from becoming boring. If there are more than 4 small groups, then they can be divided into two streams, and the exchange of small group members can be carried out separately between each stream, and the presentation can be carried out together.

If the audience (or class) is not adapted to the exchange of places of small groups (or it is inconvenient to exchange), then instead of exchanging participants' places, the materials distributed to the groups are exchanged until they return to the groups from which they were originally taken, and the opinions of the audience are collected. From them, a general definition (or rule) is derived and a presentation is made.

This technology can be used in chemistry lessons in topics such as "Chemistry - ", "Ecology - ", "Solutions - ", "Acids - ", Periodic Table - ", "Electrolytic dissociation - ", "Organic chemistry - ", "Hydrocarbons - " and others.

Introducing the technology of innovative technologies "3 x 4" in teaching the topic "Oxygencontaining organic compounds".

After completing the section "Oxygen-containing organic compounds", it is appropriate to use this technology in order to repeat, consolidate and control the knowledge acquired in the section.

For this, students are divided into 4 small groups. After the small groups are introduced to the procedure for conducting the technology, they carry it out.

Handouts with the following topics are distributed to the groups:

Group 1 - "Alcohols - ", Group 2 - "Aldehydes - ", Group 3 - "Carbohydrates - ", Group 4 - "Carbohydrates - ".

The work of the groups is presented and summarized.

Blitz - game technology

Blitz - game technology is aimed at teaching students to correctly organize the sequence of actions, think logically, and select the necessary from a large number of diverse ideas and information based on the subject they are studying. During this technology, students can convey their independent thoughts to others, because this technology creates full conditions for this. Blitz-game technology helps students to first independently determine the sequence of actions indicated on the distributed papers, and then to convey their thoughts to others or to remain in their own opinion, to agree with others.

Example. Homologous series of saturated hydrocarbons (alkanes)



Saturated hydrocarbons	Naming saturated hydrocarbons	Error	Price	Correct answer
C5H12	Methane			
C <sub>8</sub> H <sub>18</sub>	Hexane			
C <sub>3</sub> H <sub>8</sub>	Nonan			
C9H20	Pentane			
C <sub>6</sub> H <sub>14</sub>	Propane			
C <sub>2</sub> H <sub>6</sub>	Bhutan			
C <sub>10</sub> H <sub>22</sub>	Heptane			
C4H10	Ethane			
C <sub>7</sub> H <sub>16</sub>	Octane			
CH <sub>4</sub>	Decane			

Pinboard method.

The word "pinboard" means "I stick it on the board." The advantage of the "pinboard" method is its developmental and educational function. This method develops the skills of students and pupils to acquire knowledge, logical and systematic thinking.

The essence of this teaching method is that in it a discussion or educational conversation is combined with a practical method. Its advantage is a developmental and educational function. In this case, a culture of communication and discussion is formed in students, the ability to express their thoughts not only orally, but also in writing, the ability to think logically and systematically is developed

To reinforce the topic of alkanes, the Pinboard method can be used. For this, the following didactic material can be used.

Alkanes						
Name	Formula	Structure formula	Number of structural isomers			
Bhutan	$C_4H_{10}$	$CH_3 - CH_2 - CH_2 - CH_3$	2			
Pentane	$C_5 H_{12}$	$CH_3 - CH_2 - CH_2 - CH_2 - CH_3$	3			
Hexane	$C_6 H_{14}$	$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$	5			
Heptane	$C_7 H_{16}$	$CH_3 - (CH_2)_5 - CH_3$	9			
Octane	$C_{8}H_{18}$	$CH_3 - (CH_2)_6 - CH_3$	18			
Nonan	$C_9H_{20}$	$CH_3 - (CH_2)_7 - CH_3$	35			
Dekane	$C_{10}H_{22}$	$CH_3 - (CH_2)_8 - CH_3$	75			

### Pinboard method

Veer technology



Veer technology is aimed at studying complex, multi-disciplinary, and potentially problematic topics. The essence of the technology is that it provides information on various branches of the topic simultaneously. At the same time, each of them is discussed from separate points. This interactive technology provides an opportunity to successfully develop critical, analytical, clear logical thinking, as well as to concisely express and defend one's ideas and opinions in written and oral form. The Veer technology is aimed at the active work of small groups, each participant, and the group discussing certain branches of the general topic.

For example, in the organic chemistry course at school, the Veer technology can be used as follows to consolidate the topic of Alkanes.

For example, in a school organic chemistry course, the Veer technology can be used to reinforce the topic of the use of alkanes as follows:

Task for groups. State the useful and harmful of alkanes in terms of their uses.

Metane		Etane		Propane		Bhutan	
Useful	Harmful	Useful	Harmful	Useful	Harmful	Useful	Harmful
Conclusio	on						

#### CONCLUSION

In conclusion, it can be said that the effective use of interactive methods in the teaching process allows students to provide quality knowledge and develop free thinking, as well as to form a number of educational qualities in them, such as respect for the opinions of others, courtesy, self-assessment of their abilities and capabilities, and responsibility for the results of their activities.

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