THE FORMATION OF CREATIVE THINKING IN TEACHING PHYSICS

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ABSTRACT

The article is devoted to the study of different approaches to the definition of creativity in order to justify the need for students to develop the ability to independently acquire knowledge based on creative thinking. The study suggests that there is a dependence of the level of students' achievements on creativity.

Keywords: creativity, flexibility of thinking, creation, conflict resolution, originality, intuition

INTRODUCTION

In modern society, in various branches of professional activity, creativity is one of the leading factors in human success. In the lists of requirements for candidates for various positions, creativity and creative thinking are not rare. Creativity becomes the quality that provides the opportunity to adapt the individual to rapidly changing living conditions and is the key to success in a professional activity. Creativity is an important factor in the development of personality, determining its willingness to change and abandon stereotypes.

Currently, there are many approaches, directions and theories of creativity due to the fact that there is no single and clearly formulated definition of the meaning of creativity. Creativity is seen as the exact opposite of template thinking, takes away from banal ideas and a boring, familiar outlook on things and gives rise to original solutions.

In connection with the gradual transformation of the traditional educational system of the information type into a qualitatively new educational system, in which the student from the position of a passive consumer of known and often outdated information becomes an active position of a creative person, the main school system faces the challenge of modifying the traditional methods of teaching physics and creating new priorities.

The process of forming an individual student is:

1) in the development of intellectual abilities;

2) to increase his upbringing in terms of its components: social, social, equal and cultural activities;

3) in preparing the student as a future producer of spiritual and material goods, as applied to teaching physics.

For school physics education this can be represented as an integrated solution of three main subtasks:

- educational;

- polytechnic.

The priority goal of modern education is not the reproductive transfer of knowledge, abilities and skills from teacher to student, but the full formation and development of the student’s abilities to independently outline the learning problem, formulate an algorithm for solving it, monitor the process and evaluate the result - learn to learn. The country's educational system faces a difficult task: the formation and development of a mobile, self-

fulfilling personality capable of learning throughout life. And this, in turn, corrects the tasks and conditions of the educational process, which are based on the ideas of developing a student's personality.

Everyone knows children's curiosity: an interest in nature, people, and social phenomena. If the teacher works in the zone of proximal development, then the interest in thinking deepens. This is a necessary condition for the development of creative thinking and cognitive activity of students.

What is creativity? The simplest definition of this concept is as follows:

creativity is the process of creating a new product of a material or ideal nature. It is believed that creativity requires special, so-called creative abilities. Pedagogical, psychological, philosophical and methodological literature is replete with the terms "creativity", "creative abilities", "creative thinking."

Creativity is the ability to create and find new original ideas that differ from accepted patterns of thinking, successfully cope with solving various problems in a non-standard way. This is the ability to see problems from a different angle and the ability to solve them in a unique way. Creative thinking is constructive thinking that is constructive in nature. Creative thinking is especially appreciated today when business, science, culture, politics, art are developing with leaps and bounds. To be a creative person means to have certain advantages in this world, for example, to be favorably different from others, to be a more interesting conversationalist, to be able to find unexpected solutions in difficult life situations. Creative people are more balanced and tolerant of others, because they know that each person sees the world in his own way. You can use your creative abilities not only to create new interesting ideas (to improve life or its individual aspects), but also for self-improvement and development of the personality as a whole.

The main components of creativity [1]

1. Fluency of thought
2. The flexibility of thought
3. Originality
4. Curiosity
5. Ability to develop a hypothesis
6. Satisfaction

Any creative activity helps us gain personal meaning and comprehend our own values. And this is the most important spiritual need of man, which distinguishes him from other living beings. In today's fast-paced world, a person is in demand not only possessing a sum of knowledge, but also capable of creative creation, making non-standard decisions, able to predict, invent, and take initiative. The creative pedagogical system of NFTM TRIZ is designed to educate the teacher in technologies that contribute to the development of students' creative

abilities. What is NFTM?

NFTM - the continuous formation of creative thinking and the development of creative imagination in students; involves multilevel continuing education, starting with preschool and ending with post-professional, after the age of 60 years. TRIZ - the theory of solving inventive problems, and in a variety of areas. A person who owns TRIZ technology must learn universal principles that are relevant in various fields of activity.

To develop students' creative thinking, various teaching methods are used.

- Brainstorm. [3]

This popular method was created back in the 30s of the twentieth century. Its peculiarity lies in the prohibition of criticism, that is, it will separate from the generation of ideas. For example, a group consists of 10 participants, within 40 minutes they will have to express their ideas on a given topic. Any fantasies are allowed: from humorous to fantasy and erroneous (you can not criticize them and all ideas are welcome). At some point, the hype begins, in which the ideas are formed by the participants involuntarily and the brain begins to put forward the most incredible hypotheses. The end of the brainstorming involves a detailed analysis and evaluation of the options proposed by the participants. The main advantage of this method is the experience of innovative thinking that each participant acquires. An effective method of creative thinking, which can be used to make decisions, record new information or organize thoughts in the head, can serve as graphic organizers.

“Graphic organizers” is a graphic way of structuring a large amount of information in a logical order. They help the student to schematically present complex information in a way that is easy to understand.

* The image of the organizer may be universal in nature, and may correspond to the subject on which a detailed answer is written.

* Adding color coding or image to the graphic organizer further enhances the usefulness of visual display.

BASIC GROUPS OF GRAPHIC ORGANIZERS:

• Sequential organizers (timeline, block charts, cyclic charts)

• Organizers comparisons and comparisons (Venn diagram, T-diagrams)

• Hierarchical organizers (pyramids, trees)

• Conceptual organizers (mental maps, concept maps, semantic networks)

• Graphic data organizers (graphs, histograms, pie charts, grids, tables)

Types of graphic organizers most applicable to physics lessons:

T-table. It is a multilateral graphic organizer for double recording: yes - no.

Distinctive features of translational motion	General features of rotational and translational motion	Distinctive features of rotational motion
• Straight trajectory	• Motion	• Curve trajectory

• Passed way - S • Speed-ϑ • Acceleration- a	• Studied in kinematics • Time dependent	• Angle of rotation-φ • Angular velocity-ω • Angular acceleration-ε

Figure 1. T-table for translational and rotational motion.

The diagram "Vienna". This is a technique for graphically presenting information that is used when discussing two ideas or texts between which there are common and distinctive features. Information is presented in the form of two or more circles that overlap each other, which overlap in proportion to common and distinct features identified during the discussion.

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Conceptual table. It is a matrix, the compilation of which allows a clearer comparative analysis or a comprehensive assessment of processes and phenomena. It is used to systematize information, identify significant signs of the studied phenomena, events.

Sinkwain (from French cinquains, English cinquain) is a five-line poetic form that arose in the USA at the beginning of the 20th century under the influence of Japanese poetry.

Insert. The active reading method makes it possible to maintain interest in the topic and text of the textbook. Marking the text "v", "+", "-", "?".

«v»	«+»	«-»	«?»
Put this sign if what you read, what you know or what you thought you know	Put this sign that you are reading, for you is new	Put this sign that you are reading is contrary to what you already knew or thought you knew	Put this sign if what you are reading is unclear or if you would like more information on this subject.

Figure 2. Sample of Sinkwain graph.

Denotation graph. This is a way of extracting the essential features of a key concept from a text.

The “Cluster” method (from the English cluster - a bunch) is a way to graphically organize the material, which makes it possible to visualize the thought processes that occur when immersed in a particular text. Sometimes I call this method “visual brainstorming”.

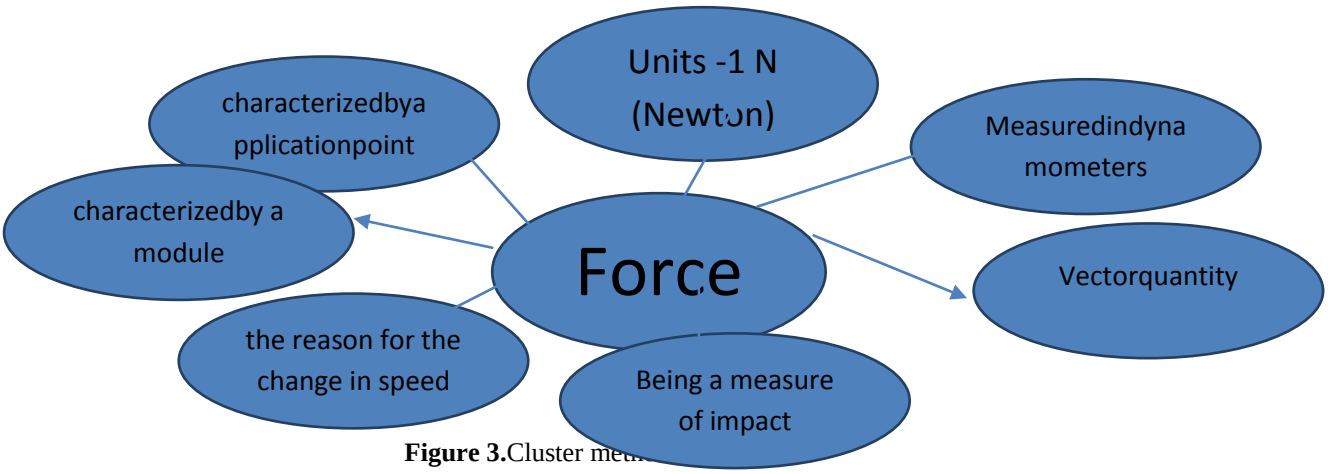

Figure 3. Cluster met

Tony Buchan's mental maps are an associative method of activating thinking.

Web. In the center is a figure reflecting the main theme, around are the key ideas of the concept.

Cluster “Tree”. At the bottom of the trunk is written a keyword. In the crown of the tree are the concepts

associated with this word.

Fishbone diagram ("Fish skeleton") is a type of diagram that allows you to effectively find solutions in difficult situations, to develop new ideas. For example, below, examples of a graphical organizer in physics lessons are considered.

Modern teaching methods are relevant in the transition to an updated educational content. In which, great importance is attached to instilling in students the skills of creative thinking, research and communication skills, solve problems and apply knowledge creatively in the educational process.

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