

## INNOVATIVE METHODS IN TEACHING “BASIC CONCEPTS OF SET THEORY AND OPERATIONS ON THEM”

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**Abstract:** *The main methodological innovations in the education system today, the importance of the use of interactive methods of teaching have been proven for several years. Recommendations for the use of “Cluster” and “Puzzle” methods to explain the topic “Sets Theory” taught to students majoring in mathematics, in order to strengthen their knowledge, are given in brief information about these methods.*

**Keywords:** *“Cluster” and “Puzzle” methods, interactive methods, set theory, merger, intersection, separation of sets, complement of the set.*

The role of discrete mathematics and mathematical logic in mathematics is unique and this science is the basis of mathematics. It is known that in discrete mathematics and mathematical logic, elements of set theory, relations, binary relations, algebra of considerations, these functions, Post theorems, calculation of considerations, proof, "theorem", predicate logic, first-order language, first-order theory, interpretation and model concepts and related issues are considered.

In this section, we present the basic concepts of set theory and the mechanism for using cluster and puzzle interactive methods in teaching the topic of operations on them. We know that a cluster is a group of several homogeneous elements with specific properties into a single independent object according to their common properties. The cluster method consists of a visual, schematic representation of the learning material, which helps to get an idea of the concepts being studied, to understand them and to clearly describe their components and interrelationships. In this way, this method also helps to develop memory and assess the student's own knowledge. We can use this method to repeat the previous topic and lay the groundwork for a new topic.

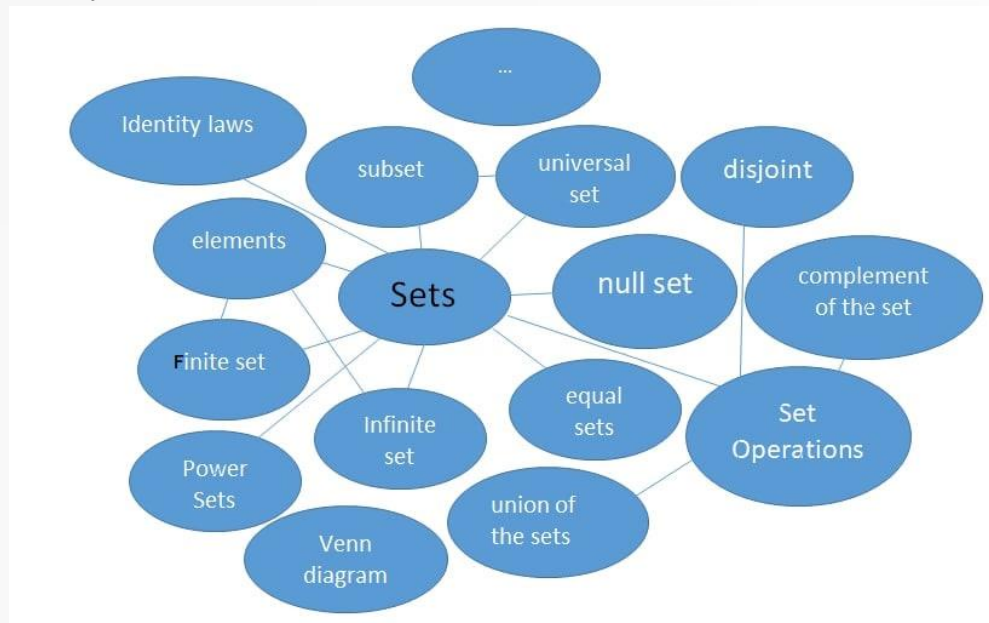
There are 4 stages of the cluster method, which are used in the course based on the following algorithm:

**Step 1** - Write the key word (concept) or idea of the lesson topic on the board or whiteboard;

**Step 2** - Students write down everything they know and remember about the word (concept). The result is a word or phrase that goes from the center to the other, describing different concepts, ideas, and facts related to the topic. All information provided by students is written on the board (paper) without omission;

**Step 3** - Based on the teaching material explained by the teacher, what is written is analyzed and an attempt is made to bring it into a system. Scattered sentences are merged, and misspelled ones are deleted;

**Step 4** - Written concepts are connected to the root word (concept) depending on how they are interrelated. They will be first-rate related records. In turn, there may also be secondary records associated with these records.



**Figure 1.**

They are connected not with the root word, but with the concept with which it is written, and so on. The result is a scheme that defines the interrelationship of perceptual concepts and facts (see Figure 1). This Figure schematically describes the content of the topic and helps to better understand it.

Once all the concepts are repeated, it is possible to analyze the problem of teaching the practical part of the topic using the puzzle interactive method.

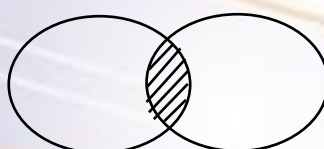
Puzzle (English puzzle - puzzle, puzzle) - the name of a children's game that involves the reconstruction of a picture using its parts. The basic information on the topic in the form of a main sentence, formula, theorem, equation, diagram and others are written on paper, then divided into several parts and mixed. Students find and match only one piece of information from these pieces.

For example: on the basic concepts of set theory and the topic of actions on them, students are presented with a set of 24 sheets (cards) in the following form. This collection contains 4 main sentences on the topic (combination, intersection, symmetric difference and complement of the set), each of which will be described on 6 pages. Description of the sentence on card 1; Euler circles corresponding to the sentence on card 2; Properties on card 3; Equally strong formulas on card 4; The result of the example simplification on card 5; Proof of the formula on card 6. Assignment 6 groups are given 4 main sentences and from the presented cards they are given the task of collecting information only on their own sentence.

The result of group 2 should be as follows:

**Card 1:** A set  $C$  made up of all the common elements of a given set  $A$  and  $B$  is called the intersection of sets  $A$  and  $B$  and is denoted by  $C = A \cap B$ .

**Card 2:**



**Card 3:**  $A \cap (B \cap C) = (A \cap B) \cap C$ ,  $A \cap B = B \cap A$ ,  
 $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ .

**Card 4:** If  $A \cap A = A$ ,  $A \cap \emptyset = \emptyset$ ,  $A \cap U = A$ ,  $A \cap \bar{A} = \emptyset$ ,  
 $A \cap (A \cup B) = A$ ,  $\overline{A \cap B} = \bar{A} \cup \bar{B}$ ,  $A \cap B = A$ , then  $B = U$ .

**Card5:**  $(A \cap B \cap X) \cup (A \cap B \cap C \cap X \cap Y) \cup (A \cap X \cap \bar{A}) = A \cap B$ .

**Card 6:**  $(A \cap B) \cap C = A \cap (B \cap C)$  - the law of associativity with respect to intersection.

Proof. Let  $x \in (A \cap B) \cap C$  is equal. So,  $x \in (A \cap B)$  and  $x \in C$ . From this  $x \in A$ ,  $x \in B$  and  $x \in C$  we can find out. For this,  $x \in A$  and  $x \in B \cap C$  is true. From this, we can find out that  $x \in A \cap (B \cap C)$  it is true too.

This method helps students develop skills such as intelligence, resourcefulness, concentration, analysis and synthesis. It can be done individually or in groups.

Let us now consider the advantages of the interactive methods used. First, from the beginning of the lesson, students' attention is drawn to the topic, the topic is repeated, and the groundwork is laid for a new topic. Second, it leads to a better mastery of the content of the new topic. Third, there is an opportunity to save time by working with multiple students at the same time and evaluating them. Fourth, the active participation of small group representatives is observed. Finally, there will be opportunities for self-assessment and intergroup assessment.

In addition to the advantages of the interactive methods used, they also have some disadvantages. The ability to monitor all students when monitoring the activities of groups is low. Negative competition between groups may arise. Conflicts can arise at the expense of students who are not active within the group. But these shortcomings can be partially overcome by equally distributing gifted students with leadership skills to smaller groups.

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