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INTERACTIVE EDUCATIONAL METHODS USED IN THE TEACHING OF MATHEMATICAL MODELING

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Abstract:
This article describes the characteristics, goals, and easiest ways of implementing interactive educational methods used in teaching mathematical modeling.

Keywords: Mathematical modeling, kwhl method, Know, Want, How, Learn, 5w1h method, Bloom's cube method, SWOT analysis.

Introduction

There are several interactive educational methods in the process of teaching the subject of mathematical modeling, and it is effective to use any educational method of the topic. Therefore, we will achieve good results if we use the interactive educational method of the next topic by improving the interactive educational methods. So, we will compare some of the interactive educational methods and discuss their purpose and implementation procedures.

"Bloom cube" method The purpose of the method: We believe that this method will be used in order to facilitate the students' acceptance of new information systems and mastery of topics in the science of mathematical modeling. Also, this method sets the task of formulating "Open" questions for listeners and finding answers to them.

Procedure for implementing the method:

1. To use this method, you need a simple cube. The following words are written on each side of the cube:

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– List, describe (simple question)
– Why (cause-and-effect question)
– Explain (the question of a comprehensive view of the problem)
– Make a suggestion (practice-related question)
– Give an example (a question that develops creativity)
– Give feedback (analysis and evaluation questions)

2. The topic is determined by the teacher.

3. The teacher throws the cube on the table. Whichever word comes up, it asks the corresponding question.

"KWHL" method Purpose of the method: This method is used for students to adopt a new information system and systematize their knowledge. Also, this method gives students the task of finding answers to the questions given in the following table on the topic of mathematical modeling. (Answers are shown in parentheses).

Explanation. KWHL: Know - what do I know (from mathematical modeling)?

Want - what do I want to know (mathematical modeling)?

How - how can I learn (the science of mathematical modeling)?

Learn - what did I learn (mathematical modeling)?

Method of "*KWHL*"	
1. What I know: – Mathematical model – Mathematical modeling techniques – Mathematical modeling of cross-sectional processes	2. What I want to know, what I need to know: – I need to know the processes in the field of mathematical modeling – - Studying the features of mathematical modeling in the field of science
3. How do I know and find: – Reading books on mathematical modeling – Go to the Internet from the necessary sites	4. What I learned: – Mathematical model – Mathematical modeling techniques – Mathematical modeling of cross-sectional processes – Reading books on mathematical modeling – Go to the Internet from the necessary sites

"5W1H" method

The purpose of the method: This method is used for the students to accept the new information system and to systematize their knowledge. Also, this

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method sets the task of finding answers to the six questions given in the table below on the topic of mathematical modeling for the students.

What?	What? (definition, content, why used)	The study of mathematical modeling in the context of sciences for ideal process control in the field.
Where?	Where (located, where to get)?	In various educational literature, on Internet sites
What kind?	How? (has parameters, types)	Mathematical modeling has been successfully used to solve various practical problems in exact sciences. Mathematical modeling provides the opportunity to quantitatively express one or another quantity characterizing a methodological issue, and then to study its relationship.еради.
When?	When? (used)	Developing updates in all areas
Why?	Why? (used)	Mathematical modeling is used to solve various practical problems in exact sciences, to develop innovations in all fields
How?	How? (created, saved, filled, editable)	In the process of burning a new problem, finding a solution to the problem

"SWOT-analysis" method.

The purpose of the method: to find ways to solve the problem by analyzing and comparing existing theoretical knowledge and practical experiences in the subject of mathematical modeling, to strengthen, repeat, evaluate knowledge, to form independent, critical thinking, non-standard thinking.

S – (strength)	• powerful sides
W – (weakness)	• weak sides
O – (opportunity)	• opportunity, facilities
T – (threat)	• threateness

"BEEP" method

The purpose of the method: This method focuses on solving complex, multidisciplinary, as much as possible, problematic issues with the help of mathematical modeling. The essence of the method is that the same

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information is given on different branches of the subject, and at the same time, each of them is discussed in separate aspects.

Procedure for implementing the method:

the trainer-teacher divides the participants into small groups of 5-6 people;

after familiarizing the participants with the purpose, terms and procedure of the training, distributes handouts to each group containing the parts necessary to analyze the general problem;

each group thoroughly analyzes the problem assigned to it and makes a written statement of its opinions for distribution according to the recommended scheme;

at the next stage, all groups will make their presentations. After that, the trainer summarizes the analysis, fills in the necessary information and concludes the topic.

For example, the problem is studied in terms of positive and negative aspects, advantages, merits and demerits, advantages and disadvantages. This interactive method provides an opportunity to successfully develop critical, analytical, clear logical thinking, as well as models and protection of students' independent ideas, opinions in written and oral form. In order to strengthen, consolidate and correct knowledge on the subject, the "BEEP" method can be used in the form of work in small groups in lecture classes, individually and in pairs, practical and seminar classes.

Innovative technologies of Ukitish is a technology aimed at forming the ability of students to think systematically and creatively, and to express non-standard ideas in solving creative problems. The final result of the innovation is as follows:

– to identify and develop students' ability to see what is not seen by most of the other people;

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– to develop the student's ability to analyze, from the point of view of creating something new. In this case, not only innovation, but the purpose of effectively solving a problem or issue is burned. Innovative technology of ukitish all types of classes:
Lectures, practical exercises, laboratory works, projects are somewhat effective in learning subjects.

Several methods are used in the innovative technology of sleeping.
These are the "Brainstorming" method, the "Jigsaw" method, the "Discussion" method, the "Find your excuse" method, the "Circle interview" method, and others. We will demonstrate one of these methods, the "Find Your Urn" method, on the example of the topic "Mathematical modeling of population survival processes" in the practical lesson of the subject "Mathematical modeling in biology and medicine". If there is a dispute about a topic in the audience, it is possible to find a solution to the problem using this method. The "Find your answer" method provides an opportunity for students to express their opinions independently, as well as to restore their opinions. Forms communication skills in students
For the purpose of the experiment, we conducted the above-mentioned method with the participation of groups 302, 302, 303 of the "Faculty of Medical Biology" of our University. First, we introduced the students to the legal rules of the "Find your answer" method. It is arranged according to the tune.
An idea relevant to the topic is thrown away. For example, how do you feel about the idea of "survival of the population during quarantine"? Comment your opinion.
1. Two posters are hung in opposite corners of the auditorium. Two contradictory ideas are written on the posters. On one of them it is written to follow the rules of quarantine, and on the top it is written that it is a bad idea, and on the other one, it is written that it is necessary to go to places with a small population.
2. This method is explained by the rules of the law.
3. Students take a place next to the poster, choosing the side that corresponds to their opinion on the problem.

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4. Students divided into two sides begin to prove their opinions. At this time, they may change their minds and go in the opposite direction. But they have to justify why they did so. In the process we are conducting, there were no students who changed their minds in the group.
5. After hearing the feedback of the participants, the listener analyzes them and draws a conclusion and evaluates the students.

After listening to the opinions of the groups on this topic, we decided to give 5th grade to 5 of 12 students of group 302, 4th grade to 4th grade and 3rd grade to 3 students. In other groups, the results were positive.

We analyze the percentage (%) of one student in group 302 by the method of mathematical proportion. From this, we find the percentage based on the number of grades obtained. There are 12 students in 302 groups, of which:

5th person is 5th grade

the 4th person is the 4th grade

3rd person 3rd grade,

Proportion 12 – 100

1 - x ,

X=100/12=8.3

5×8.3=41.5%, grade 5

4×8.3=33.2%, grade 4

3×8.3=24.9%, grade 3

Result: 99.6%

6. The existence of different approaches to the same topic was shown by means of this method. All students were required to participate in the lesson organized according to the method of "Find your name" and each student was interviewed at least once. It was once again evident that the excitement of the lesson process is of great importance in the formation of students' creative thinking. After hearing all the opinions, the students were able to fully understand and analyze the explained idea with the help of the final conclusion.

This method enriched students' imagination about this topic when the lesson topic was over.

Result:

Interactive methods form the basis of pedagogical technologies that increase the learning and creative activity of students and guarantee the effectiveness

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of the educational process while solving the above-mentioned problems in the teaching of Mathematical Modeling. With the help of such methods, we have increased the activity of reading and learning among students. Effective, purposeful and effective use of interactive methods in the teaching of Mathematical Modeling by teachers (pedagogues) in the process of education and training improves communication, teamwork, logical thinking, synthesis of existing ideas, analysis, between different points of view. We have a wide opportunity to develop the ability to find logical connections, and we have achieved high results.

Summary

In modern conditions, the most acceptable way to increase the effectiveness of education is the effective, purposeful and effective use of interactive methods that increase the learning and creative activity of students while solving the problems given in the teaching of mathematical modeling.

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