

Levels of Mathematical Modeling in Medicine and Medical Diagnostics

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Abstract

This article provides a scientific analysis of the features, goals and the simplest ways to implement the interactive educational method "Brainstorming" used in teaching the subject "Mathematical Modeling in Medicine and Medical Diagnostics", and the positive results obtained ensure the free participation of students in the educational (discussion)) process.

Keywords: Mathematical modeling, medical diagnosis, model analysis, terminology, artificial intelligence, algorithm, functional connection, initial velocity, coordinate.

Introduction

For the purpose of experiment and testing, we conducted the process of researching the stages of mathematical modeling in medicine and the topic of medical diagnostics with the participation of the members of the 3rd year group 372 of the Faculty of Medical Prevention, Medical Biology and Folk Medicine of the Bukhara State Medical Institute.

Before starting the lesson, the students were told to pass the lesson using the interactive method of "brainstorming", giving brief information about this method.

"Brainstorming" method

This method serves to ensure students' activity in the training process, to encourage them to think freely and to free them from the inertia of the same thinking, to collect colorful ideas on a specific topic, as well as to teach them to overcome the thoughts that appeared at the initial stage of the process of solving creative tasks. . The "Brainstorming" method was recommended by **A.F. Osborn**, and its main principle and condition is to absolutely prohibit criticism of the opinion expressed by each participant of the training (discussion), and to ensure free flow during the lesson. The

effective and successful use of this method in the educational process depends on the teacher's pedagogical skills and breadth of thinking. When using the "brainstorming" method, the number of students should not exceed 12. Training based on this method can be organized up to one hour.

The beginning of the main process

Mathematical modeling is successfully used to solve various practical problems in exact sciences. The method of mathematical modeling provides an opportunity to quantitatively express one or another quantity characterizing the problem, and then to study the relationship. The method is based on the concept of a mathematical model.

- Mathematical model refers to the functional relationship between the characteristics of the studied object expressed in the form of a mathematical formula or algorithm. Since the invention of the computer, the importance of mathematical modeling has increased dramatically. It has become a real possibility to create complex technical, economic and social systems, and then to implement them with the help of a computer. Analyzing the mathematical model gives an opportunity to get into the essence of the phenomenon under study. The study of phenomena with the help of a mathematical model is carried out at the same stage.

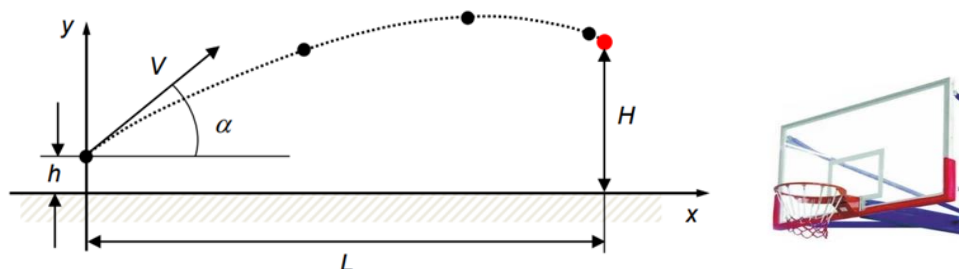
- The first step is to express the laws that connect the main objects of the model.
- The second stage is to check mathematical problems in the model.
- The third step is to determine whether the model satisfies the accepted practice criteria. In other words, determining whether the theoretical results obtained from the model and the results of observation of the object match.
- The fourth stage is to carry out the next analysis of the model by gathering information about the phenomenon under study, and to develop and refine it.

Next, we clarify the concept of a mathematical model with a single problem.

. **The issue.** (The issue was discussed among the students in the context of a problematic situation, and the final decision was taken into account taking into account the opinions of all students. Student participation was evaluated)

The player is trying to throw the ball into the basketball net.

Let's analyze if the player hits the basketball net when he shoots the ball.





Analysis of the issue:

- Is the initial information provided sufficient?
- Does the problem have a solution?
- Is there a single solution to the problem?

I. Statement of the issue

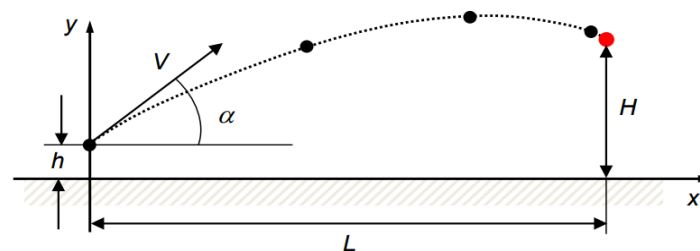
We assume:

- we consider the ball and the basketball net as material points;
- the distance from the place where the player is standing to the basketball net is clear;
- The length of the player's buoy is clear;
- the distance from the ground to the basketball net is clear;
- the initial speed of the stem movement is clear;
- air resistance is not taken into account.

Given these conditions, determine at what angle the ball should be shot to solve the problem.

II. Build a model

Graphical model



Mathematical model

$$x = V \cos \alpha \cdot t, \quad y = h + V \sin \alpha \cdot t - \frac{gt^2}{2}$$

Issue: If

$$V \cos \alpha \cdot t = L, \quad h + V \sin \alpha \cdot t - \frac{gt^2}{2} = H$$

then determine a

III. Model analysis.

Mathematical model

$$x = V \cos \alpha \cdot t$$

$$y = h + V \sin \alpha \cdot t - \frac{gt^2}{2}$$

- if the initial speed is equal to 0, the root will fall in place.
- the coordinate of the trunk at $t=0$ (0,h)
- if it is shot vertically upwards ($\alpha=90^\circ$) x coordinate will not change
- starting from a certain value of t, the value of "u" starts to decrease.

IV. Experience

Method 1.

we change the angle α . Let's construct a basketball ball motion graph for the selected angle α . If the ball goes high over the basketball net, we decrease the angle, otherwise we increase the angle.

Method 2. From the first equation, we determine the nut movement time:

$$V \cos \alpha \cdot t = L \quad \Rightarrow \quad t = \frac{L}{V \cos \alpha}$$

we change the angle α . We determine t corresponding to the value of α and y corresponding to it. If its value is greater than H, we decrease the angle, if it is smaller, we increase it.

Advanced management of healthcare systems depends in many ways on the development of digital technologies and the formation of databases. Assessment of the results achieved in healthcare, artificial intelligence and mathematical calculation, allows effective management based on the data of methodological and technological advances.

Medical diagnostics is one of the scientific fields of medicine.

It includes dozens of different methods and studies aimed at identifying and identifying pathologies and diseases. In fact, the diagnosis is an examination of the patient. This science, which arose hundreds of years ago, developed along with other branches of medicine, as well as chemistry, biology and physics. Many centuries of experience of

scientists and practicing doctors have been collected, systematized and improved, as a result of which we have introduced many effective diagnostic methods. These discoveries help doctors make the correct diagnosis, identify diseases in the early stages of diagnosis, and provide timely and appropriate treatment.

In clinical diagnosis, models are created by assigning scores to various signs and symptoms as an aid to clinical diagnosis. Among the important directions of the use of models in medicine are epidemiological studies, prediction, planning and evaluation of preventive and control measures, health level assessment, cost-benefit analysis, disease risk assessment, including diagnosing patients and improving the efficiency of operations.

The results obtained

5th person is 5th grade

The 4th person is the 4th grade

3rd person 3rd grade,

Proportion: 12 - 100

1 - x,

$$X=100/12=8,3$$

$$8,3\% \cdot 12 = 99,6\%$$

$$5 \times 8,3 = 41,5 \% \text{ , 5-бaxo}$$

$$4 \times 8,3 = 33,2 \% \text{ , 4-бaxo}$$

$$2 \times 8,3 = 24,9 \% \text{ , 3-бaxo}$$

$$1 \times 8,3 = 8,3 \% \text{ 2-бaxo}$$

The result of the lost lesson using the "Brainstorming" method: 76.7% positive rate was achieved with 99.6% improvement.

Result: In the process of covering the stages of mathematical modeling in medicine and the topic of medical diagnostics, with the help of this "Brainstorming" method, it was possible to ensure the students' activity during the training. 99.6% improvement in the formation of skills and competences on the subject by applying certain theoretical knowledge in practice in a short period of time

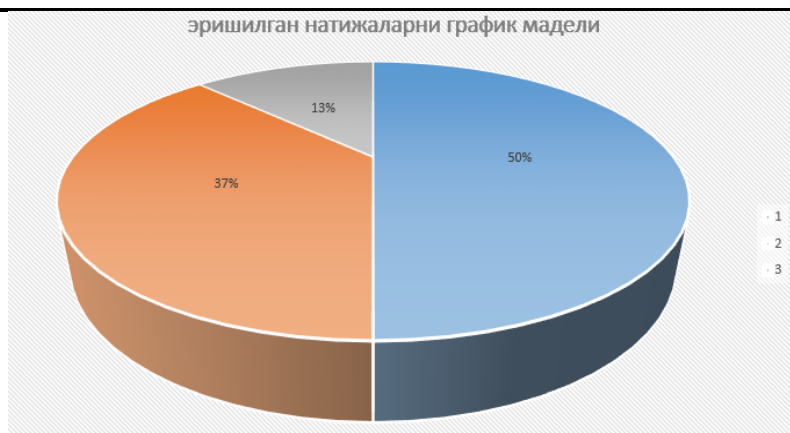
$$5 \times 8,3 = 41,5 \% \text{ , 5-mark}$$

$$4 \times 8,3 = 33,2 \% \text{ , 4-mark}$$

$$2 \times 8,3 = 24,9 \% \text{ , 3-mark}$$

$$1 \times 8,3 = 8,3 \% \text{ 2-mark}$$

We achieved a positive indicator of 76.7%.



Conclusion:

Explaining the topic of this practical training to students, it was explained that the importance of mathematical modeling in medicine is incomparable. In the process of covering the stages of mathematical modeling in medicine and the topic of medical diagnostics, the method of "Akliy Hujum" was used to make them think freely, and it was proved possible to speed up the process of diagnosis and treatment, the results of which will be ready in the long term.

Thus, the difference and superiority of the "Akliy Khujum" method from other methods is that the main principle and condition of this method is to absolutely prohibit criticism of the opinion expressed by each participant of the training (discussion), and to ensure the free discussion of the student.

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