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PEDAGOGICAL ANALYSIS OF THE TOPIC "TYPES OF INFORMATION IN MEDICINE" BASED ON THE "BRAINSTORMING" METHOD

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ABSTRACT

"This article presents a pedagogical analysis and scientific research results based on the "Brainstorming" method, a modern interactive approach to the topic of information types in medicine. The study focuses on supporting student initiative and responsibility in learning, considering prior knowledge, fostering practical skills, and promoting independent thinking. The results demonstrate the generation of positive scientific outcomes and the absence of critical attitudes toward ideas. In higher education, the topic of "Information Types in Medicine" was taught to students by dividing them into two groups and using two methods: traditional and the "Brainstorming" method. The modern teaching program led to an increase in student motivation, an enhanced interest in science, and the development of independent thinking, yielding positive scientific results. This increased the overall quality of the educational process, and, when the "Brainstorming" method was used, a 11.83% improvement was achieved in students' understanding of the subject.

Key words: modern teaching program, educational process, yielding positive scientific

INTRODUCTION

Interactive methods are methods that stimulate students' learning and encourage free thinking, with learners at the center of the educational process. When these methods are used, they call for active participation of both the teacher and the students. Students actively participate throughout the entire lesson. The beneficial aspects of a student-centered approach in the learning process are evident in the following:

Creating an environment with higher teaching effectiveness;
High level of student motivation;
Considering prior knowledge;
Aligning the learning process with students' goals and needs;
Supporting student initiative and responsibility in learning;
Creating conditions for two-way feedback. "

"It should be emphasized that the use of interactive methods in the process of teaching computer science to students has special characteristics. The in-depth study and application of each interactive method used in teaching practice expands students' independent thinking. It also has a creative impact on their ability to find the right solution to the problem. This increases the creativity and activity of students in the classroom. It has been observed that when many theoretical and practical problems are analyzed on a scientific basis using modern interactive methods, students acquire deeper knowledge, their skills expand, and high efficiency is achieved.

THE "BRAINSTORMING" METHOD: The term "Brainstorming" is taken from the English words "brain storming". This refers to a method by which free ideas and opinions expressed by participants on a particular problem are collected and a certain solution is reached through them. This method encourages intellectual activity to further expand, stimulates interest in science, and accelerates creative and innovative processes. The emergence of this method is directly related to the American specialist A. Osborn, who served in the Japanese Sea during World War II. A council is held to determine how to protect a warship from torpedoes. According to the rules of the council, everyone - from workers to the captain - could say any ideas, even imaginary and impracticable ones, and all suggestions were written down.

During the discussion, this proposed idea was reworked, and it was decided to use a strong current of water. The torpedo was hit by the stream of water ejected from the pump and it was stopped. The idea, which at first seemed ridiculous, solved the problem. By the end of the 1950s, the American scientist A. Osborn began to promote the "Brainstorming" method at the university where he worked as a way to collect unexpected ideas and suggestions and to solve complex problems. Considered a stimulator of strong and meaningful scientific creativity and resulting effectiveness, the "Brainstorming" method mainly relies on a pedagogical mechanism called the lack of a critical environment that opposes the emergence of new, original ideas. Thus, the "Brainstorming" method was first used in England and France, then in Japan. Since the 1970s, the "Brainstorming" method has been used in Russia in scientific research carried out by educators. Since the 1990s, it has been used in Uzbekistan and has shown that a noticeable increase in the effectiveness of students' understanding of the topic is achieved.

The objectives of using the "Brainstorming" method are as follows:
To propose new methods of teaching for solving the problem
To sort ideas according to their importance
To form active thinking skills
To demonstrate the process of emergence of unexpected, relevant, and problematic ideas
To develop the skill of using the ideas found."
"The main principle of the "Brainstorming" method lies in the fact that in this method:
Students present a specific problem and participants are encouraged to share their thoughts on how to solve this problem and offer the most unexpected ideas.
All expressed opinions are recorded by the group leader.
No critical attitude is shown towards the opinions expressed.
All ideas are recorded on audio or video tape.
If approved, the author himself can also write down the ideas.
Analysts analyze, re-synthesize, evaluate, and select problem ideas with high efficiency.

MATERIALS AND METHODS

We will provide an example of the practical application of the "Brainstorming" method in the classroom, specifically its direct application in solving problematic issues. For example, the necessary problem being studied, the goals pursued by solving it, the relevant plan, and the rules that participants must follow are displayed on the screen. It takes up to 10 minutes to implement this issue. The problem is explained. At this stage, the performance of the main task depends on the teacher who explains the topic to the students using the "Brainstorming" method. He must be an organizer, a leader, and a creative and insightful individual. It should be noted that, first of all, the teacher suggests that the participants of the "Brainstorming" method choose one of several problems. Also, the jointly selected problem should be interesting, relevant, and familiar to the students of the group. If this is a problem related to computer science or information technology, then, for example, in the educational process, it is possible to study:

1. the use of mathematical models in information technologies,
2. the classification of mathematical models,
3. the use of artificial intelligence ideas in the development of information technologies,
4. the role of computer science in solving medical problems,
5. problems of modeling by projections in the treatment of malignant tumors being studied in medical diagnostics."

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ky, 2000): “Any interaction between objects, if as a result of this one of them acquires some substance and the other loses it, is called informative interaction. In this case, the transmitted substance is called information.”

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1-Table.Types of Information

By method of perception	By form of expression	By address width	By general importance
Visual Auditory Tactile Gustatory (optional)	Textual Numerical Graphic Sound	Public Specific Private	General-political Aesthetic Scientific Productive Technical Managerial Knowledge, skills Forecast, plan Intuition

All types of medical information can be divided into 4 main groups:
Alphanumeric information;
Visual information:
Static;
Dynamic;
Sound information;
Combined types of information;

Alphanumeric information.

Alphanumeric information is the basis of almost all types of printed and written documents (unless the document expresses a graph or drawing). It forms a structural part of medical information when viewed broadly.

Static visual information.

Analyzing, this category of medical information includes various images (radiographs, MRI, CT, echocardiograms, etc.). Information obtained may be (for example, an X-ray image) or colored (for example, an endoscopic image), depending on technical means and other characteristics.

Dynamic visual information (video).

Examples of such information include the client's fast or slow walking, gestures, or fainting, the pupil's reaction to light, and dynamic images generated by diagnostic devices.

Sound information.

From an optical point of view, the category of sound information includes various sounds, voices, speeches, natural sounds and sound signals of the human body amplified by technical methods generated by medical devices.

From an otorhinolaryngology point of view, examples of sound signals amplified by technical and technological methods include tones, noises, wheezing, and other auscultation elements that are heard with a phonendoscope used in medicine.

Examples of sound signals generated by medical devices include blood circulation in echocardiography, Doppler signals under examination, flowmetric signals, monitor signals, etc.

Some types or specific instances of sound information may be part of a combined type of medical information (for example, in accordance with visual-graphic information).

Combined type of information.

Medical information expressing any combination of alphanumeric, visual-graphic, and sound information is called combined.

The most popular combined type of information is the combination of dynamic visual information with sound. However, in practice, other compatibilities are also widely used.

The nature of medical data. In medical practice, the expression "data collection" or "information retrieval" is often used. These expressions can be misinterpreted, based on the assumption that medical information exists in the real world for use in diagnosis or treatment. In fact, some objective parameters, such as biological doses, can be interpreted, or rather, they can only become information in context.

Of course, medical information exists only in the environment in which it is interpreted and must be constantly updated to be free of diagnostic and therapeutic errors. Subjectivity has a high degree in medicine. This partly explains the undeniable nature of medical information. Information may not be available because a question is not asked of a client or a client's answer is not recorded. It is believed that 40 percent of the problems identified during the study were due to poor retention of medical information (Bentsen, 1976).

It is very important to evaluate the quality of medical data and, first of all, to assess their information significance.

Confidentiality of medical information.

A characteristic feature of medical information is its confidentiality. Providing physician secrecy for the purpose of obtaining information without the consent of a citizen, without the consent of his illegal representative, is possible in the following cases:

For the purpose of examining and treating a citizen who, by his condition, cannot express his consent;

In the event of the spread of infectious diseases, mass poisoning, and contamination;

At the request of his own request for inspections;

To inform his parents or relatives of the client's medical care;

Medical data does not always provide up-to-date information and cannot serve to identify diseases in the same way.

It is difficult to establish the measurement accuracy of clinical information used in medicine, which depends significantly on the point of view of the treating physician on each clinical case, whether correct or comparative.

In 1641-1642, Blaise Pascal invented the moving summing machine ("Pascalina"). This marked the beginning of the era of mechanical computers.

In 1673, the German scientist Wilhelm Gottfried Leibniz created a calculating machine for adding and multiplying 12-degree decimal numbers. Such devices received the name arithmometers (Figure 1).

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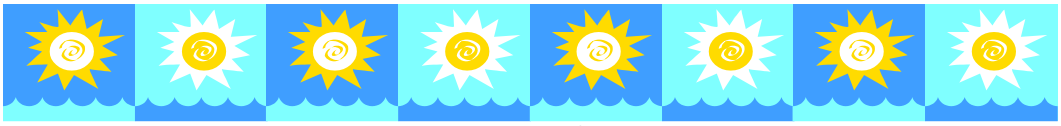

Figure 1. The first arithmometers.

The main disadvantage of such devices is that they cannot operate automatically, that is, they cannot function without human involvement.

Presenting Medical Data

Another way to improve the quality of disease diagnosis and, of course, the quality of treatment in patients is to improve the quality of medical data stored in an information system that can contextually change the way data management is viewed in the information technology world in recent years.The teacher, constantly through various departments, must be able to fully utilize and manage all complex information, which will be the basis for tomorrow's production.

For the presentation of information, one should orient not only on alphanumeric data, but also on video, sound, documents, spatial information, images, and anything else that allows for timely and adequate decision-making. The use of complete and comprehensive complex information can ensure a critical understanding of ongoing processes, providing an opportunity to constantly improve and evaluate work methods. This statement is especially relevant for medical information systems, where the medical data obtained during the diagnosis and treatment process is often multimedia.

In addition, there are a number of problems in the field of expressing medical information. The following key problems in this area can be highlighted:

Differences in the interpretation of used concepts and terms;

Insufficient implementation of technology to reflect the semantic value of terms;

Difficulties in reusing encoded texts in different medical contexts.

Interpretation of Medical Data

In general, the interpretation of data is based on an argumentation mechanism. Argumentation begins with the formation of a hypothesis that can explain the events and processes that occur. The word used to express a situation, symptom, signs, and the relationships established between these signs greatly affects the argumentation process. This phenomenon is combined with uncertainties inherent in various diagnostic procedures.

In medical literature, quantitative and qualitative uncertainties are often encountered, as in the expression of clinical phenomena. Quantitative signs are also often subjective and can be interpreted differently.

Reasons for Using Non-Parametric Statistics in Medicine

When statistically processing medical data, it is necessary to remember the following:

First, it was always said about the normal distribution of the random variables (RVs) and the equality of their variances being studied;

Secondly, the random variables (RVs) we used earlier were quantitative signs of observation objects (kilograms, centimeters, etc.);

Thirdly, most of the RVs we encountered earlier were continuous quantities, that is, they could be quantities whose values could differ from each other by any amount, no matter how small;

Finally, all RVs were expressed in absolute values (kilograms, centimeters);

In order to assess the significance of differences when the listed conditions are met, parametric criteria must be used, such as the Student's t-criterion, which is familiar from manual calculations and working with Excel. It is therefore called parametric because its good application requires taking into account the distribution parameters that can be equated to random variables. Specifically:

The distribution of RVs must be sufficiently normal;

The variances must be sufficiently homogeneous.

However, the vast majority of RVs encountered in healthcare do not meet the conditions listed above.

Firstly, there are many parameters of processes in the body that do not conform to the normal distribution law.

As an example, one can cite the individual level of motor activity in human and animal populations, the concentration of certain hormones in the blood, the amount of medication consumed by the population (as a rule, people either do not take medication at all or take several types of drugs in large doses at the same time).

Rare disease cases are not normally distributed in the population. Neither is the number of car accidents, nor are many of the variables of interest to researchers normally distributed.

In addition, in many cases, the distribution of random variables (RVs) is unknown, or it cannot be determined due to the small sample size.

Secondly, doctors often focus on the quality of work.

Thirdly, many of the RVs that need to be evaluated are discrete by nature, meaning they can only be magnitudes with distinct values that cannot have other values between them. Many diagnostic signs belong to these: the number of points obtained in a questionnaire, the number of manifestations of the disease, the number of cases of recovery, and so on.

Fourthly, statistical analyses often require comparing relative RVs used in medicine. Similarly, for example, in healthcare, it is customary to express indicators of birth, morbidity, mortality, and many other phenomena. These are the number of events per 1000, 10,000, or 100,000 people.

On the other hand, non-parametric tests have less statistical power (less sensitivity) than their parametric analogs. If even weak deviations need to be found (for example, whether this dietary supplement is dangerous to health), it is necessary to select a statistical criterion with particular precision and conduct multiple trials.

In addition, non-parametric methods are most often used when the sample size is small. If there is a lot of data, then it becomes possible to check the type of distribution of the signs. If the distribution is close to normal, then it does not make sense to use non-parametric criteria. In such cases, parametric methods are more sensitive. Therefore, it is crucial to choose an adequate method of statistical processing of data in order to draw the correct conclusion.

A Brief Overview of Non-Parametric Methods

In terms of content, for each parametric criterion, there is at least one non-parametric analogue. These criteria can be said to belong to one of the following groups:

Descriptive statistics

Criteria for differences between independent samples (groups)

Criteria for differences between dependent samples

Criteria for relationships between RVs.

Descriptive Statistics

In the context being studied, the most important parameter of descriptive statistics is the criterion for checking the type of distribution, primarily for its conformity to the normal type. There are many conformity criteria designed for this purpose. The most popular of these are skewness and kurtosis indicators, Shapiro-Wilk, and Kolmogorov-Smirnov criteria.

The point is that if the data are normally distributed, then the calculations of simple descriptive statistics (for example, mean, standard deviations) are not very informative. For example, in psychophysiology, Weber-Fechner's law is known, according to which the perceived intensity of stimuli (for example, subjectively perceived light brightness) expresses a logarithmic function of the real intensity.

Difference between Independent Samples

When it's necessary to compare average data with only two choices (for example, men and women), the t-test for independent samples is used (TTEST in Excel). A non-parametric alternative to this test is the Mann-Whitney U test.

Relationship (Connection) between Variables

To assess the relationship between two variables (e.g., drug dosage and its pharmacodynamic effect), the Pearson's correlation coefficient is typically calculated. Its non-parametric analogue is the Spearman's R coefficient.

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If the two variables being considered are different in their nature, the appropriate non-parametric criteria for assessing the relationship are the chi-square and Fisher's exact test.

To assess the relationship between several variables, Kendall's coefficient of concordance is used. This test is used to assess the consistency of opinions of independent experts expressed in scores assigned to the same subject.

Software for Non-Parametric Statistics

RESULTS AND DISCUSSIONS

Currently, there is a large number of specialized computer programs that allow for fast, accurate, comprehensive, and demonstrative statistical processing of data.

English-language software package Statistica is among programs that allows for processing with the most popular non-parametric criteria (product of StatSoft corporation). Its Russian-language version is Statistica 6 БИОСТАТ. There are also SPSS and MegaStat, which is a small software structure consisting of a collection of non-parametric methods for Excel.

The "UniTime" platform is a project developed in collaboration by major US IT companies. UniTime is an AI-based educational planning system that generates university course and exam schedules, separates students into groups, and creates personalized schedules for students. Therefore, using artificial intelligence to assess learning and work performance is a good opportunity. The artificial intelligence field, known as the "Fourth Revolution in Education," aims to provide every student, regardless of location, with access to quality, personalized, and accessible education (both formal and informal). The field of artificial intelligence focused on learning and assessing work performance can also be used for:

- Intellectual learning systems. The task of intellectual learning systems is to provide step-by-step training sessions that are individual for each student in a mandatory block of subjects such as mathematics or physics. Based on the subject and cognitive science experience, the system also determines the best methods of learning through educational materials and audiences that individually respond to students' difficulties or successes. This approach is sometimes used in learning management systems such as "Moodle" and "OpenedX" or platforms such as "Khan Academy". As a student engages in learning activities, the system uses knowledge tracking and machine learning algorithms to automatically adjust the difficulty level and provide advice or recommendations based on each student's strengths and weaknesses. It should be noted that some modern intelligent learning systems collect and analyze emotional state data extensively.To further develop the education system, dialogue-based learning systems use natural language processing and other artificial intelligence methods to fully study and simulate the dialogue between teachers and students in a series of online assignments. More broadly, most interactive learning systems have been developed within the framework of research projects. A frequently tested innovative system is "AutoTutor," a computer tutor that helps students learn and get a better education. The "Watson Tutor" platform is a commercial system developed in collaboration by IBM and Pearson Education that works on the principle of adapting and individualizing the learning system.

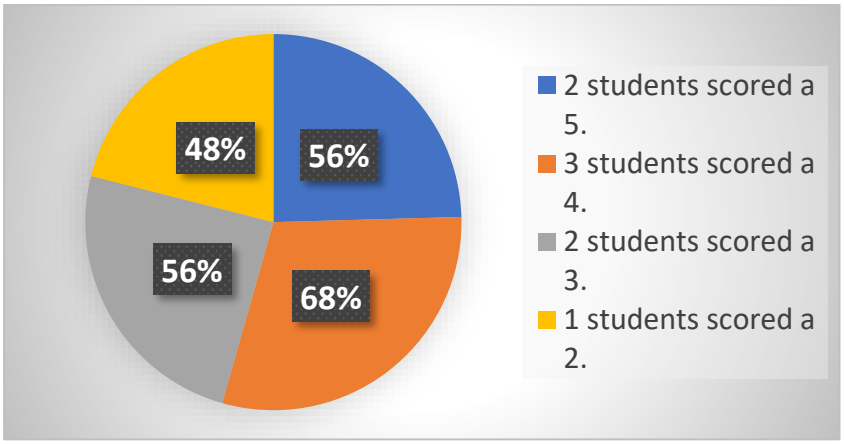
At the Tashkent Pediatric Medical Institute, the Department of Biophysics, Medical Informatics, II-Pediatrics and Medical Biology Faculty conducted empirical studies to determine the results of training organized to develop students' competencies in teaching the topic "Methods for Monitoring Radiation Safety."

The department is located at the 60910200 - Treatment work of 1st stage DI-104, DI-107, DI-110, DI-112 groups of students, 60910300 - Pediatrics of 1st stage PI-101P1, PI-106P2, PI-109P2, PI-112P2 groups of students, 60910600- Medical biology 1 st stage TB-101, TB-102, TB-103, TT-401, TT-402, TT-403 groups of students.

The students in the class were voluntarily divided into two groups: the first, control group (8 students) was taught in the traditional way, while the second, experimental group (10 students) was taught using electronic educational resources and interactive methods.

The first group consisted of 8 students, and they received the following grades:

2 students with a grade of 5 = 56% (average)
3 students with a grade of 4 = 68% (average)
2 students with a grade of 3 = 56% (average)
1 student with a grade of 2 = 48% (average)
Level of assimilation **= (56%+68%+56%+48%)/4=57%**



"Results were obtained by using the interactive method - 'Brainstorming' - with the second group of students. This group has a total of 10 students, and their results are as follows:

3 students received a grade of 5 = 70% (average)
5 students received a grade of 4 = 84% (average)
2 students received a grade of 3 = 58% (average)
Level of assimilation"**= (70%+84%+58%)/3=70,66%**

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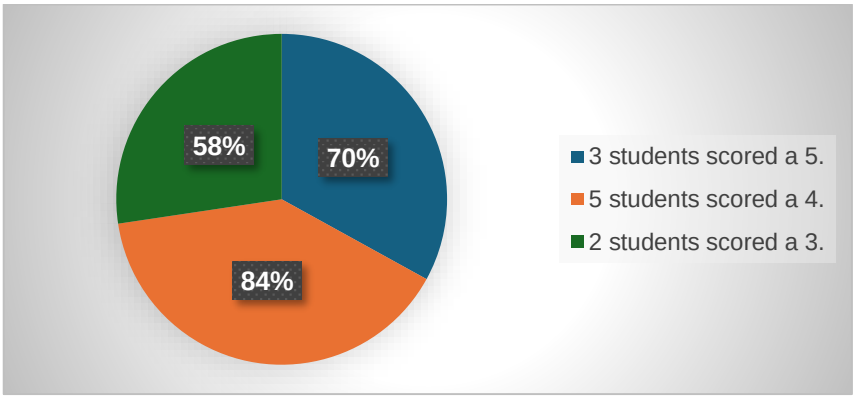

To comprehensively develop students' competencies in teaching the topic "Types of Information in Medicine," we conducted empirical studies to determine, to the extent possible, the results of specially organized theoretical and practical training sessions. The students in the class were voluntarily divided into two groups, independent of any parameters: students in the first, control group (8 students) were taught in the traditional way, while students in the second, experimental group (10 students) were taught using interactive methods.

Conducting the lesson on the topic of medical information types using the "Brainstorming" method increases the motivation of higher education students for the lesson, teaches students independent thinking, strengthens memory, promotes a culture of debate, reinforces knowledge acquired by students during the lesson, and teaches them to conduct independent research and scientific analysis. The lesson conducted using this "Brainstorming" method yielded an effectiveness of 13.66%.

RESULTS AND DISCUSSIONS

The scientific research based on the experience of innovative educational programs in higher education institutions helped to assess the possibilities of introducing the achievements of the modern educational system into the development of medical informatics and artificial intelligence systems. Based on scientific research, experimental testing was conducted at the Tashkent Pediatric Medical Institute, Faculty of "II-Pediatrics and Medical Biology," Department of "Biophysics, Medical Informatics," with students of the 1st stage of the 60910200 - "Medical Care" educational direction, groups DI-104, DI-107, DI-110, DI-112, students of the 1st stage of the 60910300 - "Pediatrics" educational direction, groups PI-101P1, PI-106P2, PI-109P2, PI-112P2, students of the 1st stage of the 60910600 - "Medical Biology" educational direction, groups TB-101, TB-102, TB-103, TT-401, TT-402, TT-403. Empirical comprehensive scientific research was conducted to determine the results of the training session organized to form the competencies of students in teaching the topic "Methods of Monitoring Radiation Safety."

In the experimental testing, significant differences were observed between the experimental group, which used the educational program, and the traditional control group. The students in the experimental group applied all the parameters related to medical informatics, teaching aids on the topic, and achieved a deeper understanding of the topic and higher indicators.

It should be noted that interactive methods are effective in increasing students' knowledge, further strengthening their interest in science, and developing their motivation and practical skills in learning.

The data obtained from student surveys and tests on the analysis of the lessons showed that all students in the experimental group achieved significantly higher scientific results in these areas of the state educational program compared to the control group. In particular, the average effectiveness of students' assimilation of topics related to medical informatics was 13.66%.

CONCLUSION

Teaching the topic of artificial intelligence in medical informatics in higher medical education by dividing students into two groups and explaining using two methods—traditional and "Brainstorming"—showed that modern educational programs achieve positive results by increasing students' motivational knowledge, shaping their practical skills, increasing their enthusiasm for science, and teaching them independent thinking. In other words, using the "Brainstorming" method to increase the overall quality of the educational process achieved a 13.66% effectiveness in students' assimilation of the topic.

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