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MATRIX METHOD IN THE STUDY OF THE LEARNING PROCESS USING ERGONOMICS

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Abstract: This research paper is devoted to the development and creation of a mathematical model of the learning process for research in the quality management of educational systems based on ergonomics.

Keywords and areas: ergonomics, mathematical modeling of the learning process, quality of learning, educational systems, mathematical research methods, matrix theory.

Innovation in the field of education is the most popular, which requires even more necessary and essential in the formation of personnel in the Republic of Uzbekistan. And so, in order to train personnel at the required level, it is necessary to create a condition for education of course initially, which meets the requirements of aesthetics, ethics and ergonomics, which accompanies the education of the trained specialist using information and communication technologies, simulation methods and mathematical methods of training quality.

The purpose of this research work is to study the educational process, develop and create mathematical or other types of models based on ergonomics, at what distance and in what position the teacher can give the maximum knowledge to the students, or the students can acquire knowledge from the teacher as much as possible/effectively (even using different technical means of training - TSO, regardless of its type).

Ergonomics is a science that is developed and created for research in various fields of science, technology, and

education. It is used in: technical developments/solutions, sports, mechanical engineering, medicine, etc.

A systematic approach to conducting research on problems in the field of teaching ergonomics.

Analysis and synthesis of the teaching process taking into account ergonomics. Ergonomics as a science of research and teaching.

Development of econometric models of teaching ergonomics

Establishment of logical and informational interrelations of pedagogical ergonomics in higher education institutions. The choice of methods by which calculations of econometric models of the ergonomics of teaching.

Analysis of research results and suggestions.

Since the educational process, regardless of the type of training, whether it is lecture, practical, laboratory or independent, they are all conducted in classrooms. Because of this, students of higher educational institutions are placed

differently in classrooms: in a radial, circular, and radial-ring form.

And so, one of the ways to determine the ergonomics of education is different types of location and distance in the audience between the teacher and the student, where, depending on this, you can determine the effectiveness of the acquired knowledge and the quality of the learning process.

To do this, it is necessary to conduct research in this area on the above indicators and factors. Our task is to explore the unknown, but in which we are always directly involved – this is the process of teaching/learning using ergonomics.

Research shows that the use and implementation of ergonomic indicators in teaching in the educational process:

- from the distance of the student and the teacher in the audience;
- from the location of the student and teacher in the classroom;
- from the student's perception coefficient during the lesson, which is determined by the INCERT method (conditionally, the "weights of acquired knowledge" can be equal: if it is in points, 0, 0.25, 0.5, 0.75 and 1.0 [1] or in grades 1, 2, 3, 4 and 5).

The progress of students is presented in the form of a table:

Acquired knowledge	Mastered	Imagine	Not very mastered	Not mastered
1.0	0.75	0.5	0.25	0
5	4	3	2	1

Based on the analysis of existing classrooms in higher education institutions as lectures, laboratory and practical classes, we suggest the following types of placement

of students in classrooms, i.e., taking into account the interaction of the teacher and the student (figure 1.).

This is:

- a radial view of the location;
- circular view of the location;
- radial-ring arrangement of students in the classroom.

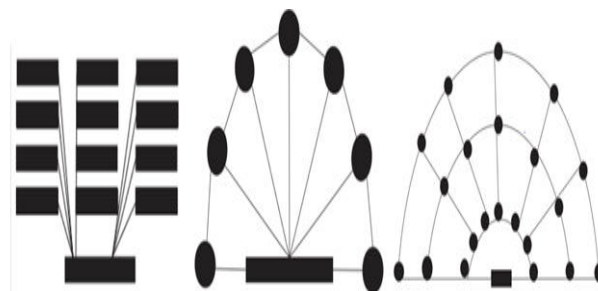


Figure 1

Based on the above built ergonomic models, the study of the quality of education can be determined by two **methods**

The first method is performed regardless of the type of location of students in the audience, it is necessary to determine the influence or distractions, which can be divided into strong, weak, and insignificant [4]. Where the interaction of the teacher and students can be defined as follows.

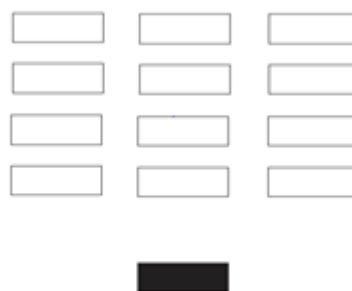


Figure 2

Figure 2 shows a study of the radial location of students in the classroom, where it is necessary to determine the influencing factors in pairs between the teacher and students.

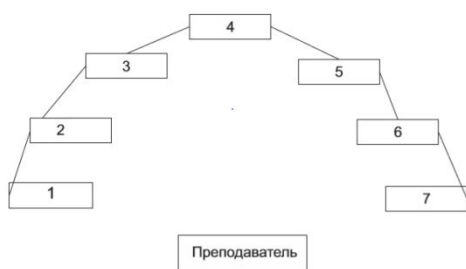


Figure 3

Figure 3 shows a study of the circular arrangement of students in the classroom, where it is necessary to determine the influencing factors in pairs between the teacher and students.

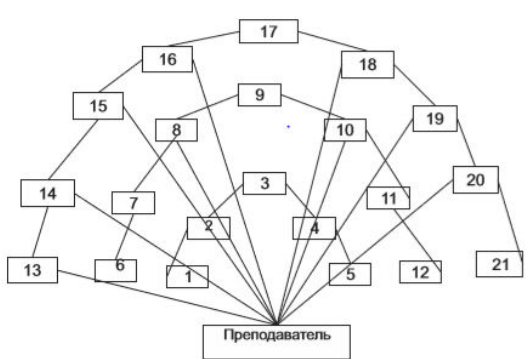


Figure 4

Figure 4 shows a study of the mixed, i.e. radial-ring arrangement of students in the classroom, where it is necessary to determine the influencing factors between the teacher and students.

The second method is a matrix method that is built on the basis of ergonomic models necessary for developing a mathematical model of the educational process. On this basis, you can build a simulation model of the object of research-the learning process. By solving them using mathematical methods like Seidel or Gauss you can get the first results of the study, i.e. the quality of learning to manage over the learning process.

From the ergonomic location of students in the classroom, we build a

mathematical model of it, so that it is convenient to use the theory of matrices from the mathematics section. Because the location of trainees in the audience, regardless of their location, is easily described in the form of a matrix, where the elements of the matrix are the trainees.

Based on the ergonomic model of the learning process and taking into account the location of teaching students in the classroom, the mathematical model of the study of the quality of learning is very convenient and easy to build in the form of a square matrix. Where the elements of the square matrix are the students being taught in the classroom.

The peculiarity of this method is that the matrix representation of the location of students being trained does not depend on the type of training (lecture, practice, laboratory, independent study). Trainees are placed in classrooms where the size of the audience is a boundary condition for the size of the matrix, i.e., indexes.

Общая Hence the square matrix A_{ij} (a – audience, a_{mn} – trainees, where the indices i,j correspond to the location of the students being trained in the audience).

Groups of trained students in the classroom regardless of the type (lecture, practice, laboratory, self-study) of training with the study of the ergonomic model, we build a mathematical model in the form of an a_{ij} matrix:

$$A_{ij} = \begin{pmatrix} a_{11}, & a_{12}, & \dots, & a_{1n} \\ a_{21} & a_{22}, & \dots, & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1}, & a_{m2}, & \dots, & a_{mn} \end{pmatrix}$$

depending on the number of students enrolled a_{mn} .

The table is filled in based on the group survey, i.e. on the response of each trainee a_{ij} . And so the matrix is statistically filled with the received responses. The values

a_{1j} , a_{2j} ,..., and a_{ij} depend on the number of valid classes. For example, if the lecture is 36 hours long, the trainees will be interviewed 18 times, i.e. $a_{(m, 18)}$ and the table will be filled with the trainees' responses 18 times, which will be carried out by brainstorming. This means that the matrix of results obtained will be cyclically calculated 18 times and the final result, i.e. the quality of training, is determined.

For each calculation, the following matrix is filled in for each response of the trainee with scores (1, 2, 3, 4, 5).

Summary:

Since this study is the first approximation in our practice, we can assume that there are other methods of achieving this goal that we do not know. In addition, we have not considered the participation of other factors, such as electronic whiteboard, sound, various devices and devices that affect the quality of training. Because of this, it is necessary to carefully study / research the learning process and build an ergonomic model relative to it, since:

First, in the literature reviews of domestic and foreign literature, we did not find materials in the field of ergonomics in the field of education.

Secondly, the mathematical model we have built in the form of a matrix is a very good choice, where it digitally adequately describes the object under study and evaluates the learning process.

Third, the use of mathematical methods in solving the problem with the help of Seidel and Gauss method. We have not yet determined the choice of one of them, this will show further research.

Fourth, this development is very necessary in determining the quality of educational systems not only for one group, but in General for the entire University and higher educational institutions, which is currently relevant.

Fifth, in the design process between the ergonomic models of such systems, it is necessary to determine the logical and informational relationships to determine the relationship of the subsystem element as a whole with the system.

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