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Paper Authors

Khaldarov Khikmatullo Akhmatovich, Primkulova Alima Asetovna, Urakova Sharofat Bakhodirovna

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THE CONSTRUCTION OF THE MATHEMATICAL MODEL OF THE LEARNING PROCCESS WITH THE HELP OF ERGONOMICS

Khaldarov Khikmatullo Akhmatovich, Ph.D., Associate Professor
Khaldarov1946@mail.ru
Primkulova Alima Asetovna, senior teacher
Urakova Sharofat Bakhodirovna, applicant
Tashkent State Pedagogical University

Annotation: This research work 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.

Key words and directions: ergonomics, mathematical modeling of the learning process, quality of teaching, educational systems, mathematical research methods, matrix theory.

Innovation in the field of education is the most demanded, 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 demanded level, it is necessary to create a condition of 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, the quality of teaching.

The purpose of this research work is to determine, develop mathematical or other types of models based on ergonomics, in what distance and in what position the teacher can give the maximum knowledge to the learners, or the learners can acquire knowledge from the teacher most / effectively, (even using different technical means training - TCO regardless of its type).

Ergonomics is a science that is developed and created for the study of various fields of science, technology, and education. It is used in: engineering / solution, sports, mechanical engineering, medicine, etc.

A systematic approach to researching problems in the field of teaching ergonomics.

Analysis and synthesis of the teaching process taking into account ergonomics.

Ergonomics is like the science of research and teaching.

Development of econometric models of teaching ergonomics.

Establishment of logical and informational relationships of pedagogical ergonomics in universities.

The choice of methods by which calculations of econometric models of teaching ergonomics are carried out.

Analysis of the research results and proposal.

As the proccess of education despite its of studying whether it is lecture practise laboratory or indenendent work, all of them are conducted in auditory. Because of this, the taught students of higher educational institutions in the classrooms are located in

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different ways: in a radial, circular and radial-circular form.

And so, one of the types of definition of the ergonomics of education is different types of location and distance in the classroom between the teacher and the student, where, depending on this, it is possible to determine the effectiveness of the acquired knowledge and the quality of the learning process.

Inorder 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 teacher in the classroom;
- from the location of the student and teacher in the classroom;
- from the coefficient of the learner's perception during the lesson, which is determined by the Incert method (conditionally, the "scales of acquired knowledge" can be equal: if it is in points, 0, 0.250.5, 0.75 and 1.0 or in grades then 1, 2, 3 , 4 and 5).

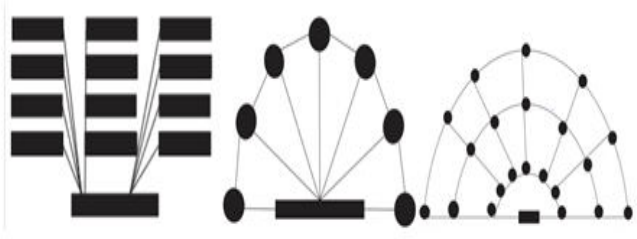
The progress of students is presented in the form of a table:

Has gained knowledge	Mastered	I represent	Not really mastered	Not mastered
1.0	0.75	0.5	0.25	0
5	4	3	2	1

Based on the analysis of the available classrooms in universities as lectures, laboratory and practical classes, we propose the following types of arrangement of students in classrooms, i.e. taking into account the interaction between the teacher and the student (Picture: 1.)

It:

- radial view of the location;
- circular type of arrangement;
- radial - circular arrangement of trainees in the classroom.

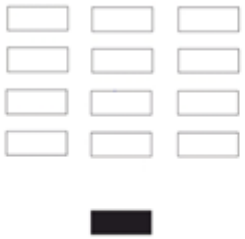


Picture 1.

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

The first method for determining the coefficient of learners' perception. This method is carried out regardless of the type of location of students in the classroom, it is necessary to determine the influence, or distractions,

which can be divided into strong, weak and insignificant. Where the interaction between the teacher and the trainees can be defined as follows.



Picture: 2.

Picture: 2 provides a study of the radial arrangement of students in the classroom, where it is necessary to determine the

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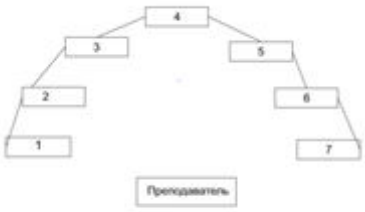
influencing factors in pairs between the teacher and the students.

For example, PR ↔ ST (n), ST (n) ↔ ST (n + 1) or ST (n) ↔ ST (n + 1) ↔ ST (n + 2) (where n is the student's serial number in the classroom). And so, we have identified 4 options for the relationship between teacher and students (2-table).

2-table

1-option	2-option	3-option	4-option
ПР ↔ CT(1), ПР ↔ CT(2), ПР ↔ CT(3)	CT(1) ↔ CT(4), CT(2) ↔ CT(5), CT(3) ↔ CT(6)	CT(1) ↔ CT(2)↔ CT(3)	CT(1) ↔ CT(4)↔ CT(7)
ПР ↔ CT(4), ПР ↔ CT(5), ПР ↔ CT(6)	CT(4) ↔ CT(7), CT(5) ↔ CT(8), CT(6) ↔ CT(9)	CT(4) ↔ CT(5)↔ CT(6)	CT(2) ↔ CT(5)↔ CT(8)
ПР ↔ CT(7), ПР ↔ CT(8), ПР ↔ CT(9)		CT(7) ↔ CT(8)↔ CT(9)	CT(3) ↔ CT(6)↔ CT(9)

Picture: 3 presents 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 the students.



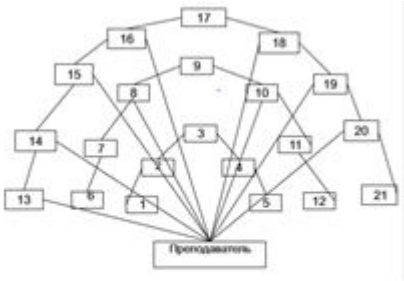
Picture: 3.

For example, PR ↔ ST (n), ST (1) ↔ ST (2) (ST (n) ↔ ST (n + 1)) or PR ↔ST (n1) ↔ ST (2) i.e. PR ↔ (ST (n) ↔ ST (n + 1)) (where n is the student's serial number in the classroom). And so, we have identified 3 options for the relationship between teacher and students (3-table).

3-table

1-option	2-option	3-option
ПР ↔ CT(1), ПР ↔ CT(2), ПР ↔ CT(3), ----- ПР ↔ CT(n)	CT(1) ↔ CT(2), CT(2) ↔ CT(3), ----- CT(n) ↔ CT(n+1)	ПР ↔CT(1) ↔ CT(2) или ПР ↔[CT(1) ↔ CT(2)] ПР ↔CT(2) ↔ CT(3) или ПР ↔[CT(2) ↔ CT(3)] ---------- ПР ↔CT(n) ↔ CT(n+1) или ПР ↔[CT(n) ↔ CT(n+1)]

Picture: 4 provides a study of mixed, i.e. radial-circular arrangement of students in the classroom, where it is necessary to determine the influencing factors between the teacher and students.



Picture: 4.

For example, PR ↔ ST (n), ST (1) ↔ ST (2) (ST (n) ↔ ST (n + 1)) or PR ↔ST (n1) ↔ ST (2) i.e. PR ↔ (ST (n) ↔ ST (n + 1)) (where n is the student's serial number in the classroom). Location options for a mixed view from Picture 4, paired links look like this:

PR ↔ ST (n);
PR ↔ ST (n) ↔ ST (n + 1);
PR ↔ ST (n) ↔ ST (n + 1) ↔ ST (n + 2);
PR ↔ ST (n) ↔ ST (n + 2) ↔ ST (n + 4);
PR ↔ ST (n ↔ ST (n + 3) ↔ ST (n + 5);

Thus, we have identified 4 options for the relationship between teacher and students (4-table).

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1-option	2-option	3-option	4-option
ПР ↔ CT(1), ПР ↔ CT(2), ----- ПР ↔ CT(n)	CT(1) ↔ CT(2), CT(2) ↔ CT(3), ----- CT(n) ↔ CT(n+1)	ПР ↔CT(1) ↔ CT(2) или ПР ↔[CT(1)↔ CT(2)] ПР ↔CT(2) ↔ CT(3) или ПР ↔[CT(2)↔ CT(3)] ---------- ПР ↔CT(n) ↔ CT(n+1) или ПР ↔[CT(n)↔ CT(n+1)]	ПР↔ CT(n); ПР ↔ CT(n) ↔ CT(n+1); ПР ↔ CT(n) ↔ CT(n+1)↔ CT(n+2); ПР ↔ CT(n) ↔ CT(n+2)↔ CT(n+4); ПР ↔ CT(n ↔ CT(n+3)↔ CT(n+5); -------

Based on the regularities of the ergonomic arrangement of students in the classroom, we have developed an algorithm for researching lectures and practical lessons.

And research predicts from specialty and specializations many more different algorithms need to be developed. Because our goal is to organize the educational process in a very spacious, comfortable, ethical, efficient and effective way so that the student gains knowledge as much as possible. And this, in turn, leads to the development of new various optimal algorithms with the help of which, with understanding, the student will acquire knowledge.

It is especially necessary to develop simulation models for conducting laboratory and independent work when they are carried out with small subgroups, where students solve the problem from setting the problem to obtaining the optimal result.

Research proves that you need to:

1. Develop an algorithm for conducting classes;
2. Develop a simulation model for conducting classes;
3. Based on the properties of the problem being solved, select from the standard available methods, if you can develop a mathematical calculation method yourself, or use the existing ready-made software packages.

Resume:

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

Secondly, we have constructed a mathematical model in the form of a matrix, a very good choice, where in digital form it adequately describes the object under study and assesses the learning process.

Thirdly, the use of mathematical methods in solving the problem with the help of Seidel and Gauss honey. We have not yet determined the choice of one of them, this will be shown by further research.

Fourthly, 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 relevant today.

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

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