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ORGANIZATION OF PEDAGOGICAL EXPERIMENTAL WORK AND ANALYSIS OF ITS RESULTS WHEN TEACHING GENERAL AND MEDICAL RADIOBIOLOGY AT UNIVERSITIES.

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Abstract:

In this article, the application of the results of pedagogical research in the educational process is important and shows the effectiveness of research work; high rates have been achieved in the formation of relevant knowledge. The experimental work was carried out during 2020-2023, the experimental and control groups were selected from among students of the Tashkent Medical Academy, Samarkand State Medical University and Bukhara State Medical University.

Keywords: General and medical radiobiology, Pearson Chi-square, Pearson formula.

INTRODUCTION

When organizing classes in general and medical radiobiology, the content of the subject and the initial state of knowledge, imagination and skills of students were determined. The results of the analysis showed that university students have insufficient knowledge of nuclear technology, teaching aids and textbooks are not published, and medical technology has no idea about the application of laws to the body.

In the experimental and control groups, all types of training in general and medical radiobiology were conducted by 8 professors. In higher educational institutions, general and medical radiobiology was carried out in control groups in the traditional way, and in experimental groups - on the basis of experimental methods.

The science of general and medical radiobiology was organized using modern educational technologies. Organization of classes with the help of pedagogical and information technologies, video materials, demonstration experiments and electronic slides led to the formation of theoretical knowledge, practical skills and qualifications among students.

One of the main tasks is to confirm the content of the research work and the effectiveness of the ideas put forward in them based on the analysis of the final results of the experimental work carried out at the Kamarkand State Medical University, Bukhara State Medical Institute, and the Tashkent Medical Academy using mathematical and statistical methods.

The experimental work consists of three stages: isolation (2020-2021), formative (2021-2022) and final (2022-2023) stages. It was organized among 1st level students of higher educational institutions.

275 university students were involved in the pedagogical experimental work, 137 were assigned to the experimental group and 138 to the control group.

Table 1.

Academic year	*Experienced higher education institutions*	*Number of students*		
		Experiment	Control	Total
2020-2021	SamSMU	20	19	39
	BukhSMU	17	18	35
	TMA	18	19	37
2021-2022	SamSMU	14	15	29
	BuxSMU	14	13	27
	TMA	15	14	29
2022-2023	SamSMU	16	15	31
	BukhSMU	12	13	25
	TMA	11	12	23
	Total	137	138	275

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As the main goal of the first stage of experimental work (2020-2023), scientific literature, dissertations, abstracts, and articles on the research problem in scientific journals were studied. Materials from foreign literature, international conferences and conferences were studied and compared with the state of the industry in our republic. As a result of the research, the content of the subject, methodological recommendations for its effective development, and teaching methods were formed. The purpose of higher educational institutions was to study the state of general and medical radiobiological science, to develop a criterion for determining the level of knowledge and ideas of students about science. For this purpose, the activities of students in general and medical radiobiology were studied in theoretical, practical and laboratory classes. Scientific and working programs of general and medical radiobiology are analyzed. Organized trainings were observed in higher education institutions.

Initial data collection questions were developed and administered to students.

1. What concepts about ionizing radiation do you know?
2. Dosimetric devices?
3. What concepts do you know about doses and units of radiation?
4. Geiger counter?
5. How is radiation sickness classified?
6. Explain radiation syndromes?
7. Occurrence, classification of mild diseases?
8. Primary period of reaction in acute mild illness?
9. Latent period of acute mild illness?
10. Advanced period of acute mild illness?
11. The initial period of recovery for acute mild illness?
12. Acute photo disease caused by uneven irradiation?
13. Chronic mild illness, mechanisms of development of complications?
14. Restorative processes in an irradiated organism?
15. Late post-radiation complications, tumor development?
16. Principles of treatment of mild illness?
17. What is a radioprotector?
18. How are radioprotectors classified?
19. Explain the mechanism of action of radioprotectors?
20. What are the prospects for using bioflavonoids as radioprotectors?
21. Describe the radiography method?
22. What is X-ray crystallography?
23. What is the maximum permissible dose?
24. Explain the amount of radiation exposure on an airplane.
25. What is the radiation dose from exposure to a TV screen?
26. What is the risk of receiving electromagnetic radiation from cell phone antennas?

Observing classes, interviewing students and answering questions revealed the following situations:

1) lecture materials in higher educational institutions do not relate to specialization and do not cover the use of modern medical technical means to patients;
2) Students do not actively participate in the process of testing and solving problems in practical classes;
3) they cannot practically explain those definitions and concepts of nuclear technology that they know by heart in the course of experimental work;
4) Students cannot demonstrate acquired knowledge, skills and abilities in practical classes;
5) Classes are organized according to traditional methods;
6) It has been established that most students do not have enough knowledge and understanding about the role of general and medical radiobiological science in the medical field.

At the second stage of experimental work (2020-2021) A criterion for assessing the knowledge, skills and abilities of students has been developed, and their level of skill is determined using a 5-point system (excellent, good, satisfactory, unsatisfactory).

Table 2. Assessment Theoretical knowledge and practical skills

Score	*Theoretical knowledge and practical skills*
5	Has complete knowledge of general and medical radiobiology, thinks creatively, makes independent conclusions, works on problems and performs experiments.
4	Has knowledge of general and medical radiobiology, can draw conclusions, solve problems and perform experimental work, cannot think independently.

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3	He does not have complete knowledge of general and medical radiobiology science, he can draw conclusions, he cannot solve problems and experiments independently, he does not think independently.
2	He does not have general and medical radiobiology knowledge, he cannot draw conclusions, he cannot solve problems and experiments, he does not think independently.

Table 3. Students' mastery indicators at the beginning and end of the experiment

Experiment stage	*Groups*	*Number of students*	*Grades*				*Average grade*
			5	4	3	2	
Experience at the beginning	Experience	137	21	59	42	15	3,6
	Control	138	18	59	45	16	3,57
	Experience	137	36	82	15	4	4,09
	Control	138	19	71	41	8	3,7

Table 4. Students' mastery at the end of the experiment indicators

Experiment stage	*Groups*	*Number of students*	*grades*				*Average grade*	*Efficiency*
			5	4	3	2		
At the end of the experiment	Experience	137	36	82	15	4	4,09	1,1
	Control	138	19	71	41	8	3,7	

RESULTS OF PEDAGOGICAL EXPERIMENTS AND THEIR ANALYSIS

To determine the reliability of the results obtained on the basis of teaching experience and to demonstrate the effectiveness of the proposed work, the Pearson "Chi-square" criterion was used. Pearson's formula is expressed as follows:

$$T_{res} = \frac{1}{n_1 n_2} \sum_{i=1}^{c} \frac{(n_1 Q_{2i} - n_2 Q_{1i})^2}{Q_{1i} + Q_{2i}}$$

Table 5. Level of student performance at the beginning and end of the experiment

Groups	*Number of students*	*Grades*			
		5	4	3	2
Experience	137	$\frac{36}{\frac{(137\cdot 54)}{275}} = 26{,}9$	$\frac{82}{\frac{(137\cdot 153)}{275}} = 76{,}2$	$\frac{15}{\frac{(137\cdot 56)}{275}} = 27{,}8$	$\frac{4}{\frac{(137\cdot 12)}{275}} = 5{,}9$
Control	138	$\frac{19}{\frac{(138\cdot 54)}{275}} = 27$	$\frac{71}{\frac{(138\cdot 153)}{275}} = 76{,}8$	$\frac{41}{\frac{(138\cdot 56)}{275}} = 28{,}1$	$\frac{8}{\frac{(138\cdot 12)}{275}} = 6$
Total	275	54	153	56	12

Let's define the degrees of freedom:

$$x^2 = \frac{(36-26{,}9)^2}{26{,}9} + \frac{(82-76{,}2)^2}{76{,}2} + \frac{(15-27{,}8)^2}{27{,}8} + \frac{(4-5{,}9)^2}{5{,}9} + \frac{(19-27)^2}{27} + \frac{(71-76{,}8)^2}{76{,}8} + \frac{(41-28{,}1)^2}{28{,}1} + \frac{(8-6)^2}{6} = 19{,}1$$

We define degrees of freedom: $\mu = (\kappa - 1)(c - 1)$

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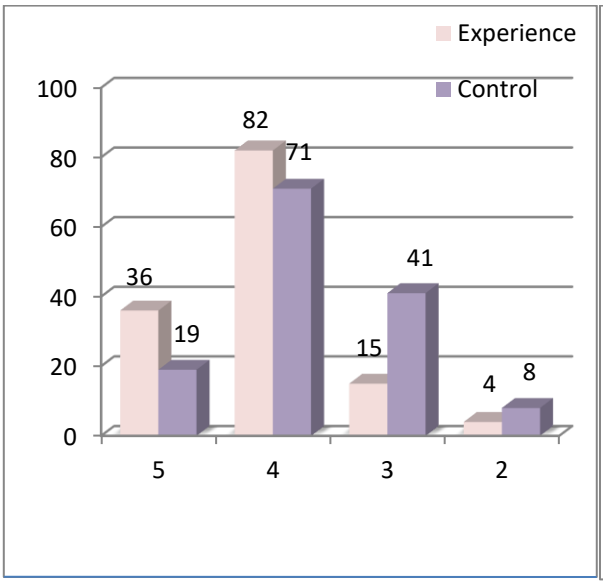
Where k is the number of columns of the data being analyzed,
number of c-rows.

From the table, we write down the corresponding values of χ^2 with degrees of freedom m=3:

$$\chi^2_{\kappa} = \begin{cases} 7{,}815 \; p = 0{,}05 \\ 11{,}345 \; p = 0{,}01 \end{cases}$$

It was found that the value of the statistical criterion for the experimental and control groups was x^2=19, 1> x^2_{crirt}=11.345. bAnalysis of the results obtained showed confirmation of the ideas we put forward. The teaching method we propose, based on modern pedagogical and information technologies, has shown its advantages.



Picture 1. Student learning rates at the beginning of the experiment

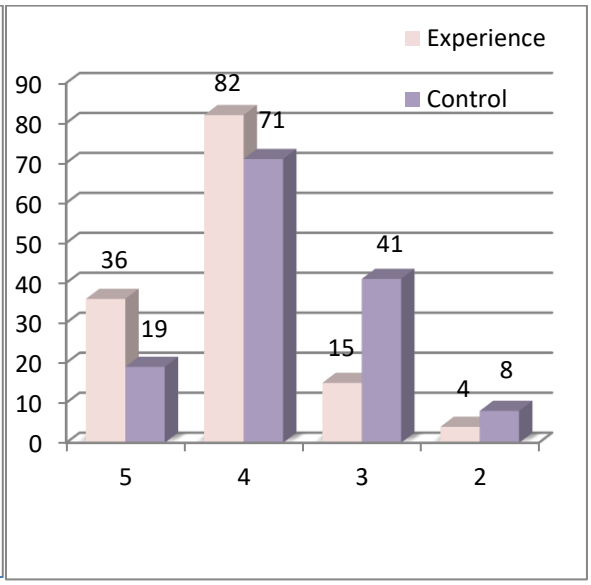


Figure 2. Attainment indicators of students at the end of the experiment

CONCLUSIONS

As a result of the experimental work, the improvement of the content and teaching methods of the higher school of general and medical radiobiology allowed us to draw the following conclusions:

1. The content of the main stages of the pedagogical experiment-test work is explained. It has been scientifically proven that the training of medical specialists in higher education on the basis of general and medical radiobiology has a positive effect on the educational process.
2. It has been established that improving the content of general and medical radiobiological science in the training of physicists and medical specialists in higher education helps to increase the efficiency of its development.
3. Using the mathematical and statistical method, the strengthening of the practical application of general and medical radiobiological science in the field of medicine in the training of highly qualified medical specialists in higher medical educational institutions was analyzed.
4. The results of the pedagogical experiment-test turned out to be higher in the experimental groups compared to the control groups (Pearson's xi-square test (· 2)).

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