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VISUAL BIOLOGY USING VIRTUAL PROGRAMS AND DIDACTICAL TOOLS IN TRAINING.

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Abstract. This study is devoted to the development and improvement of methods for using virtual programs and didactic tools in the educational process in biology with the aim of effectively developing students' research skills. The study allows us to conclude that the use of virtual programs and didactic tools using the developed methodology contributes to more effective development of students' research skills in the process of teaching biology. The presented results can be used in educational practice to improve the quality of education and motivate students to active learning activities.

Keywords: modern technologies, virtual programs, didactic tools, teaching methods, teaching biology, pedagogy.

INTRODUCTION

In the context of the rapid development of virtual technologies, the use of virtual programs in teaching biology is a promising approach that helps improve the quality of education and increase students' motivation for learning activities.

Visual biology provides the teacher with the opportunity to find the most interesting and effective teaching methods, making classes interesting and more intense. The main advantage of visual biology is the ability to demonstrate biological phenomena from a wider perspective and comprehensively study them.

MATERIALS AND METHODS

During the study, a wide range of methods was used, including theoretical analysis of literature in the field of pedagogy, psychology and teaching methods, study of best practices, interviews, questions and answers, comparative analysis, as well as the use of surveys, testing, questionnaires, pedagogical observation, monitoring, generalizations and statistical methods.

As part of practical activities, the effectiveness of the proposed methodology was assessed based on the level of students' knowledge acquisition in the discipline "Medical Biology". For this purpose, the following forms of control were used:

1. Oral questions and answers that assessed students' thorough understanding of topics and their ability to logically analyze educational material.
2. Individual and group interviews aimed at identifying the degree of mastery of concepts, identifying learning difficulties and identifying aspects that require additional attention in subsequent classes.
3. Practical tasks aimed at testing the application of theoretical knowledge in practice, as well as at developing and consolidating skills and competencies in solving problems of a biomedical nature.
4. Test tasks used by students to assess the level of mastery of both theoretical and practical knowledge, as well as skills and abilities in the field of medical biology, both on individual topics and in general.

To evaluate the effectiveness of the recommended system and methodology in teaching the subject "Medical Biology" in medical universities, a comprehensive study was conducted, including sequential, continuous ongoing, intermediate and final control measures in both the experimental and control groups. The purpose of the tests was to determine the advantages of the recommended system and methodology in the effective organization of the educational process in this subject.

During the assessment process, attention was paid to the following aspects:

- Formation and expansion of students' knowledge of "Medical Biology" in medical universities, taking into account the learning objectives.
- Stability of acquired medical and biological knowledge among students.
- Conscious assimilation of biomedical concepts by students and their ability to apply them logically in further professional education.
- Development of independent thinking skills and logical coherence among students when mastering various topics in the subject.
- The ability of students to apply the acquired theoretical knowledge of "Medical Biology" in practice, including educational and medical practice, effectively and professionally.

RESULTS AND DISCUSSIONS

Mathematical and statistical analysis of the results of the pedagogical experiment was carried out according to the method of V.E. Gmurman. Quantitative indicators representing test results obtained in the control and experimental groups were determined as a percentage (%) of the total number of students assigned to the control and experimental groups, and were taken as a statistical sample. Through X_{ki} , Y_{ki} and Z_{ki} for three academic years ($k=1$ for 2019–2020; $k=2$ for 2020–2021; $k=3$ for 2021–2022), respectively, the Tashkent Medical Academy (TMA), Termez branch of the Tashkent Medical Academy (TftMA), Samarkand State Medical University (SSMU) and student respondents involved in the experimental work.

The number of repetitions of the respondents' response indicators for the above three test sites is n_{ki} , m_{ki} and l_{ki} .

The results are reflected in the following tables 3.1, 3.2, 3.3:

Table 3.1. Experience ($k=1$) ordered (variational) series for the 2019–2020 academic year.

Groups	Replays	Indicators X_{ki} , Y_{ki} and Z_{ki}														
		30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Control (SSMU)	n_{ki}	2	1	3	2	2	3	3	5	7	7	9	8	8	0	0
Experience (TftMA))	m_{ki}	0	0	0	2	3	1	1	4	8	7	11	10	7	4	2
Experience (TMA)	l_{ki}	0	0	0	0	2	1	1	1	9	7	11	12	7	5	4

Table 3.2.($k=2$) ordered (variational) series for the 2020–2021 academic year

Groups	Indicators X_{ki} , Y_{ki} and Z_{ki}
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	Replays	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Control (SSMU)	n_{ki}	1	2	1	2	2	3	3	4	7	9	8	8	7	3	0
Experience (TfTMA))	m_{ki}	0	0	0	0	2	2	2	2	5	6	10	10	12	7	2
Experience (TMA)	ℓ_{ki}	0	0	0	0	0	1	0	5	6	6	12	8	10	8	4

Table 3.3. (k=3) ordered (variational) series for the 2021–2022 academic year

Groups	Replays	Indicators X_{ki} , Y_{ki} and Z_{ki}														
		30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Control (SSMU)	n_{ki}	0	0	1	1	4	3	2	4	10	9	11	3	5	5	2
Experience (TfTMA))	m_{ki}	0	0	0	0	1	2	3	1	4	7	8	9	10	9	6
Experience (TMA)	ℓ_{ki}	0	0	0	0	0	3	1	1	5	7	6	9	12	8	8

From the analysis of the table it can be seen that the performance indicators of students in the control groups were lower compared to the experimental groups:

In 2019–2020 they were 70.1%;

In 2020–2021 - 72.9%;

In 2021–2022 - 74.4%.

The performance indicators of students in the experimental groups were higher:

In 2019–2020 - from 77% to 79.08%;

In 2020–2021 - from 80% to 82.5%;

In 2021–2022 - from 82.8% to 84.1%.

This indicates that the effectiveness of training in experimental groups exceeds the results of control groups. The reasons for this difference may be the following:

1. Insufficient level of development of complex knowledge in the subject “Medical Biology” in the control groups.

2. Predominant use of traditional methods and forms of teaching.

3. Lack of educational collaboration between students and teachers in the sciences.

4.. Insufficient attention to the development of independent skills in students and their qualifications for independent work.

The effectiveness of teaching in the experimental groups was increased through the use of advanced pedagogical methods, such as interactive methods and stimulation of independent study of educational material. This led to an increase in student interest in the educational process and, consequently, to an improvement in

the acquisition of both theoretical and practical knowledge in the field of medical biology.

CONCLUSION

In conclusion, the analysis showed that the use of advanced pedagogical methods in organizing training in the subject "Medical Biology" in the experimental groups led to a significant increase in student performance indicators compared to control groups. This confirms the effectiveness of new approaches to teaching, such as the use of interactive methods, stimulation of independent study of material, and the development of educational collaboration between students and teachers.

The observed increase in students' interest in the educational process and a deeper assimilation of both theoretical and practical knowledge in the field of medical biology indicates that the use of advanced pedagogical technologies really contributes to improving the quality of education. This emphasizes the importance of continuous development of teaching methods and the introduction of innovative approaches to the educational process to achieve better learning results and prepare highly qualified specialists in the medical field.

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