

STUDY OF THE IMPACT OF ELECTRONIC LEARNING TOOLS ON THE LEVEL OF FORMATION OF HEALTH-PRESERVING COMPETENCE AMONG STUDENTS OF THE SPECIALTY «THERAPY AND REHABILITATION»

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ABSTRACT

Aim: To check the effectiveness of the health-preserving competence formation in future specialists with the processing of multidimensional data using electronic learning tools when studying the discipline «Basics of the theory of health and a healthy lifestyle».

Materials and Methods: The research was conducted during the 2022-2023 academic year on the basis of the «Kharkiv Humanitarian and Pedagogical Academy» a communal institution of the Kharkiv Regional Council, Poltava State Medical University and Luhansk Taras Shevchenko National University. 120 students of the specialty 227 «Therapy and Rehabilitation» and 017 «Physical Culture and Sports» were involved in the pedagogical experiment. Research methods: analysis of scientific and methodical literature; pedagogical observation; pedagogical experiment; pedagogical testing; methods of mathematical statistics.

Results: The technology of performing practical competence-oriented tasks and the system of its evaluation, which provided for the diagnosis of the activity component of competence, were substantiated. Test tasks for diagnosing the cognitive component of competence and a special method of processing the results have been developed, which ensures the integration of relevant indicators of individual components of competence into the final generalized result.

Conclusions: The diagnostics of the development levels of the formation of the health-preserving components of multidimensional data processing competence among future specialists, the statistical processing of the obtained data at all stages of experimental work, made it possible to make a statistically reliable conclusion about the positive impact of the implemented model of the formation of the studied health-preserving competence by means of electronic learning.

KEY WORDS: health-preservation, competence, model, rehabilitation, higher education students, therapy

INTRODUCTION

Among pedagogical technologies, new information technologies with an aspect of health-preserving competence have become widespread in institutions of higher education. There is no doubt about the necessity of their implementation in the educational process, since information technologies are one of the most important means of raising the intellectual level of a person, and qualitatively improving the training of future specialists. Usage of information technologies stimulates motivation, increases cognitive interest, and the effectiveness of learning. Information technologies of education open fundamentally new opportunities in educational activity and creativity of the student of education [1-3].

Computer systems for educational purposes provide an opportunity to differentiate the learning process,

apply an individual approach, monitor the personality and provide feedback, to ensure self-control and self-correction of educational and cognitive activity; to reduce learning time by performing complex calculations by the computer [4-10]. A careful analysis of the scientific and methodological literature on the problem of the use of informational means of learning by students of higher education indicates the presence of various computer software products of an educational and controlling nature. But at the same time, we discovered that not enough attention is given to informatization of the process of assimilation of multivariate analysis methods [11-14]. This prompted the authors to determine the influence of electronic learning tools on the level of formation of health-preserving competence among students of higher

education specialty 227 «Therapy and Rehabilitation» and 017 «Physical Culture and Sports» [15-20].

The transition to competence-oriented content of education requires a thorough system of evaluation of the final result of education, determination of the level of competence formation. Currently, a clear, unified methodology for diagnosing health-preserving competence has not been developed. Traditional methods of monitoring knowledge and skills do not allow to fully diagnose the level of health-preserving competence formation, which is why there is a need for a comprehensive approach to solving this task.

AIM

The aim of the study is to check the effectiveness of the model health-preserving competence formation in future specialists with the processing of multidimensional data using electronic learning tools when studying the discipline «Basics of the theory of health and a healthy lifestyle».

MATERIALS AND METHODS

The research was conducted during the 2022-2023 academic year on the basis of the «Kharkiv Humanitarian and Pedagogical Academy» a communal institution of the Kharkiv Regional Council, Poltava State Medical University and Luhansk Taras Shevchenko National University. 120 students of the specialty 227 «Therapy and Rehabilitation» and 017 «Physical Culture and Sports» were involved in the pedagogical experiment. In accordance with the set task, in order to determine the effectiveness of the model of competence formation among future specialists in the processing of empirical data, a pedagogical experiment was conducted, which consisted of two stages: ascertainment-research (September-December 2022) and formative (January-May 2023).

At the first stage of the experiment, an analysis of the scientific and methodological literature on the research problem was carried out; existing requirements for informational training of students of higher education, experience in using electronic learning tools; the level of residual knowledge of education seekers regarding the basic concepts of data processing was determined, a questionnaire was conducted, the directions and tasks of the next stage of the pedagogical experiment were outlined.

At the beginning of the 2022-2023 academic year, in order to diagnose the current level of basic knowledge of informatics in data processing among students, a testing method was chosen and a special system of test tasks was developed. The corresponding test contained general information on the basic concepts of data processing, in the following directions: 1) information and information processes; 2) modeling; 3) information technologies; 4) informational system; 5) problem solving technology using information and communication technologies tools; 6) algorithmization. Entrance testing was conducted at the first information technology class in a computerized form. Exactly 120 students of the specialty 227 «Therapy

and Rehabilitation» and 017 «Physical Culture and Sports» took part in the testing.

At the formative stage of the experiment, representative samples of students of the control (CG) and experimental (EG) groups were formed, and model of health-preserving competence formation of higher education seekers using multidimensional data analysis methods in therapy and rehabilitation with the use of electronic learning tools was tested. The main methods of research at this stage were: pedagogical experiment, questionnaires, testing, statistical methods of processing research results. In accordance with the tasks of the research, the following algorithm was created: formation of representative samples of students of master's degree from CG and EG; organization of the training process for students from EG in accordance with the developed model of health-preserving competence formation in the processing of multidimensional data with the use of electronic learning tools; experimental verification of the effectiveness of the developed model for the formation of health-preserving competence in processing multidimensional data.

In order to form a representative sample of students of CG and EG before the start of the experimental work, we determined the following indicators: input control of knowledge available to students regarding the study of experimental data processing. To conduct a pedagogical experiment, students of higher education divided into two groups of 50 people each. Before the start of the experiment, the hypothesis regarding the law of the distribution of random variables was tested and a criterion was selected for testing the hypotheses regarding the parameters of this distribution. Due to the fact that the studied variables in the experiment are subject to a normal distribution, the Student's t-test was used [4, 5, 21].

At different stages we have used such *set of research methods*:

- *theoretical* - methods of conceptual and comparative analysis, which compared the existing theoretical approaches on the basis of generalization of philosophical, methodological, psychological, pedagogical, educational literature and video materials; method of structural-system analysis and modeling;
- *empirical* - methods of collecting information (questionnaires, surveys, pedagogical testing), analysis of learning outcomes, interviews, methods of expert assessment, self-assessment, generalization of independent characteristics; ascertaining, formative, and control stages of pedagogical experiment, methods of clarity;
- *methods of statistical data processing* - for processing experimental data, their quantitative and qualitative analysis. They were used to identify the reliability of the difference between the studied indicators, the correct processing of the results, reflecting them in graphical and tabular forms, conducting experimental testing; descriptive statistics, determination of the statistical significance of differences between groups by correlation analysis.

We used the Student's criterion to determine whether there are statistically significant differences between the residual knowledge from the previous study of discipline «Basics of the theory of health and a healthy lifestyle» by students from CG and EG. The null hypothesis H_0 was formulated as follows: there are no significant differences in the existing knowledge of informatics in CG and EG before the start of the experiment. It turned out that the empirical value of the t-criterion (0.57) is less than the critical value (2.01). Thus, we concluded that there were no significant differences in the residual knowledge among students from CG and EG before the start of the experiment at the significance level of 0.05.

The Ethics Commission of the Luhansk Taras Shevchenko National University has no comments on the methods used in this study.

RESULTS

The conducted survey also makes it possible to draw a conclusion about the homogeneity of EG and CG. The analysis of the obtained data during the evaluation by the students of CG and EG education of their own abilities to use general purpose programs allows us to state: 16.0% of CG education students indicated that they know how to work perfectly; 36.0% are able to perform basic actions confidently; 32.0% have difficulties; 12.0% do not know how to work at all. Students of EG education indicated that they know how to work perfectly - 20.0%; are able to perform basic actions confidently - 32.0%; have difficulties - 36.0%; do not know how to work at all - 12.0% of respondents (Fig. 1). The results are almost the same when students self-assess their desire to learn methods of processing multidimensional data before the experiment. Current interest was recorded in 52.5% of students of CG education and 53.8% of students of EG education (Fig. 2).

Based on the analysis of the results of the input control of the residual knowledge in the study of the discipline

«Basics of the theory of health and a healthy lifestyle» and questionnaires, it can be stated that there were no differences in the students of CG and EG before the experimental work. This approach allows us to consider the CG sample identical to the EG sample at the corresponding stage of the experiment with a confidence level of 0.95.

The developed computer training and control program was used during classroom and independent classes with students of the specialty 227 «Therapy and Rehabilitation» and 017 «Physical Culture and Sports» EG in the discipline «Basics of the theory of health and a healthy lifestyle». Teachers used the developed program to demonstrate theoretical material in lectures, when conducting practical classes for students to master practical skills in working with professional statistical packages, to organize their independent work and to control the cognitive component of the formed competence in multidimensional data analysis methods. Indicators of the levels of competence formation of students in the processing of multidimensional data according to the developed criteria for EG and CG are given in the Table 1.

Most of the students from EG education (64.0%) demonstrated a sufficient or high level of competence in processing multidimensional data, and from CG respectively - 24.0%. A comparative analysis of the obtained results regarding the formation of competence of students of CG and EG education is presented in Fig. 3.

The formation of the studied competence had highest value at a satisfactory level for students from EG education, and at medium level for students from CG education (Table 2).

It should be noted that the formation of the investigated competence in processing multidimensional data, depending on its components, among students of EG education has the greatest value at a satisfactory level, and in CG greatest value is at medium level. Table 3 presents knowledge and activity data.

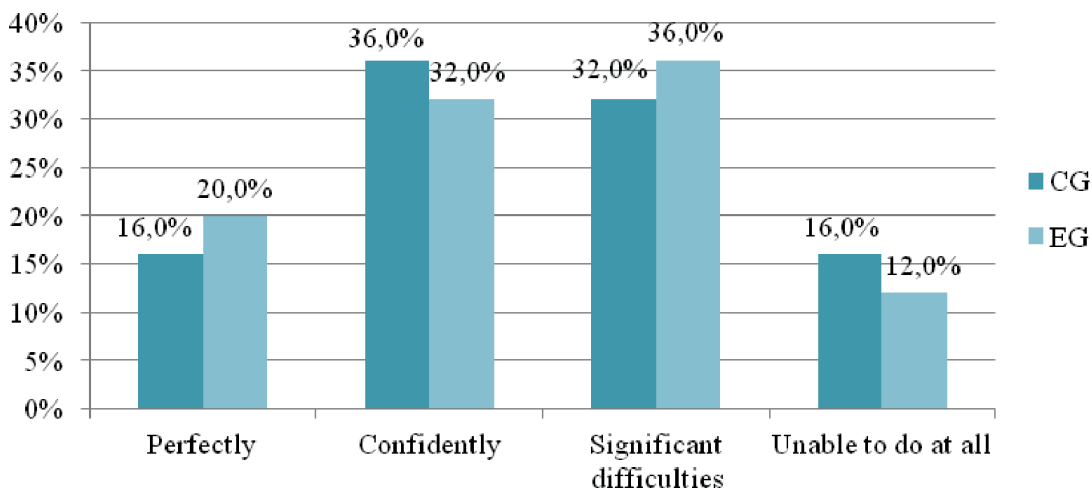


Fig. 1. Assessment by students of higher education of CG and EG of their own level of ability to use general-purpose programs

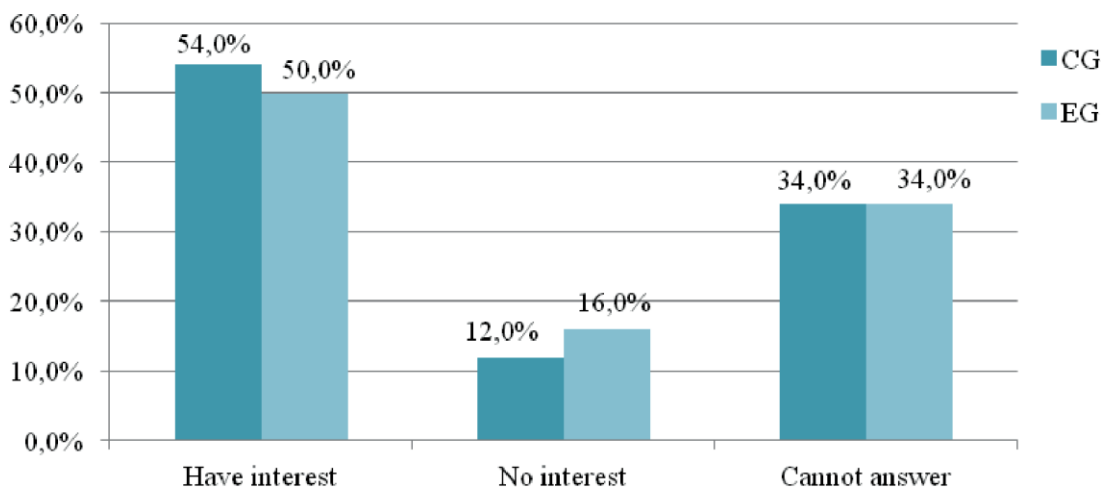


Fig. 2. Self-assessment by students of CG and EG education of the desire to learn methods of processing multidimensional data

Table 1. Indicators of the formation of competence in multidimensional data processing among students of CG and EG after the experiment

Level	Rating scale	Control group		Experimental group	
		Number of students	%	Number of students	%
Unsatisfactory	(0%-20%)	1	4.0	1	4.0
Low	(20%-40 %)	5	20.0	1	4.0
Medium	(40%-60 %)	13	52.0	7	28.0
Satisfactory	(60%-80%)	5	20.0	12	48.0
High	(80%-100%)	1	4.0	4	16.0
Total		25	100	25	100

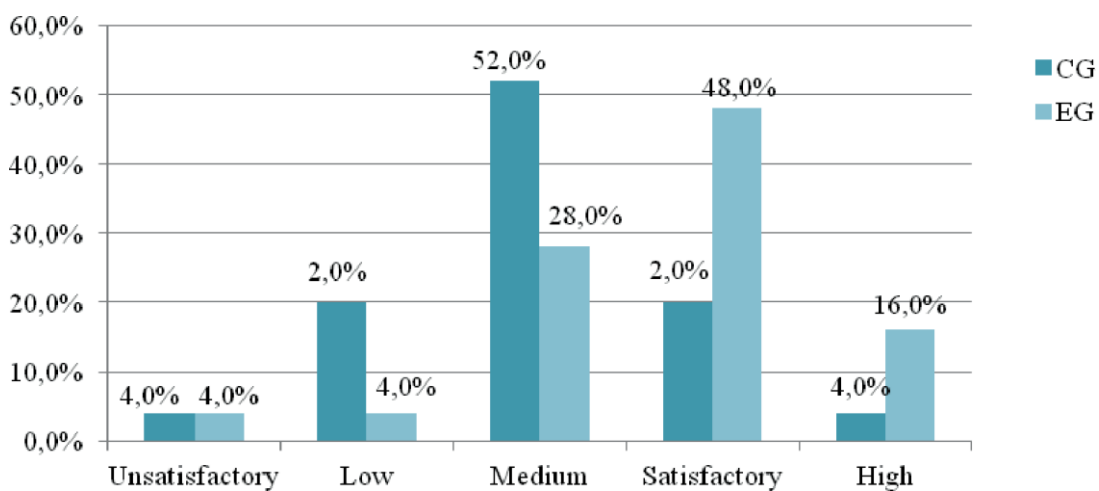


Fig. 3. Indicators of levels of competence formation in processing multidimensional data of students from CG and EG

Table 2. Indicators of the formation of competence in multidimensional data processing among students of CG and EG according to the established criteria after the experiment

Component of competence	Level	CG (%)	EG (%)
Cognitive (knowledge)	Unsatisfactory	4.0	4.0
	Low	20.0	4.0
	Medium	52.0	32.0
	Satisfactory	20.0	50.0
	High	4.0	10.0
Active	Unsatisfactory	4.0	4.0
	Low	20.0	4.0
	Medium	56.0	30.0
	Satisfactory	16.0	50.0
	High	4.0	12.0

Table 3. The percentage of components of competence with the processing of multidimensional data at a satisfactory and high level in students from CG and EG after the experiment

Component of competence	Level	CG (%)	EG (%)
Cognitive	Satisfactory	20.0	50.0
	High	4.0	10.0
Action	Satisfactory	16.0	50.0
	High	4.0	12.0

The results show that the percentage of students of EG education, in whom the formation of the cognitive component of competence at satisfactory and high levels, was 60%, and in CG - only 24%. As for the activity component, the advantage of EG over CG is even greater - 62% versus 24% ($p < 0.01$).

A comparison of the results obtained in the pedagogical experiment, their quantitative and qualitative analysis revealed that the developed model of health-preserving competence formation for processing multidimensional data in the learning process led to statistically significant changes in the levels of formation of the investigated competence. We can assert that there were differences in the levels of competence formation with the processing of multidimensional data between CG and EG with a significance level of $p = 0.01$.

This makes it possible to conclude that the obtained results regarding the formation of competence in the processing of multidimensional data in EG are the result of the complex implementation of the developed model using electronic learning tools, which ensures the effective formation of the investigated competence. In order to identify future specialists' motivation and personal interest in studying methods of processing multidimensional data with the help of ICT after a pedagogical experiment, a questionnaire was proposed.

The results of the survey showed that the expression of interest in learning methods of processing empirical data after the experiment was significantly higher in EG compared

to CG (88.0% and 40.0%, respectively) (Fig. 4). It is worth noting that only one EG student indicated that he had no interest in learning data processing methods compared to CG, in which 24.0% of students gave the answer «no» (Fig. 4).

When answering the question «Did you strive to achieve a high level of competence in the processing of medical and biological data?», 92.0% of the EG students answered «yes», compared to 60.0% of the CG's students. It is worth noting that only one student of EG education gave the answer «no», in contrast to 16.0% of CG (Fig. 5).

When assessing their own level of competence in processing multidimensional data, students of EG education mostly chose a high or satisfactory level (32.0% and 56.0%, respectively). CG education seekers most often chose a satisfactory or medium level of formation of the studied competence (40.0% and 48.0%, respectively) (Fig. 6).

When evaluating their own level of computer skills after the experiment, 60.0% of EGs chose the «satisfactory» category, which is 36.0% more than CG. It is worth noting that not a single student of CG and EG education indicated that they did not know how to use computer equipment after the experiment. The «minimum skills» category was chosen by 24.0% of CG students, compared to 4.0% of EG students. The «specialist» category was chosen by 12.0% of EG, in contrast to 4.0% of CG (Fig. 7).

The analysis of the results obtained in the assessment by the students of their own skills in using text editors, electronic spreadsheets, database management systems,

programs for preparing presentations and working on the Internet after the experiment allows us to state that positive dynamics were observed in both groups, but the results of EG were higher. When students of EG education assessed their own ability to use general-purpose programs, 68.0% chose the «perfectly» category, which is 44.0% more than CG (Fig. 8). Not a single EG master's student indicated that they do not know how to use general-purpose programs, in contrast to 4.0% of CG.

The results of CG students' evaluation of their own skills in using general-purpose programs before and after the experiment showed that the most often the education seekers chose the «confident» category - 42.0%, which is 14.0% more than the results before the experiment (Fig. 9).

DISCUSSION

The diagnostics of the development levels of the formation of the components of multidimensional data processing

competence among future specialists, the statistical processing of the obtained data at all stages of experimental work, made it possible to make a statistically reliable conclusion about the positive impact of the implemented model of the formation of the studied competence by means of electronic learning [2-8]. The results of the study confirmed that the developed model ensures the creation of a favorable educational environment for the formation of competence in future specialists with the processing of multidimensional data in the process of studying the discipline [14-17].

In the process of studying the discipline «Basics of the theory of health and a healthy lifestyle» a certain level of competence in processing empirical data in a multidimensional space is formed in the students, which can be evaluated based on the results of specially organized calculation and graphic work of competence orientation and computerized test control. The technology of performing

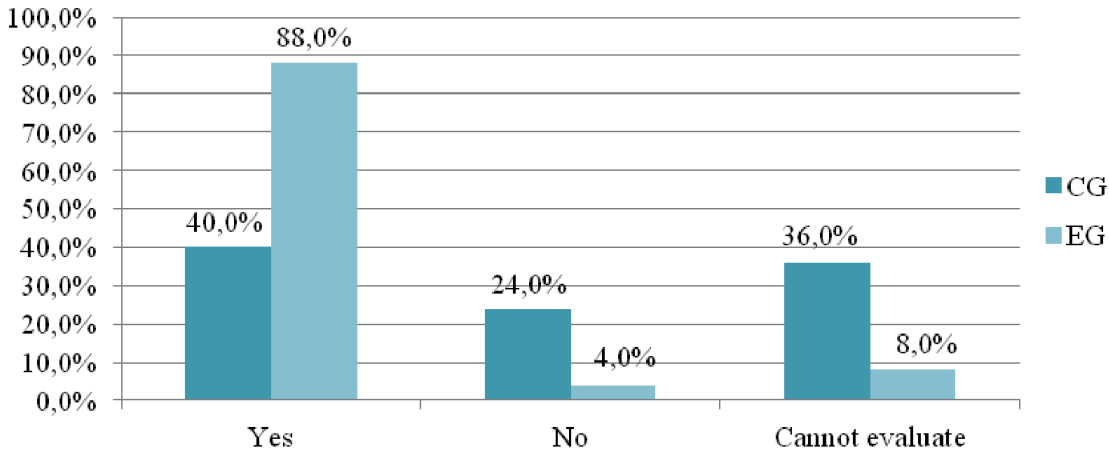


Fig. 4. Self-assessment of interest in learning methods of processing multidimensional data by students from CG and EG

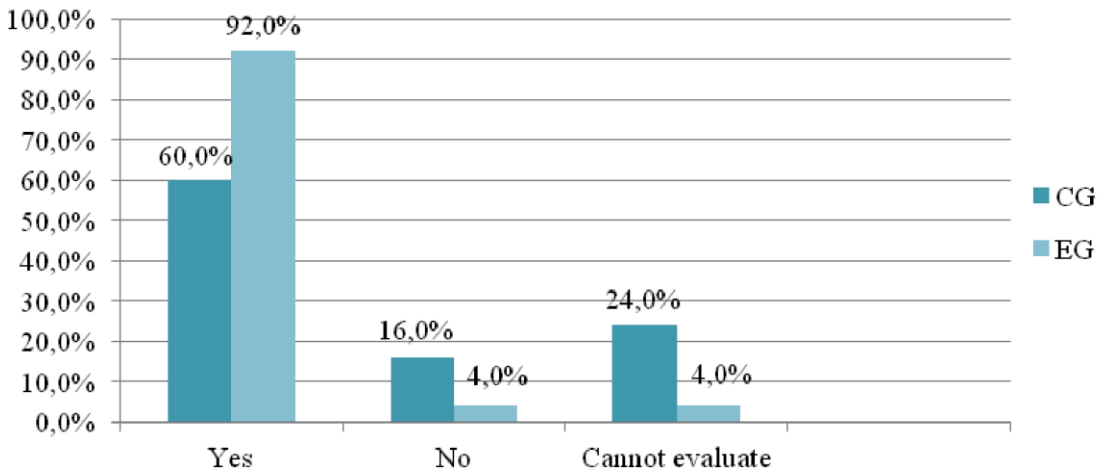


Fig. 5. Self-assessment of the desire to achieve a high level of competence with the processing of multidimensional data by students from CG and EG

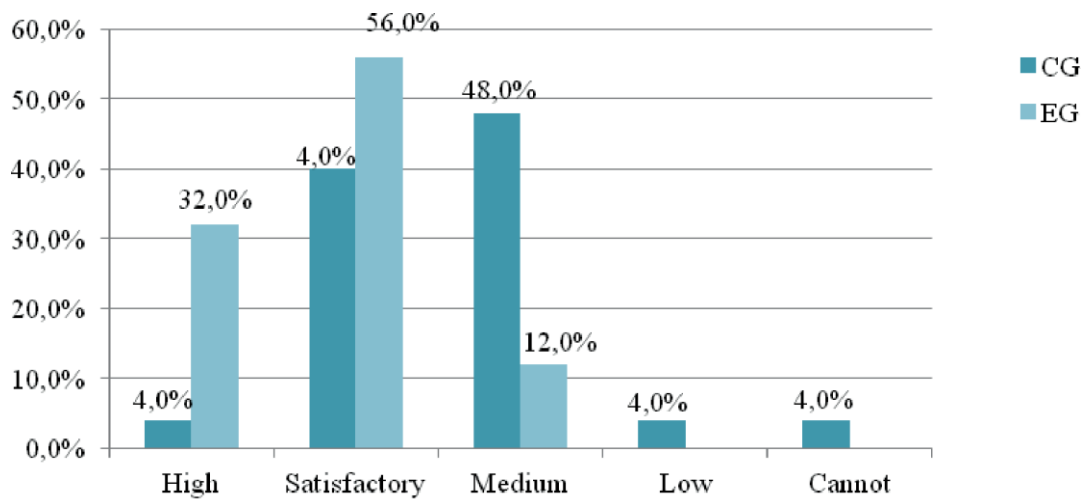


Fig. 6. Evaluation by students from CG and EG of their own level of competence formation with the processing of experimental data

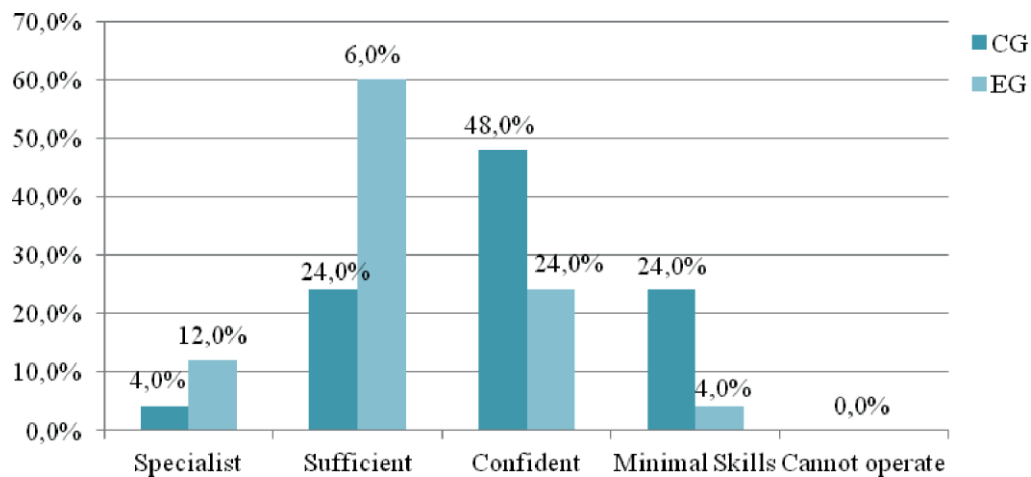


Fig. 7. Assessment by students from CG and EG of their own level of ability to use computer equipment after the experiment

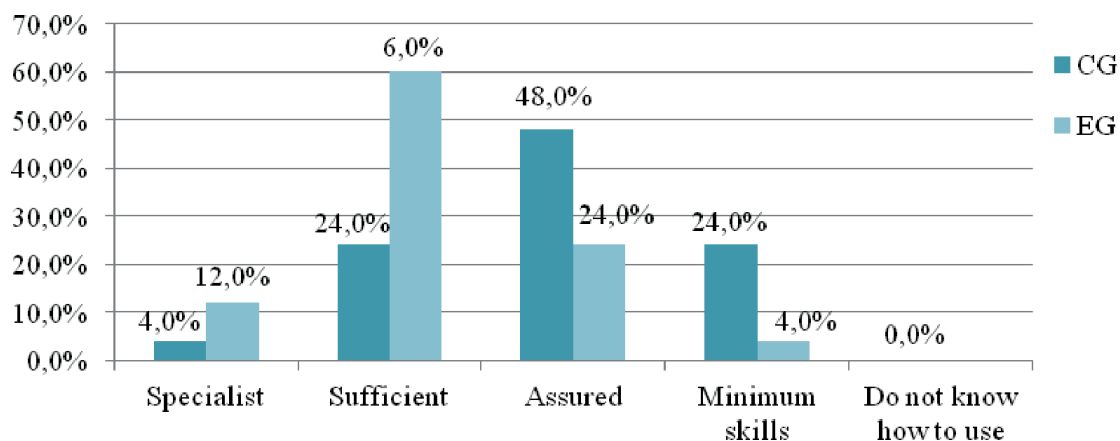


Fig. 8. Evaluation by students from EG of their own skills in using general-purpose programs before and after the experiment

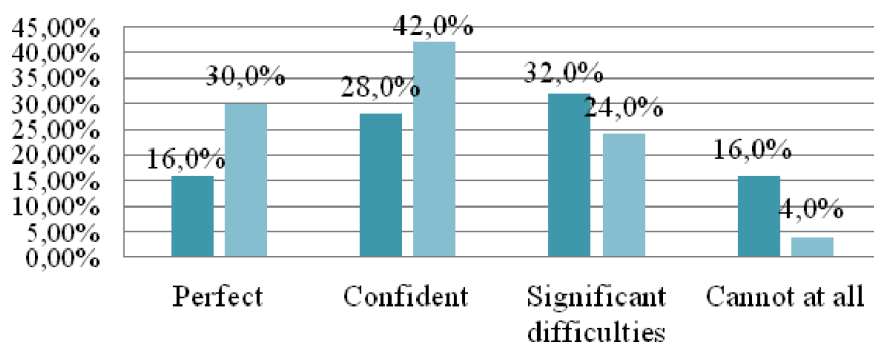


Fig. 9. Assessment by students from CG of their own skills in using general-purpose programs before and after the experiment

practical competence-oriented tasks and the system of its evaluation, which provided for the diagnosis of the activity component of competence, were substantiated. Test tasks for diagnosing the cognitive component of competence and a special method of processing the results have been developed, which ensures the integration of relevant indicators of individual components of competence into the final generalized result [18-21].

The results of the questionnaire at the final stage of the pedagogical experiment showed that all students (100%) of the EG assessed the ability to process multidimensional data as important for the professional activity of future therapy and rehabilitation specialists and indicated that they sought to achieve a high level of the studied competence. In CG, only 68.0% of respondents rated the relevant skills

as important; 62.0% of the respondents sought to achieve a high level of the investigated competence.

CONCLUSIONS

The experimental study confirmed the effectiveness of the developed model of health-preserving competence formation in future specialists with the processing of multidimensional data and the methodology of its implementation in the process of teaching the discipline. The analysis of the obtained results allows us to state that the main goal of the study - the verification of the effectiveness of the model of health-preserving competence formation in future specialists with the processing of multidimensional data using electronic learning tools in the study of the discipline has been achieved.

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CONFLICT OF INTEREST

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