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Essence And Structure Of The Integration-Functional Model Of Natural And Scientific Training Of Future Specialists In Physical Therapy And Occupational Therapy

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Essence And Structure Of The Integration-Functional Model Of Natural And Scientific Training Of Future Specialists In Physical Therapy And Occupational Therapy

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ABSTRACT
The results of the generalization and systematization of literary sources testify to the thoroughness of approaches to the problem of modeling in modern professional education. The aim of the study is to comprehensive analysis of the essence and structure of the integration-functional model of the natural-scientific training of future specialists in physical therapy and occupational therapy. Experimental work was carried out during 2020–2022 in three stages: ascertaining, forming and control. Each of the identified stages involved solving the relevant tasks and identifying the necessary research methods. Research methods: analysis of scientific and methodical literature; pedagogical observation; pedagogical experiment; pedagogical testing; methods of mathematical statistics. The experimental verification of the proposed author's model regarding the formation of diagnostic competence took place on the basis of the Institution of Higher Education of the Poltava Institute of Business «International Scientific and Technical University named after academician Yuri Bugai». 636 students of the specialty «Physical therapy, occupational therapy» took part in this experiment. According to the results of the experimental work, the developed model allows determining the optimal combination of modern and traditional forms of education and contributes to increasing the levels of formation of natural and scientific competence of future specialists in physical therapy and occupational therapy.

Keywords: integration-functional model, professional training, specialist in physical therapy and occupational therapy, professional competence, medical education.

1. INTRODUCTION

The problem of training future specialists in physical rehabilitation as an important stage of qualified recovery of the body of a person by the means and methods of physical culture is relevant and timely. The formation of physical rehabilitation as a science and educational discipline conditions due to the fact that in society there was an urgent need to study it comprehensively processes of human health development (formation, treatment, restoration, recovery), stages of health management (maintenance, preservation, reproduction) in general and its individual components (physical, mental, reproductive ductive, etc.) and distinguish types of professional rehabilitation (social, medical physical, mental, pedagogical) (Kononets et. al., 2021; Shkola et. al., 2021).

It has been established that natural and scientific competence stimulates the personal self-development of a specialist in the field of rehabilitation throughout his life in the social and professional spheres thanks to holistic and systemic transdisciplinary knowledge on the methods of restoring health indicators, development of the ability to critically and rationally analyze relevant scientific information, as well as purposefully adapt it in the process of performing professional tasks.

Scientists have (Griban et. al., 2018; Donchenko et. al., 2020; Kornosenko et. al., 2020; Kononets et. al., 2021; Shkola et. al., 2021) proven that the main method of transforming the traditional educational paradigm into a competent one is the modeling method. The use of modeling in the system of natural and scientific training as an effective means of finding the optimal solution to rehabilitation and health problems allows predicting the prospective dynamics of the object's development.

The relationship between pedagogical science and health-rehabilitation practice contributes (Rudenko, 2015; Zhamardiy et. al., 2019; Otravenko et. al., 2021; Emetc et. al., 2022; Fastivets et. al., 2022) to the formation of a health-preserving educational space and the deepening of its content, which proves the relevance of the mentioned method and the necessity of its implementation in the system of professional training of future specialists in physical therapy and occupational therapy.

The results of the generalization and systematization of literary (Yevtukh, 2002; Yelnikova, 2010; Boyarchuk, 2013) sources testify to the thoroughness of approaches to the problem of modeling in modern professional education. So, the problem of professional training of future specialists in physical education rehabilitation is considered by domestic scientists mainly in context health care and formation of valeological culture. At the same time, it should be noted that there is currently no systematic scientific understanding of the scientific bases of modeling the process of formation of natural and scientific competence of future specialists in physical therapy and occupational therapy, in fact, the opportunities and prospects for the development of natural cycle disciplines in the professional training of specialists have not been explored, and methodical provision of such training is also not sufficient. That is why it became necessary to develop a scientifically based model of the formation of natural and scientific competence of future specialists in physical therapy and occupational therapy.

2. MATERIALS AND METHODS

The aim of the study is to comprehensive analysis of the essence and structure of the integration-functional model of the natural-scientific training of future specialists in physical therapy and occupational therapy.

The set goal was achieved by using a set of general scientific methods, in particular the analysis, systematization and generalization of data from scientific sources.

Experimental work was carried out during 2020–2022 in three stages: ascertaining, forming and control. Each of the identified stages involved solving the relevant tasks and identifying the necessary research methods.

The experimental verification of the proposed author's model regarding the formation of diagnostic competence took place on the basis of the Institution of Higher Education of the Poltava Institute of Business «International Scientific and Technical University named after academician Yuri Bugai». 636 students of the specialty «Physical therapy, occupational therapy» took part in this experiment.

The experimental test took place in three stages, which corresponded to the defined stages of formation of diagnostic competence of future specialists in physical therapy and occupational therapy: initial professional (1st course of study) – aimed at developing values and motives of diagnostic activity, forming operational and health-restoring components of professional competence; fundamental professional (2nd-3rd courses of study) – involves the formation of diagnostic competence based on practical knowledge, skills, and abilities; study of theoretical disciplines of directly diagnostic and prognostic orientation and practical training, in the process of which the acquired experience is tested; professional implementation (4th year of study), which ensures the development of creative aspects of diagnostic competence, the beginning of approbation of the acquired experience in the process of internships and diploma design.

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 by Pearson's method.

3. RESULTS AND DISCUSSION

By modeling (Novik, 1968), modern scientists understand the indirect practical or theoretical study of an object, which involves the direct study not of the object itself, but of an artificial or natural system (model), which has a relationship with this object and is able to replace it at certain stages cognition, and as a result, the study provides information about the object being modeled. Modeling allows you to study (Yevtukh, 2002) the internal structure of a complex dynamic system, determine the peculiarities of the functioning of its individual components, as well as evaluate the overall effect of such a system.

From the point of view of the tasks of our research, it is important to pay special attention to the scientific position of (Yelnikova, 2010), who understands modeling as a purposeful creative process of constructive-design and analytical-synthetic activity, aimed at displaying the object in general or its individual components, which determine the functional direction of this object, as well as ensure the stability of its existence and development.

Among the main requirements for creating a model, scientists single out following: scientificity (relying on reliable and substantiated facts), meaningfulness (compliance with the created model of the research process), integrity (interconnection of all structural blocks and their components, compliance of all elements with the purpose of the study), purposefulness (checking the effectiveness of the model at all its stages: from setting the goal and defining tasks to achieving the final result), flexibility (adaptation to new conditions and unforeseen situations).

The practical value of the model for the formation of natural and scientific competence of future specialists is determined by its adequacy to the studied aspects of the object and the complete consideration of the main principles of modeling (visibility, certainty, objectivity) at all stages of building the model. In our study, we understand the model as a schematic description of the structural components of the process of forming the professional competence of future specialists.

It is also important to take into account the scientific position of (Shapran, 2012), according to which the model performs a number of functions: it clearly defines the components that make up the system; schematically and realistically reflects the connections between its components; is a tool for comparative study of various features of a phenomenon or process.

In the process of experimental verification of the model of formation of natural and scientific competence of future specialists in physical therapy and occupational therapy in the process of professional training, we identified the following blocks: motivational-target, content-procedural, operational-active and diagnostic-resultative.

Taking into account the described components, the model of the formation of natural and scientific competence of future specialists in physical therapy and occupational therapy will have the form presented in Fig. 1. Isolation of a number of regular, functionally related components that make up a complete system made it possible to more clearly present the purposeful process of formation of natural and scientific competence of students of higher education.

The developed model made it possible to reveal the following functions of natural and scientific training of future specialists in physical therapy and occupational therapy:

1) educational, which allows students of higher education to form a system of necessary medical and biological knowledge;

2) educational, which promotes the implementation of life attitudes and principles, ideals and standards of health care in the future;

3) personality stimulating, which is an important condition for the formation of a specialist as an individual, and also ensures his preparation for independent professional activity and self-realization;

4) innovative, which contributes to the formation of future specialists' readiness to perform professional tasks, as well as the development of professional mobility, the ability to adapt to rapid changes in professional activity, the ability to acquire, select, integrate, store, transfer and reproduce the received information.

Motivational-target block of the model reveals the goal of forming natural and scientific competence of future specialists in physical therapy and occupational therapy in the process of their professional training, a system of methodological approaches, motivational factors and principles of education. This block of the model provides for students of higher education to be aware of the purpose and tasks of natural and scientific training, the consistent formation of tasks at each stage of education.

Within the framework of the motivational and target block of the model, we have defined a goal – the formation of natural and scientific competence of future specialists in physical therapy and occupational therapy in the process of studying natural sciences.

A system of tasks has been developed:

- establishment of a close relationship between natural science disciplines and professional and practical training of future rehabilitators;
- creation of adequate conditions for the formation of natural and scientific competence;
- development of components of natural and scientific competence.

In the motivational-target block, we have also highlighted the structural components of natural and scientific competence (motivational-value, cognitive, reflective-personal, and activity-based) (Fastivets et. al., 2018).

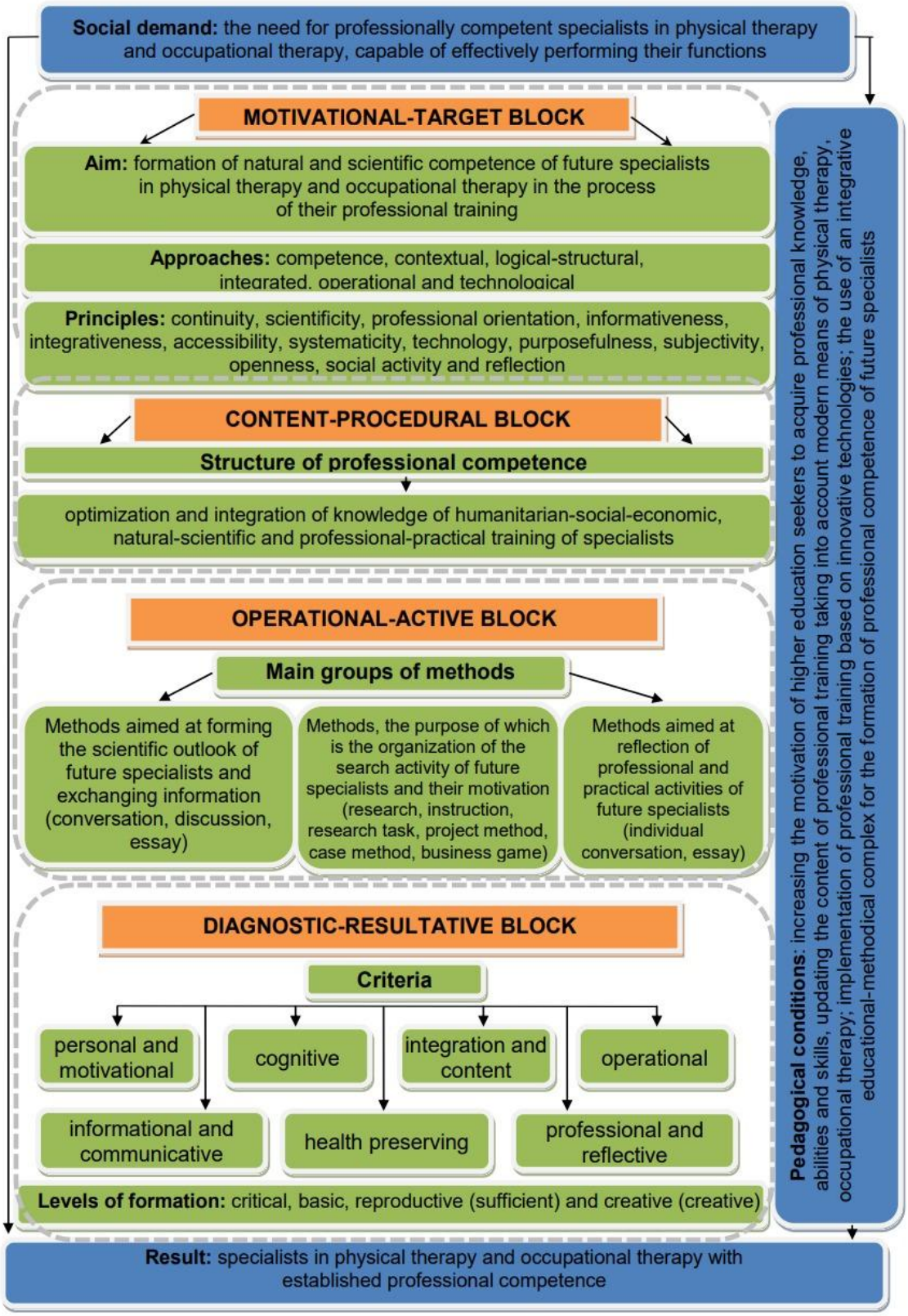

Fig. 1. Integration-functional model of the natural-scientific training of future specialists in physical therapy and occupational therapy

The motivational-value component is characterized by the need and desire to master general cultural and subject competencies with further conscious use of them in the learning process to achieve personal success in future professional activities. The cognitive component of the natural-scientific competence of future specialists in physical therapy and occupational therapy reflects the system of natural-scientific knowledge and the ability to use the acquired knowledge in non-standard professional situations. The reflective-personal component of natural and scientific competence is a set of individual and psychological qualities of future specialists, which determine the reflection of their own rehabilitation and health-improving activities. The activity-based component determines the practical application of natural and scientific knowledge in standard and dynamically changing situations, the skills and abilities to forecast, implement and correct the system of rehabilitation and health activities, experience in forecasting the dynamics of the development of indicators of body recovery.

The motivational-target block summarizes the general trends of natural and scientific training, which include humanization, fundamentalization, humanitarianization, interdisciplinary and interdisciplinary nature of knowledge, intellectualization, dynamism and flexibility.

Based on the generalization of various theoretical propositions that made up the methodological concept of the study, the main scientific approaches to the realization of its goals and tasks were determined: competence, contextual, logical-structural, integrated, operational and technological.

The development of a model for the formation of natural and scientific competence of future specialists in physical therapy and occupational therapy during the study of natural disciplines in modern educational institutions takes into account the specifics of our research and is based on the following didactic principles of education: continuity, scientificity, professional orientation, informativeness, integrativeness, accessibility, systematicity, technology, purposefulness, subjectivity, openness, social activity and reflection (Fastivets et. al., 2022).

Content-procedural block of the model reflects the stages of the organization of natural and scientific training through the implementation of the methodology for the formation of professional competence of future specialists in physical therapy and occupational therapy, which integrates practice-oriented methods of learning and is aimed at the implementation of the pedagogical conditions defined by us. It is worth noting that in the process of natural and scientific training, the pedagogical conditions defined by us are implemented on the basis of taking into account the peculiarities of the functioning of the holistic integration system and by introducing the initial (theoretical), basic (practically oriented) and final (professionally adaptive) stages of training.

An important component of the content-procedural block of the developed model is the optimization and integration of humanitarian-social-economic, natural-scientific and professional-practical training of specialists in physical therapy and occupational therapy. The unity of theoretical and practical training contributes to the implementation of the principle of connection of natural and scientific training with the practice of future professional activity.

The structural and functional basis of the developed model is an integration scheme of inter-subject and trans-subject connections, which ensures the systematic and scientifically based use of connections between subjects both within one cycle and between educational cycles of training of a specialist in physical therapy and occupational therapy.

Operational-active block is aimed at the implementation of educational, cognitive and developmental functions of future specialists in physical therapy and occupational therapy. In order to ensure the effective formation of natural and scientific competence of future specialists in physical therapy and occupational therapy in the process of studying natural sciences, we have determined the most effective forms of education that correspond to the programs of these disciplines: lecture, seminar-discussion, laboratory-experimental class, Olympiad, round table, conference, master class, independent work, practice, work in a scientific group and individual consultation.

The formation of natural and scientific competence of future specialists in physical therapy and occupational therapy in the system of professional training is not a spontaneous, but a controlled and regulated process, the effectiveness of which depends on the pedagogical conditions implemented with the help of appropriate means, methods and forms of education. We have identified the following main groups of methods:

1) methods aimed at forming the scientific outlook of future specialists and exchanging information (conversation, discussion, essay);
2) methods, the purpose of which is the organization of research activities of future rehabilitators and their motivation (research, instruction, research task, project method, case method, business game);
3) methods aimed at reflection of professional and practical activities of future specialists (individual conversation, essay) (Fastivets et. al., 2018).

The main forms of organization of education include a lecture, a seminar-discussion, a laboratory-experimental class, a round table, a conference, a master class, independent work, practice, work in a scientific group, and individual consultation (Lerner, 1981).

The operational-active block of the model summarizes the methodological aspects of the use of teaching aids: technical teaching aids (computers, multimedia projectors, interactive whiteboards), dictionaries, electronic

presentations, electronic textbooks and training aids, methodical developments, reference materials, visual aids (tables, diagrams, photos), audio and video materials, information resources from Internet. Therefore, the forms, methods and means of education used in the process of natural-scientific training of future specialists in physical therapy and occupational therapy are oriented directly to the personality of the student of higher education, his need to obtain high-quality natural-scientific knowledge and professional-practical skills, as well as an active position in self-development. Compared to the traditional lecture-practical approach, the proposed active forms and methods of training make it possible to bring the content of specialist training as close as possible to reality, imitating the professional and practical activities of a physical therapist and occupational therapist.

Diagnostic-resultative block of the developed model performs a number of functions (diagnostic, prognostic, control, corrective, regulatory, orienting) and makes it possible to evaluate and control the assimilation of natural and scientific knowledge by students of higher education and their mastering of methods of action aimed at the implementation of practice-oriented knowledge in professional activity (Shapran, 2018).

Using generally accepted criteria, indicators, levels of formation, evaluation scales and evaluation tools in the diagnostic-resultative block of the integration-functional model, we identified such a set of quality indicators of the formation of natural and scientific competence:

1) criteria for the formation of natural and scientific competence: personal-motivational, cognitive, integration-content, operational-activity, information-communicative, health preserving and professional-reflexive;

2) indicators of the formation of natural and scientific competence developed according to each separate criterion;

3) levels of formation of natural and scientific competence: critical, basic, reproductive (sufficient) and creative (creative);

4) means, types, organizational forms and methods of assessment and diagnosis of the levels of formation of natural and scientific competence.

As a result of the introduction (Boyarchuk, 2013) of the developed model into the educational process of higher education institutions, we predict the acquisition of natural and scientific competence, which is a holistic, integrative personality quality of the future specialist in physical therapy and occupational therapy, which is formed in the process of his natural and scientific training and is characterized by the presence of deep medical and biological knowledge, a number of subject skills, experience in research activities in the field of rehabilitation, a natural and scientific outlook and the readiness of the future specialist to carry out professional activities based on fundamental ideas and principles of natural sciences.

The conducted qualitative analysis of the effectiveness of the implementation of the experimental methodology based on the competence approach and the structural-functional training model developed on its basis led to the need for a comprehensive quantitative analysis of the research data. The summarized data of the experimental study are shown in Table 1.

Table 1. Generalized results of the implementation of the structural-functional model of the formation of diagnostic competence of future specialists in physical therapy, occupational therapy (absolute units/number of persons)

Level	Control group before the experiment		Experimental group before the experiment		Control group after the experiment		Experimental group after the experiment	
	persons	%	persons	%	persons	%	persons	%
Reproductive	152	48	153	48	145	46	61	19
Situational	126	40	125	39	130	41	102	32
Creative	38	12	42	13	41	13	157	49
Total	316	100	320	100	316	100	320	100

From Table 1, we can see that the indicators of the control and experimental groups on the control section do not differ significantly. We also note the absence of significant changes in the indicators of the control group before and after the experiment, which was a consequence of the use of traditional methods of studying professionally oriented disciplines. Significant changes are observed in the dynamics of the indicators of the experimental group before and after the implementation of the developed methodology.

Thus, in the experimental group, we note a decrease in the number of students who found a reproductive level of diagnostic competence formation by 92 persons, which is 29 %. By 23 people (7 %) in the experimental group, the number of subjects who showed the situational level of the specified competence decreased. At the same time, an increase in the number of respondents who revealed a creative level (115 people – 36 %) is noted. Such results led to a conclusion regarding the pedagogical expediency of the developed structural-functional model and the effectiveness of the developed didactic support for the formation of diagnostic competence of future specialists.

4. CONCLUSIONS

Therefore, the integration-functional model proposed by us has a holistic character, since the motivational-target, content-procedural, operational-active and diagnostic-resultative blocks are interconnected and function to achieve a single result. The implementation of the model is carried out by meaningful and targeted provision of the training process of future specialists in physical therapy and occupational therapy at various stages of professional training (new author's courses in natural and scientific disciplines, educational computer programs, methodological recommendations for industrial practice, educational and methodological manuals, as well as methodological recommendations and instructions for coursework, independent and individual works). It is worth noting that an important role in the implementation of the proposed model belongs to teachers of natural sciences. Especially important is the choice of forms, methods and means of education that direct the independent activity of the future specialist to the development of scientific and cognitive interest in future professional activity.

The professional competence formation model helps in the research process to solve, in particular, the following problems: 1) formulation of a specific goal for teachers and students to achieve; 2) control of the effectiveness of the process of formation of professional competence; 3) specification of society's requirements for knowledge, abilities, skills and personal traits of future specialists in the form of acquired competencies, as well as students' awareness of the importance of professional competence in the process of their professional development; 4) activation of reflection of future specialists and their focus on self-development.

The implementation of the goal and objectives of our research and the verification of the hypothesis takes into account the structure of the model, which fully reflects the process of formation of natural and scientific competence from the beginning to the time of its actual implementation, allows you to see this process holistically and explore not only individual elements, but also the connections between them and facilitate the theoretical analysis of the process of natural science training. With the help of the integration-functional model, it is also possible to methodically interpret the main conceptual provisions of the study and, to a certain extent, to technologize the process of developing the natural-scientific competence of occupational therapists. A feature of the developed model is the balance, complementarity and interdependence of pedagogical conditions and means of forming the natural and scientific competence of students, the presence of a complex of interconnected components of the system, as well as the integration of targeted and indirect influences, which in their totality create a single educational environment. As a result, such an educational and developmental professionally-oriented environment is formed, which contributes to the formation of a complex of components of the studied competence of future specialists in physical therapy and occupational therapy.

According to the results of the experimental work, the developed model allows determining the optimal combination of modern and traditional forms of education and contributes to increasing the levels of formation of natural and scientific competence of future specialists in physical therapy and occupational therapy. Such a model is an effective tool for forming the researched competence of future specialists and diagnosing its levels. It is open and can be supplemented with new components.

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