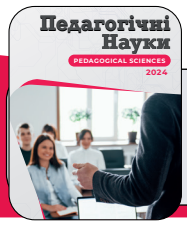

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Pavlo Khomenko*
Doctor of Pedagogical Sciences, Professor
Poltava V.G. Korolenko National Pedagogical University
36003, 2 Ostrohradskoho Str., Poltava, Ukraine
https://orcid.org/0000-0003-3065-9095

Oksana Kornosenko
Doctor of Pedagogical Sciences, Professor
Poltava V.G. Korolenko National Pedagogical University
36021, 16 Hrushevskoho Str., Poltava, Ukraine
https://orcid.org/0000-0002-9376-176X

Oleksandr Khyzhnyak
Doctor of Philosophy
Poltava V.G. Korolenko National Pedagogical University
36003, 2 Ostrogradskoho Str., Poltava, Ukraine
https://orcid.org/0000-0003-1791-2957

Valeriy Manyk
Postgraduate Student
Poltava V.G. Korolenko National Pedagogical University
36003, 2 Ostrogradskoho Str., Poltava, Ukraine
https://orcid.org/0009-0003-6881-1504

Experimental study of the development of scientific and research competence of future physical education and sports specialists

Abstract. The relevance of the study lies in the need to develop and implement effective pedagogical conditions and technologies for the formation of scientific and research competence in future specialists in physical culture and sports, which meet modern educational requirements and the real needs of the industry. This work aimed to theoretically substantiate, develop, and experimentally verify pedagogical conditions that ensure the effective development of scientific and research competence in students of the specialty 017 (A7) Physical Culture and Sports. To achieve the goal, theoretical methods (analysis, synthesis, generalisation), empirical methods (questionnaire, observation, pedagogical experiment), as well as methods of statistical data processing were used. The pedagogical experiment was conducted in 2023-2025 on the basis of the Faculty of Physical Education and Sports of the Poltava V.G. Korolenko National Pedagogical University with the participation of 156 applicants for the second (master's) level of higher education. In the control and experimental groups, the dynamics of the levels of formation of scientific and research competence were compared according to the specified criteria. It was established that the formation of scientific and research competence is one of the key conditions for the professional growth of a specialist and their readiness to implement innovations in the field of physical culture and sports. The results of the experimental study showed minor changes in the control group and significant growth in the experimental group: the high level increased from 8 to 31%, the sufficient level from 22 to 43%, while the share of students with average and low levels decreased by 21 and 23%, respectively. Such dynamics are a consequence of the implementation of a set of pedagogical

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*Corresponding author

conditions: integration of research tasks into the content of academic disciplines, application of project and research technologies, organisation of mentoring support, and reflective and evaluative support. The practical value of the work lies in the possibility of using the proposed approaches in the educational process of training physical culture specialists for the purposeful formation of their scientific and research competence

Keywords: higher education students; professional training; future trainers; pedagogical conditions; project and research technologies; scientific research methodology; innovative technologies

INTRODUCTION

The current stage of development of higher education in Ukraine is characterised by increased attention to the formation of not only professional, but also scientific and research competencies in applicants, which meets the objectives of the European educational space and the requirements of the Concept of Education Development of Ukraine for 2021-2031. In the context of the growing role of science and innovation in the field of physical culture and sports, the ability of future specialists to apply scientific knowledge, analytical thinking, and solve practical problems based on a research approach is gaining particular importance. This approach is the basis of innovative professional thinking, self-development, and improvement of practice in the field of physical education, sports, and health activities. Therefore, to substantiate the key provisions of the study, it is necessary to conduct a detailed analysis of literary sources devoted to the formation of scientific and research competencies.

A. Proskurin & V. Stadnichenko (2023) investigated the features of the formation of scientific and research competence of future coaches as a factor of readiness for effective sports selection. Scientists have proven that the multi-year process of physical education and sports training can be successfully implemented, provided that the age and individual characteristics of human development, the level of their fitness, the specifics of the chosen sport, the features of the development of physical qualities, and the formation of motor skills are carefully taken into account. A modern coach must be a specialist who has scientific and research and prognostic activities, which actualise the formation of scientific and research competence in the system of professional training in higher education institutions.

A. Yefremenko *et al*. (2023) considered research competence as a key component of a coach's professional competence. Scientists noted that it encompasses theoretical knowledge and practical skills necessary to understand scientific research methods in improving the process of training athletes. Among the components of research competence, scientists distinguished analytical skills and self-reflection, which allow the coach to constantly improve. The formation of this competence in future coaches should be based on their motivation for scientific research, which will further contribute to the implementation of modern, scientifically based training methods. V. Stynska *et al*. (2024) emphasised the need to implement special methodological approaches to the development of research skills in students of pedagogical specialties. Since traditional methods often do not give the desired result, there is a need to search for and test new forms and means. This approach should provide not only theoretical understanding but also practical implementation of research projects, which will contribute to the formation of holistic scientific competence. Successfully solving this task is key to preparing competitive specialists capable of innovative activity.

Y. Slodynytska (2025) emphasised the role of an innovative university environment in stimulating the research activity of applicants, which allows them to form a holistic scientific culture. Such an environment contributes not only to the assimilation of theoretical knowledge but also to the development of practical skills necessary for independent scientific research. Involvement in real research projects and interdisciplinary teams creates conditions for the effective formation of scientific and research competence. This, in turn, ensures high-quality professional training and the competitiveness of future specialists in the labour market. Scientists also pay significant attention to the philosophical and interdisciplinary principles of professional training, which directly affect the formation of scientific and research competence, in particular in the studies of Y. Dutczak & V. Antonets (2022), where the competency-based approach is revealed as the conceptual basis of the professional training of a trainer-teacher. The study emphasises that a modern specialist must possess not only theoretical knowledge, but also a set of practical skills necessary to solve professional tasks. The formation of competencies contributes to the adaptation of graduates to the dynamic requirements of the labour market and increases their competitiveness. Thus, the transition from a knowledge-based to a competency-based paradigm is key to the modernisation of higher education in the field of physical education. The monograph by J. McLeskey *et al*. (2022) is a fundamental work for specialists and researchers in the field of inclusive education. The proposed practices are scientifically sound and systematically implemented in the teaching process, which makes them an ideal object for empirical research and provides researchers with a modern methodological basis for the development and validation of educational and corrective programs. The content of the textbook is mainly focused on working with students with mild and moderate disabilities, which allows researchers to focus on effective models of comprehensive training of children. In the study of H. Fastivets *et al.* (2024), philosophical aspects of the formation of professional competence of future teachers, which are important for modern

education, are revealed. The authors analyse the key components of this process, emphasising their interconnection and systematicity. The main attention is paid to determining the philosophical principles that underlie the development of professional qualities of future teachers.

A separate block of research is devoted to the digitalisation of the educational process and the application of information and communication technologies in the development of scientific and research competence. Thus, scientists V. Potop *et al*. (2023) considered digital tools as effective means of optimising research activities in the educational process. Considerable attention is paid to applied aspects of the formation of scientific and research competence in the works of M. Byrka *et al.* (2021). In particular, structural and functional models of the formation of this competence at different levels of education are presented, which allows systematising the training process and ensuring its integrity, taking into account the specifics of each educational level. The implementation of these models contributes to achieving high results in the training of specialists capable of independent scientific work. Scientists P. Čajka *et al*. (2022) proved that universities function not just as educational institutions, but as key drivers of innovation in their region. In addition to teaching students, universities have a mission – to conduct their own scientific research and develop the scientific and research competence of applicants, which generally contributes to the technological, economic, and social development of the region.

Thus, the analysis of scientific sources allows to conclude that the problem of forming scientific and research competence is multifaceted and complex. Scientists justify the need to update the content of education, modernise pedagogical technologies, and integrate scientific activity into professional training, which, in turn, forms a stable basis for the further development of research competencies in future specialists in the field of physical culture and sports. In this regard, it is relevant to develop, implement, and experimentally verify the effectiveness of pedagogical conditions and technologies aimed at developing scientific and research competence of future specialists in physical culture and sports in the process of professional training in a higher education institution. The purpose of the study was the theoretical justification, development, and experimental verification of pedagogical conditions and means that ensure the effective development of scientific and research competence of future specialists in physical culture and sports in the process of their professional training in higher education institutions.

MATERIALS AND METHODS

To achieve the goal and solve the research problems, the study used a set of complementary methods that cover the theoretical, empirical, and statistical levels of analysis. Theoretical methods included the analysis and generalisation of scientific literature devoted to the problems of professional training, the competency approach, and the organisation of scientific and research activities in higher education; systematisation and classification of scientific approaches to the formation of scientific and research competence were carried out, as well as modelling of pedagogical conditions for its purposeful development. The study used a set of empirical methods, in particular: observation, questionnaires, and a pedagogical experiment consisting of ascertaining, formative, and control stages. An important element was the methods of self-assessment and reflection, which allowed for to exploration of the subjective experience of the participants. The applied pedagogical diagnostic methods included questionnaires, testing, analysis of scientific tasks completed by students, expert evaluation, reflective maps, as well as quantitative and qualitative processing of results using mathematical statistics methods (in particular, determining average values, distribution frequencies, and probabilities of differences between groups).

The experimental work was carried out during 2023-2025 at the Faculty of Physical Education and Sports of the Poltava V.G. Korolenko National Pedagogical University. 156 applicants for higher education of the second (master's) level, who studied in the specialty 017 Physical Culture and Sports, were involved in the study. In accordance with the logic of the pedagogical experiment, all participants were divided into control (CG) (n = 78) and experimental (EG) (n = 78) groups of equal number, observing the principle of representativeness; the contingent of students was selected taking into account the same learning conditions, level of training, and motivation for research activities at the initial stage.

Structurally, the experiment had three stages: the ascertaining stage – conducting an initial diagnosis to determine the initial level of formation of scientific and research competence according to the developed criteria and indicators; the formative stage – implementing a system of pedagogical conditions in the experimental group, which took place mainly within the disciplines of the research direction ("Methodology and organisation of scientific research", "Management of scientific and applied projects", "Higher school pedagogy", "Innovative technologies in physical culture and sports"), as well as in extracurricular scientific activities; the control stage – repeated diagnosis to identify changes in the level of formation of scientific and research competence and compare the results of the EG and CG.

The following tools were used to collect data: the questionnaire consisted of 15 closed and open-ended questions. The time to fill out the questionnaire was 15 minutes. The questionnaire contained 20 questions aimed at assessing the scientific and research competence of students. To ensure the reliability of the assessments, the expert consensus method was used, which showed a high level of concordance. To determine the level of theoretical knowledge at the ascertaining and control stages, testing was used, which included questions grouped into four thematic blocks. Each question contained four answer options, which allowed checking the depth and completeness of students' knowledge, for example:

Block 1. Theoretical foundations of scientific research:

1. What is the main purpose of a hypothesis in scientific research?

2. Name the three main stages of the scientific research process.

3. How does a qualitative research method differ from a quantitative one?

4. What ethical principles should be considered when conducting research with the participation of people?

5. Formulate the difference between the object and the subject of research.

Block 2. Planning and organising the study:

1. What steps are needed to formulate a relevant topic for scientific research?

2. Give an example of a specific research goal in the field of physical education and sports.

3. Describe how to select a representative sample for an experiment.

4. What tools will you use to collect data during the observation of the training process?

5. How can you ensure the validity and reliability of the results obtained in the study?

Block 3. Analysis and interpretation of results:

1. What is the meaning of the correlation coefficient, and what does it show?

2. How can you present the obtained results of the study graphically for clarity?

3. Give an example of how to interpret statistically significant differences between two groups.

4. How should the results be summarised to draw conclusions that meet the research objectives?

5. Describe how to prevent erroneous interpretation of data during analysis.

Block 4. Formatting and presenting a scientific paper:

1. What are the main sections that a scientific paper should contain?

2. Describe how to properly format a quote taken from another source.

3. What key elements should be included in the presentation of a scientific paper?

4. How does a reference list differ from a bibliography?

5. What text formatting standards should be considered when writing a thesis?

To assess the validity of the tool, the content validity method was used, which ensures the correspondence of the questionnaire questions to the subject under study. The reliability of the questionnaires was checked using the Cronbach's coefficient of reliability ($\alpha = 0.85$), which indicates high internal consistency. To process the data of the students' testing, the method of mathematical statistics, Student's t-test, was used to compare the mean values in the experimental and control groups. The level of statistical significance was set at $p < 0.05$. The choice of this criterion was due to two main factors: the experimental data had a normal distribution, and the sample size was large enough. Student's t-test was used to compare the statistically significant difference between CG-1 (mean score) and EG-1 (mean score) – to confirm that the groups were the same at the beginning; KG-2 (mean score) and EG-2 (mean score) – to assess whether there is a difference between the groups after the experiment; EG-1 (mean score) and EG-2 (mean score) – to identify whether there were changes in the experimental group after the intervention. Data processing was carried out using SPSS 23.0 software. All research procedures were carried out in compliance with ethical standards. Participants provided informed consent to participate, and confidentiality of their data was ensured. The study complies with the requirements of the American Sociological Association's Code of Ethics (1997).

The experimental group studied under the conditions of implementing the proposed model of the formation of scientific and research competence, which provided for the implementation of a set of pedagogical conditions: integration of research tasks into the content of professionally oriented disciplines; gradual involvement of applicants in individual and group scientific projects; application of project-research technologies; organisation of reflective support of research activities; preparation of teachers for mentoring support. The educational process in the control group was carried out under the conditions of traditional organisation of the educational process without the purposeful formation of scientific and research competence.

To objectively measure the results of the formative experiment and identify the level of development of scientific and research competence of future physical culture and sports specialists, the study defined a system of criteria with indicators that reflect the main components of this integrative quality, in particular: cognitive-content (reflects the level of students' assimilation of theoretical knowledge about the methodology and stages of scientific research), operational-activity (shows the extent to which students have practical skills in conducting research, from formulating a hypothesis to presenting results), motivational-value (assesses students' desire for scientific activity and their awareness of its importance for their future profession), and reflective-evaluative (characterises students' ability to self-analyse and critically reflect on their own research activities). Based on the defined criteria, four levels of scientific and research competence were identified: high (characterised by stable knowledge, formed research skills, pronounced motivation for science, developed reflection and the ability to engage in independent scientific activity), sufficient (implies possession of basic knowledge and skills, the need for partial pedagogical support, a positive attitude towards research activity), medium (manifested in fragmentary knowledge, poorly formed skills, situational or external motivation, superficial reflection) and low (indicates the lack of scientific and research competence: knowledge is random, research actions are unconscious or absent, interest in science is minimal or absent). Such a criterion-level approach allowed to ensure diagnostic accuracy during the ascertaining and control stages of the experiment, as well as to determine the dynamics of changes as a result of the implementation of pedagogical conditions.

RESULTS AND DISCUSSION

In the context of implementing the requirements of the higher education standard in the specialty 017 "Physical Culture and Sports", the formation of scientific and research competence is defined as a key area of professional training. However, the analysis of educational and professional programs of the second (master's) level indicates insufficient systematic inclusion of research components in the content of academic disciplines. The vast majority of courses are focused on the formation of practical, methodological, and organisational skills, while research activities are often considered optional or implemented exclusively during the preparation of qualification work.

The conducted survey revealed a low level of awareness of scientific research methods, limited participation in student scientific activities (circles, conferences, scientific paper competitions), and insufficient motivation to independently study current problems in the field. Only a small part of the respondents demonstrated the ability to formulate scientific hypotheses, determine research methodology, or conduct elementary processing of experimental results. Analysis of the work of teachers indicates a lack of systematic methodological training to support the scientific research activities of applicants, which is due to both the overload of curricula and the lack of incentives for the development of mentoring support in the field of student science. Thus, it was established that there is a contradiction between the requirements for the formation of scientific research competence, declared in educational standards, and the real state of its development in students, which necessitates the purposeful design of pedagogical conditions that would ensure the effective inclusion of students in research activities in the educational process.

The results of the theoretical analysis and the ascertaining stage of the experiment showed the presence of contradictions between the requirements for the formation of scientific and research competence of future specialists in physical culture and sports, declared in regulatory documents (higher education standards, concepts of education development, professional qualification characteristics), and the real level of their development in higher education applicants. In particular, the following were revealed:

- fragmentary inclusion of research elements in the educational process;
- insufficient motivation of students to carry out research activities;
- lack of conditions for the practical application of scientific knowledge;
- low level of formation of analytical, critical, and interpretative thinking;
- limited participation of applicants in collective and individual scientific projects.

Thus, the need to develop and implement a system of pedagogical conditions aimed at activating scientific and research activities is due to both external requests (compliance with state standards, labour market requirements) and internal needs (realisation of students' scientific potential, ensuring continuity of education and self-development). Effective development of scientific and research competence of future specialists in physical culture and sports requires the creation of a holistic system of pedagogical conditions that would ensure the integration of the research approach into all components of the educational process. One of the leading conditions is the integration of scientific and research tasks into the content of professionally oriented disciplines – this involves the inclusion in the curricula of tasks aimed at analysing scientific sources, formulating research hypotheses, developing mini-studies, and testing results in practical activities; such an approach allows combining the assimilation of theoretical material with the practical application of research skills in an industry context.

The next condition is the gradual involvement of students in participation in individual and collective scientific projects – the implementation of this condition occurs through the functioning of student scientific circles, the organisation of participation in professional conferences, scientific paper competitions, the preparation of publications, which forms the experience of research activities, communication skills in the academic environment, and also develops the ability to present the results of their own work (Momot *et al.*, 2025). An important pedagogical condition is the use of project-research teaching technologies aimed at activating the cognitive activity of students; in particular, this involves the use of such methods as educational design, case methods, research workshops, modelling of professional situations; such an approach contributes to the development of critical and analytical thinking, initiative, and the ability to independently solve problems, which is of decisive importance in the training of a new generation of specialists.

Special attention is required for the organisation of reflective and evaluative support for research activities. This involves the introduction of self-assessment and mutual assessment tools, as well as keeping researcher diaries and using reflective questionnaires. This contributes to the formation of students' ability to understand their own research activities, identify difficulties, set goals for further development, and improve personal scientific potential. The fifth pedagogical condition is the preparation of teachers for scientific mentoring and providing the educational process with appropriate methodological support, which involves increasing the level of research competence of teaching staff, developing motivation for mentoring activities, creating instructional and methodological materials, templates for scientific tasks, and feedback forms. Of particular importance is the individualisation of support for students in scientific activities, which allows taking into account their personal interests, pace of development, and level of preparedness. Thus, the identified pedagogical conditions are the basic elements of organisational and pedagogical support for the formation of research competence and form the basis for designing the formative stage of the pedagogical experiment.

In the context of the implementation of certain pedagogical conditions, an important factor in the effective formation of scientific and research competence of future specialists in physical culture and sports is a purposeful rethinking of the content and methodological support of educational disciplines that have a research orientation. In particular, the integration of content, project-analytical, and reflective components into educational courses allows creating a systemic basis for the development of relevant competencies (Teliachyi *et al*., 2023). A key element of such training is the discipline "Methodology and Organisation of Scientific Research", which directly contributes to the implementation of pedagogical conditions related to the integration of scientific and research tasks into the content of professionally oriented disciplines, as well as the organisation of reflective and evaluative support for learning. The course content involves the study of the foundations of scientific knowledge, research methods, and the construction of the logic of empirical and theoretical explorations; The practical part of the training may include the analysis of professional sources, the formulation of hypotheses, the construction of a research structure, the development of mini-research tasks, which ensures that students acquire the skills of independent scientific activity. Additionally, the introduction of such tools as researcher diaries, reflective cards, self- and mutual assessment allows the formation of critical thinking and the ability to objectively analyse one's own activities.

The discipline "Management of Scientific and Applied Projects" is also of great importance, which allows implementing pedagogical conditions associated with the use of project-research technologies and the gradual involvement of students in participation in individual and collective research initiatives. The educational process within this discipline may involve designing full-fledged scientific and applied projects, covering the stages of substantiation of relevance, definition of goals and objectives, selection of methods, formation of expected results, and their public presentation. It is important that students are involved in teamwork, present projects in the educational environment, and receive feedback, which contributes not only to the formation of research but also to communicative competence. In this context, the teacher performs the function of a scientific mentor who accompanies, advises, and corrects research activities, thereby contributing to the development of mentoring in the training system. The discipline "Higher School Pedagogy" has significant potential for training teachers for scientific mentoring and integrating research elements into the process of professional training. Studying the laws of higher education, the principles of organising the educational process, and the specifics of teacher-student interaction allows students not only to master the basics of didactics but also to design their own educational and research trajectory. An important element is the development of pedagogical research methods, in particular in the context of analysing the effectiveness of educational technologies and interpreting the results of the educational process. Thus, students realise the importance of combining the pedagogical and scientific functions of a higher school teacher. A separate functional role in the formation of scientific and research competence is played by the discipline "Innovative Technologies in Physical Culture and Sports", which is focused on the implementation of conditions associated with the use of project-research technologies and involving students in the development and testing of innovative models of professional activity. The course content allows to master the latest digital tools, services for data processing and visualisation, and methods for assessing the effectiveness of innovations in sports practice. Practical classes can be focused on the formation of research groups that work on assessing the implementation of new technologies (for example, GPS tracking, digital monitoring of the athlete's condition, virtual training platforms), with subsequent presentation of the results in the form of reports or scientific presentations.

Thus, the specified disciplines not only allow the realisation of certain pedagogical conditions, but also creating an interdisciplinary basis for the formation of integrative scientific and research competence in students. Their content and organisational transformation in the context of research-oriented training becomes a necessary condition for the preparation of a competitive specialist capable of scientific research, innovative thinking, and professional self-improvement (Popel *et al*., 2023). The results of the control stage of the experiment made it possible to assess the dynamics of changes and the effectiveness of the implemented pedagogical conditions in the process of forming the research competence of future specialists in physical culture and sports (Table 1, Fig. 1).

Table 1. Dynamics of levels of formation of scientific and research competence of future specialists in physical culture and sports

Group	Stage	Level	Percentage (%)	Number of people
CG-1	Before the experiment	High	9	7
		Sufficient	23	18
		Average	40	31
		Low	28	22
CG-2	After the experiment	High	11	8
		Sufficient	25	19
		Average	38	29
		Low	26	20

Table 1. Continue

Group	Stage	Level	Percentage (%)	Number of people
EG-1	Before the experiment	High	8	6
		Sufficient	22	17
		Average	41	32
		Low	29	23
EG-2	After the experiment	High	31	24
		Sufficient	43	34
		Average	20	16
		Low	6	5

Source: developed by the authors

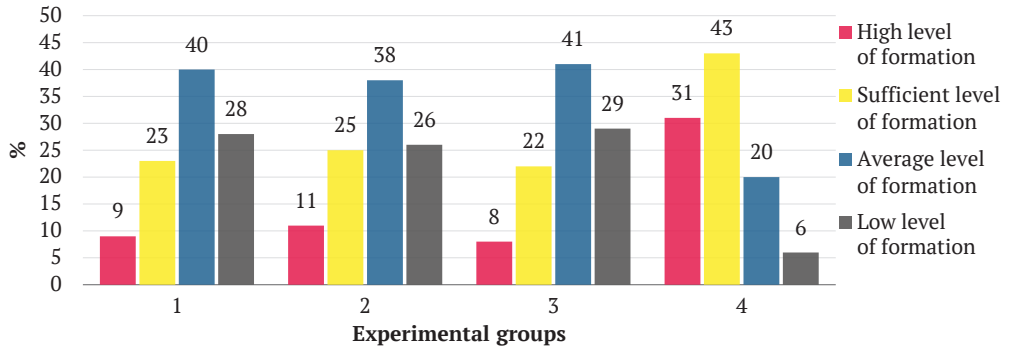

Figure 1. Results of the formation of scientific and research competence of future specialists in physical culture and sports

Note: 1 – control group before the experiment; 2 – control group after the experiment; 3 – experimental group before the experiment; 4 – experimental group after the experiment

Source: developed by the authors

At the beginning of the experiment, no statistically significant differences were found between the control (CG, n = 78) and experimental groups (EG, n = 78) in terms of the level of development of scientific and research competence ($t = 0.42$, $p > 0.05$). The average score in the control group was 21.3 ± 0.7 points, while in the experimental group it was 21.9 ± 0.6 points. This indicates the homogeneity of the groups at the beginning of the study. After conducting the formative experiment, statistically significant changes were recorded in the experimental group. The average score in the EG increased to 29.8 ± 0.5 points, which is significantly higher than in the CG, where the average score was 22.1 ± 0.8 points. According to the results of comparing the averages, the student's t-test showed a statistically significant difference between the groups ($t = 8.11$, $p < 0.05$). These results are confirmed by changes in the percentage distribution of levels: in the EG, the share of students with high and sufficient levels of knowledge after the experiment increased from 30 to 74%; in the CG, this indicator almost did not change, remaining at the level of 36% (CG-1: 32%, CG-2: 36%). Thus, the obtained data prove that the proposed system of pedagogical conditions effectively influenced the development of scientific and research competence in students of the experimental group.

These empirical results correlate with the theoretical foundations of the study, which are based on a multi-component approach to the structure of scientific and research competence. In particular, the study used as a theoretical basis an analysis of publications (Vysochan *et al.*, 2023), which considered the concept of "scientific and research competence" as an integrative characteristic of a person, combining several key components. Cognitive implies the presence of fundamental knowledge of the methodology of scientific knowledge, the foundations of research, as well as mastery of methods of empirical and theoretical analysis. It is this component that forms the theoretical and cognitive basis for understanding scientific principles and their application in professional activities. The operational and activity component reflects the formation of the skills to search, select, and analyse scientific information, plan and implement all stages of research, conduct experiments, and present results in the form of publications. This component is a practical manifestation of the acquired knowledge. Motivational and value – characterised by the student's internal interest in scientific work, the desire for self-realisation through research, and a positive attitude to cognitive activity, which determines the level of his activity and initiative. The reflective component allows a specialist to critically reflect on his experience, identify errors and improve his research approach and includes: critical thinking – the ability to objectively evaluate his own hypotheses, methods and conclusions; the ability to adequately assess

the level of one's competence and identify gaps in knowledge and skills; the ability to adjust one's research goals and plans based on the experience gained. In addition to the main components, it is advisable to supplement this concept with a communicative component, which includes public presentation skills – the ability to speak clearly and convincingly at conferences, seminars, and thesis defence; academic writing – the ability to write scientific articles, theses, and reports, adhering to standards and style; working in research teams, discussing results, and sharing experience with colleagues, etc.

In the works of S. Atamanyuk *et al.* (2021) and I. Boyko's (2025) research competence is not only a sign of high-quality professional education, but also a factor that ensures the ability to self-development, innovative search, and scientific creativity in the field of physical education, sports, and health care. Scientists O. Kornosenko *et al*. (2022) drew the attention of the scientific community to the absence in the educational process of a holistic, purposeful system for the formation of research competence in students, which would involve not only providing relevant knowledge, but also creating an educational environment that stimulates scientific thinking, research activity, and self-realisation of future specialists. The modern education system does not always ensure comprehensive preparation of future specialists for research activities, highlighting the need for the development of new, effective methods and pedagogical conditions aimed at forming both theoretical knowledge and practical skills.

The experience of O. Otravenko *et al.* (2021) on the practical implementation of research approaches in the training of health and sports specialists is also valuable. The authors' works substantiated the importance of developing students' research potential in the context of physical rehabilitation, recreation, and biomedical training. This ensures a close connection between science and practice in the field of physical culture. Such approaches not only help students acquire theoretical knowledge but also provide them with tools to solve real problems. The introduction of research activities into the educational process allows future specialists to acquire the skills necessary for continuous professional improvement, analysis, and assessment of the effectiveness of methods. Ultimately, this contributes to the formation of highly qualified coaches capable of innovation and adaptation to the dynamic requirements of the modern industry.

The effectiveness of the formation of integrative professional competencies (which include scientific and research competencies) is ensured by the implementation of a set of specially developed pedagogical conditions, as evidenced by the scientific studies of M. Kryshtanovych *et al*. (2022) and T. Zhytomyrska (2023). In the context of their research, the conditions act as organisational, pedagogical, didactic, and psychological factors of creating a favourable environment for the development of target personality characteristics. Based on the results of the study, pedagogical conditions were developed aimed at the effective formation of scientific and research competencies of physical culture and sports specialists, which, unlike others, are distinguished by the possibility of operational implementation in practical activities. This means that students can directly test scientific methods during training, physical education, and recreation classes or competitions. Such conditions allow them not only to master the theory but also to immediately observe how it works in real conditions, which makes the learning process more meaningful and motivating. The formation of research competence occurs not as a separate, isolated process, but as part of general training. Students can use research methods to: analyse biomechanical characteristics of movements; assess physiological changes in the body of athletes; compare the effectiveness of different training methods. This integrates research skills into the professional toolkit of the future specialist, making him capable of constant self-improvement and innovation. Also, research in this area requires knowledge not only of pedagogy, but also of related sciences: biology, physiology, biomechanics, psychology, and medicine. Specially selected conditions allow students to simultaneously develop competencies in different scientific fields, creating a holistic understanding of the human body and its capabilities. This approach prepares them to solve complex, complex tasks that arise in professional practice.

Thus, the research competence of a future specialist in physical culture and sports is a holistic system that integrates knowledge, skills, motivation, reflection, and communicative culture. It is necessary for effective professional activity in the conditions of modern education, which is confirmed by research (Kornosenko *et al.,* 2021; Zhytomyrska, 2023). The specificity of the conditions lies in the inextricable link between theoretical knowledge and practical experience. That is why there is a need for the organic integration of research tasks into the content of professional training, which will allow future specialists to apply scientific approaches to solving real problems in the industry. Based on the analysis of the data obtained, it was established that the integration of research approaches into the educational process contributes to the formation of a specialist capable of high-quality and competitive thinking. Thus, research competence is not only an element of professional competence, but also a key factor in the high-quality training of a specialist in the field of physical culture and sports.

The results of the pedagogical experiment confirmed the effectiveness of the proposed system of pedagogical conditions, ensuring a statistically significant increase in the level of scientific and research competence in the experimental group compared to the control group. In particular, in the experimental group, the number of students with a high level of research competence formation increased more than threefold (from 8 to 31%), and the share of those who reached a sufficient level doubled (from 22 to 43%). At the same time, in the same group, there was a sharp decrease in the number of students with low and

medium levels of competence. The number of students with an average level decreased more than twice (from 41 to 20%), and with a low level, almost fivefold (from 29 to 6%). These positive changes in the experimental group are directly related to the implementation of a set of pedagogical conditions focused on the formation of research activity of applicants: in particular, the inclusion of research-related tasks in the educational process (within the disciplines "Methodology and Organisation of Scientific Research", "Innovative Technologies in Physical Culture and Sports") contributed to the growth of the cognitive-content and operational-activity components of competence; applicants learned to formulate scientific problems, hypotheses, choose research methods, work with the source database, conduct experiments, formalise results and present them. An important role was played by the gradual involvement of students in individual and collective scientific projects that were implemented within the discipline "Management of Scientific and Applied Projects" and in extracurricular work; such activities allowed the participants of the experimental group to gain experience in team interaction, scientific communication, and responsibility for the result. In addition, the organisation of reflective and evaluative support for research activities contributed to an increase in the level of awareness and self-assessment of students of their actions; the use of researcher diaries, reflection questionnaires, and self-assessment forms allowed to strengthen the reflective and evaluative component of competence; active mentoring by teachers, methodically prepared for mentoring activities (especially within the discipline "Higher School Pedagogy"), became an additional factor of success. The implementation of the communicative component allowed the improvement of research activity through the formation of skills of clear and reasoned presentation of thoughts during presentations. Students also gained experience in scientific communication at conferences and seminars, which helped to establish professional contacts and exchange experiences. In addition, joint work on projects developed the skills of effective team interaction, which is critically important for future professional activities. Thus, the formation of scientific and research competence requires the efforts of both sides of the educational process – the teacher and the applicant – and is based on a shared awareness of the value of research as a resource for professional development and a tool for innovative renewal of the sphere of physical culture and sports.

It is important for teachers to ensure the organic implementation of research tasks in the educational process. This involves updating the content of professionally oriented disciplines and supplementing them with tasks of an analytical, problem-based, and empirical nature. The practice of the experimental group confirmed that the use of project-research teaching technologies (in particular, methods of case analysis, design, and modelling of real situations) contributes not only to the activation of students' cognitive activity but also to the formation of their ability to independently solve professionally significant tasks. In addition, the development of the teacher's mentoring function is of particular importance. Providing scientific support, providing advisory support, motivating students to participate in scientific circles, conferences, and competitions, and contributing to the formation of a scientific culture and a sustainable interest in research activities. It is also worth paying attention to the development of the reflective component through the introduction of such tools as researcher diaries, reflective questionnaires, and individual maps of research growth.

It is important for higher education students to actively engage in research activities from the first stages of professional training. Particular attention should be paid to the development of critical analysis skills, working with scientific sources, and forming their own research interest. The study showed that students who systematically participate in scientific activities demonstrate a higher level of competence formation, readiness for independent knowledge, and professional self-improvement. An important factor is the formation of the ability to reflect and self-assess their own activities, which ensures awareness of personal progress, setting new goals, and orientation to results. It is advisable for students to use elements of self-organisation, in particular, maintaining an individual portfolio, analysing the dynamics of their own research experience, and processing constructive feedback from teachers and colleagues.

CONCLUSIONS

It was determined that scientific and research competence is an integrative characteristic of the personality of a higher education applicant, which involves the formation of knowledge in the methodology of scientific knowledge, the ability to carry out research activities, positive motivation for scientific activity, reflexivity, and readiness for self-development. Its development in students of the specialty 017 Physical Culture and Sports should be based on targeted influence through the content of professional training, organisational and pedagogical conditions, and mentoring support. A system of pedagogical conditions has been proposed and implemented, which includes: integration of research tasks into the content of professionally oriented disciplines; gradual involvement of students in individual and group scientific projects; application of project and research technologies of education; organisation of reflexive and evaluative support; preparation of teachers for mentoring activities.

Results of a formative experiment conducted at the Faculty of Physical Education and Sports of the. Poltava V.G. Korolenko National Pedagogical University, during 2023-2025, with the participation of 156 applicants for higher education of the second (master's) level, confirmed the effectiveness of the implemented model. In the control group, the indicators of the levels of formation of research competence remained almost unchanged, while in the experimental group, a significant increase in the proportion of students with high and sufficient levels was recorded (the total increase was over 40%), which was accompanied

by a decrease in the number of applicants with medium and low levels. The generalisation of the results allows to state that the effective formation of research competence in the system of training future specialists in physical culture and sports is possible under the condition of comprehensive implementation of pedagogical conditions, adaptation of the content of academic disciplines, development of research motivation, mentoring support from the teacher, and creation of a reflective educational environment. The conducted study laid a scientific and methodological foundation for the purposeful formation of research competence of future specialists in physical culture and sports. An important problem for further scientific development is the creation and testing of adaptive models of individualisation of research training for students with different levels of academic success and motivation.

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CONFLICT OF INTEREST

None.

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Павло Хоменко
Доктор педагогічних наук, професор
Полтавський національний педагогічний університет імені В. Г. Короленка
36003, вул. Остроградського, 2, м. Полтава, Україна
https://orcid.org/0000-0003-3065-9095

Оксана Корносенко
Доктор педагогічних наук, професор
Полтавський національний педагогічний університет імені В. Г. Короленка
36021, вул. Грушевського, 16, м. Полтава, Україна
https://orcid.org/0000-0002-9376-176X

Олександр Хижняк
Доктор філософії
Полтавський національний педагогічний університет імені В. Г. Короленка
36003, вул. Остроградського, 2, м. Полтава, Україна
https://orcid.org/0000-0003-1791-2957

Валерій Маник
Аспірант
Полтавський національний педагогічний університет імені В. Г. Короленка
36003, вул. Остроградського, 2, м. Полтава, Україна
https://orcid.org/0009-0003-6881-1504

Експериментальне дослідження розвитку науково-дослідницької компетентності майбутніх фахівців фізичної культури і спорту

Анотація. Актуальність дослідження зумовлена необхідністю розроблення та впровадження ефективних педагогічних умов і технологій для формування науково-дослідницької компетентності у майбутніх фахівців фізичної культури і спорту, що відповідає сучасним вимогам освіти та реальним потребам галузі. Метою роботи було теоретично обґрунтувати, розробити та експериментально перевірити педагогічні умови, які забезпечують ефективний розвиток науково-дослідницької компетентності студентів спеціальності 017 (А7) Фізична культура і спорт. Для досягнення мети використано теоретичні методи (аналіз, синтез, узагальнення), емпіричні методи (анкетування, спостереження, педагогічний експеримент), а також методи статистичної обробки даних. Педагогічний експеримент проведено у 2023-2025 роках на базі факультету фізичного виховання та спорту Полтавського національного педагогічного університету імені В. Г. Короленка за участі 156 здобувачів другого (магістерського) рівня вищої освіти. У контрольній і експериментальній групах здійснено порівняння динаміки рівнів сформованості науково-дослідницької компетентності за визначеними критеріями. Установлено, що сформованість науково-дослідницької компетентності є однією з ключових умов професійного зростання фахівця та його готовності до впровадження інновацій у сфері фізичної культури і спорту. Результати експериментального дослідження показали незначні зміни в контрольній групі та суттєве зростання у експериментальній: високий рівень зріс із 8 до 31 %, достатній – із 22 до 43 %, водночас частка студентів із середнім і низьким рівнями зменшилася на 21 та 23 відсоткові пункти відповідно. Така динаміка є наслідком реалізації комплексу педагогічних умов: інтеграції дослідницьких завдань у зміст навчальних дисциплін, застосування проєктно-дослідницьких технологій, організації наставницької підтримки та рефлексивно-оцінювального супроводу. Практична цінність роботи полягає у можливості використання запропонованих підходів в освітньому процесі підготовки фахівців фізичної культури для цілеспрямованого формування їхньої науково-дослідницької компетентності

Ключові слова: здобувачі вищої освіти; професійна підготовка; майбутні тренери; педагогічні умови; проєктно-дослідницькі технології; методологія наукових досліджень; інноваційні технології