DOI: 10.15587/978-617-8360-24-5.CH6

6 FORMATION OF STUDENTS' RESEARCH COMPETENCE IN THE INNOVATIVE EDUCATIONAL ENVIRONMENT OF HIGHER EDUCATIONAL INSTITUTIONS

Nadiia Morhunova, Svitlana Dimitrova-Burlayenko, Gulnara Ikhsangaliyeva, Viacheslav Kudriavtsev, Nataliia Oleshko

ABSTRACT

The section is devoted to the study of the problem of forming research competence in students of higher educational institutions. An analysis of scientists' approaches to understanding the concept of "research competence" was carried out, the results of which emphasize the readiness of future specialists to independently carry out scientific and research activities, analyze processes and phenomena, and introduce innovations into professional practice. It is proved that the formation of research competence, which contributes to the development of students' critical thinking, the ability to independently solve professional issues, develops in them the ability to analyze, reflect, and experiment, is today a necessary condition for ensuring the quality of higher professional education. The formation features of the research competence of students, the principles of organizing their scientific and research activities in higher educational institutions of Ukraine, its structure, basic pedagogical conditions, technologies, and methods necessary for its effective implementation are determined. The results of an empirical study are presented, which indicate the effectiveness of the hypothesis put forward.

KEYWORDS

Research competence, higher education institution, innovative teaching methods, innovative educational environment, project-based learning, AI technologies.

6.1 UNDERSTANDING THE CONCEPT OF "RESEARCH COMPETENCE" OF HEI STUDENTS IN MODERN SCIENTIFIC RESEARCH

The modern stage of society development is characterized by dynamism, changes in the social structure and the emergence of qualitatively new types of activity in previously unknown areas. In these conditions, the ability to independently search for the necessary information, master the fundamental knowledge that constitutes the theoretical foundations of professional activity, the ability to create and implement new strategies of behavior and activity becomes especially important for a specialist. The research component becomes one of the leading in the structure of a specialist's readiness for professional activity, which is especially relevant in the context of the educational space transformation, the vocational education reform and the integration of Ukraine into the European educational space. Therefore, the issue of forming research competence is a popular requirement that is put forward today for graduates of higher education institutions. Higher professional education is faced with the need to transition to a more flexible system of

student training, to update the ways of designing and organizing the educational process, which will take into account the needs of the individual in developing his/her creative potential, which will allow forming a specialist who will be more susceptible to changes in the field of work, able to quickly find solutions and act in situations of uncertainty and contradiction, etc.

Today, the development of the research orientation of the future specialist in the educational practice of Ukrainian HEIs is not fully stimulated, as a result of which it is necessary to study the theoretical aspects of the concept of research competence of HEI students.

Students' scientific and research work is an important component of the educational process, which must be carried out from the first days of a student's study at a HEI within the framework of an educational space specially created for this purpose. The modern system of higher professional education should contribute to the development in the future specialist of a new type of intelligence, thinking, attitude to a new changing reality, and the main thing on this path is the formation of a system of cognitive abilities, close to the intelligence of a scientific worker. This requires the organization of the conditions of the educational process, in which the student will be involved in active intellectual, exploratory, creative and independent educational activities. This necessitates the generalization of existing experience, the development of new techniques and technologies that meet the requirements of educational programs and contribute to the development of students' research competence.

The theoretical basis for designing ways to form the research competence of students of higher education institutions was the work of foreign and domestic scientists, which substantiate the ideas of the competency approach (I. Bekh, O. Demchuk, Yu. Zinkovsky, O. Pometun, J. Raven, E. Toffler, R. White, R. Haigerty, N. Chomsky, M. Leiter, etc.); the theory and practice of research, experimental, innovative pedagogy is considered (A. Bermus, N. Bibik, G. Gorelikova, V. Kraevsky, V. Kremin, M. Rud, V. Serikov, S. Sysoeva, V. Laptev, etc.); the specifics of students' research competence are studied (M. Arkhipova, T. Baybara, L. Bondarenko, I. Drach, N. Demeshkant, N. Lyubchak, O. Popadych, G. Selevko, I. Frolova, N. Sosnytska, V. Sharko, V. Yatsenko); possibilities of cooperation between teachers and students in scientific research (L. Bachieva, O. Dubaseniuk, I. Zyazyun, A. Mayhew, G. Mirskykh, E. Sypchuk, Yu. Solyanykov, L. Sushchenko, E. Short, etc.), features of its organization (O. Bondarevska, M. Kantorovych, G. Onkovych, N. Ostapenko, O. Semenog, I. Yakymanska, etc.); the issues of the formation of certain types of competence (speech competence (L. Merkulova, M. Knyazyan), general cultural competence (T. Yezhova, G. Shpytalevskaya), etc. are revealed.

It should be noted that although the principles and pedagogical means of developing the research skills of the individual have been the subject of research for several decades, as pedagogical means and conditions for their development in most of them, a rather narrow range of forms and methods of teaching was considered, which was limited to the framework of problem-based and contextual learning. It should also be noted that in previous years, research skills were considered from a narrow, purely didactic position. Nowadays, a whole range of innovative teaching technologies has been developed in pedagogy, including digital, appropriate forms, methods and tools, which have great potential in the development of students' research competence and require further development.

Let us turn to the analysis of the understanding of the "research competence" concept in modern scientific literature. Our analysis of scientific sources allowed us to identify several approaches to the study

of the " research competence" concept, which differ depending on what is taken as the basis of the definition. Supporters of the first approach proceed from the concept of "competence" and consider research competence as one of the key competencies, as a component of cognitive competence or professional competence. The integral professional competence of a specialist enables the effective solution of the entire range of professional tasks, and research competence acts as its component part. Thus, the task of forming research competence in a graduate of a higher education institution implies that the higher education system should be aimed at forming not only a professional performer, but a professional researcher who is able to easily adapt to rapidly changing conditions, find solutions to problems that arise as a result of possessing research skills and personality traits.

Representatives of the second approach see the definition of the "activity" concept as the basis and consider research competence as the readiness of an individual to carry out research activities (depending on the professional orientation of the student). For example, Yu. Nikorak, interprets research competence as "an integrative characteristic of a person, which involves possession of methodological knowledge, technology of research activity, recognition of their value and readiness to use them in professional activity, which is characterized by stable motivation", and positions it as an integral component of general and professional education, a characteristic that means possession of skills and methods of research activity at the level of technology in order to search for knowledge to solve educational problems [1]. According to O. Popadych, research competence encompasses a number of important skills: setting a research problem, formulating a hypothesis, selecting methodological tools, processing and interpreting results, participating in scientific discussions, as well as adapting and implementing scientific achievements in the real conditions of the educational process [2]. M. Golovan defines research competence as a holistic, integrative quality of a person, which combines knowledge, skills, abilities, experience of research activity, value attitudes and personal qualities and is manifested in the readiness and ability to conduct research in order to obtain new knowledge by applying methods of scientific knowledge, using a creative approach in goal setting, planning, analysis, decision-making and evaluation of the results of research activity" and emphasizes that this competence is formed in activity and always manifests itself under the condition of personal interest and value attitude to activity, thanks to which a high professional result is achieved [3].

The third group of researchers considers the result of a student's independent research activity not just the acquisition of new knowledge, but also changes in his/her personality. L. Bondarenko interprets research competence as the result of personal self-development, which is manifested in the ability of an individual to self-organize, generalize his/her experience, and form personally significant qualities of a researcher, in particular, such as innovative thinking, the ability to creative and innovative activity [4]. Scientists agree that although research competence is a product of learning, it does not directly follow from it, but is a consequence of the self-development of the student's personality, his/her personal growth, holistic self-organization and synthesis of his/her cognitive, activity and personal experience.

In recent scientific works of Ukrainian teachers, research competence is defined as "a complex quality of a student, which combines research abilities and skills in acquiring new knowledge by applying methods of scientific cognition, creative thinking, an innovative approach in planning, decision-making, discussion and evaluation of the results of research and experimental activities" [5].

Students' research activities can contribute to the development of science and the improvement of the level of education in general. A student-researcher is an education seeker who possesses the necessary knowledge and skills to conduct scientific research, responsibly approaches his/her education and constantly develops as a professional. L. Vysochan believes that the development of students' research competence allows them to better understand their professional direction, develop their abilities and skills, which contributes to their successful career in the future [6].

We want to emphasize the transformative nature of research competence and propose to consider it as an integral personal quality, which is manifested in the readiness and ability to independently assimilate and obtain new knowledge as a result of transferring the semantic context of existing knowledge, skills, abilities and means of activity. The development of research skills in students makes it possible not only to reproduce the knowledge they have received in class, but also stimulates the independence of reasoning, conclusions that reflect the patterns and logical connections of educational information.

Typical components of research competence are working with scientific sources of information, critical understanding and analysis of the information received, the ability to present research results, explain and prove the correctness of one's position, etc. The most demanded skills and abilities of this competence are the ability to analyze, critically understand and evaluate the data obtained as a result of the selection [7, 8], interpret research results [8, 9], use the obtained data in practical work, plan and create one's own scientific products, be able to present and scale research results [8—10]. However, research competence should include not only individual skills and abilities, but also a personal attitude to this activity.

Note that scientific and research activities are not limited to working with scientific literature and its analysis. To implement it, students should also practice the ability to see the problem, ask questions, put forward a hypothesis, compare, classify, formulate a goal, structure the material, independently conduct an experiment, observe, explain and prove the correctness of their position.

Therefore, research competence always involves dynamic activity of students, which ensures the acquisition of the necessary skills of creative research activity, contributes to the independent solution of educational, scientific and professional tasks. Summarizing the approaches considered, we define students' research competence as a personal quality, which is manifested in the need for scientific activity, recognition of the value of research skills, readiness and ability to independently solve research and creative tasks; the ability to observe and analyze, put forward hypotheses; the ability to conduct scientific research, understand its methodology, organize a scientific experiment; generalize and predict the consequences of research activities, the ability to use scientific methods and approaches to solve problems in accordance with their professional direction, combining the qualities of a specialist and a researcher-scientist.

6.2 THE STRUCTURE OF HEI STUDENTS' RESEARCH COMPETENCE

The study of the understanding of research competence by modern scientists allows us to move on to the definition of its components, which, in our opinion, should be primarily aimed at in the educational process.

As we have already noted, the research competence of students is an integrative personal formation that is constituted in the process of studying and research activities in higher education institutions within the framework of independent transformative-heuristic mastery of theory and practice in the scientific field. It must necessarily include a constructive attitude towards innovation as a particularly significant personal and professional value.

Considering the structure and components of the research competence of HEI students, the researchers proposed the following interrelated components: information-communication (mastery of data collection methods in accordance with hypotheses, formation of empirical data sets, analysis of various sources of information, etc.), communicative (ability to work with respondents and cooperate with colleagues within the framework of research activities) (O. Bida); personal-creative (level of development of creative qualities of the individual) (S. Sysoeva); motivational, cognitive, activity-practical, reflective (M. Golovan, V. Yatsenko); motivational-stimulating, organizational (organization of cognitive activity), coordinating (management of the process of assimilation of research activity elements), cognitive, operational-activity, motivational, value-semantic (Yu. Slodynytska), etc. So, as we see, in the understanding of scientists, research competence appears as a complex synthesis of cognitive, subject-practical, and personal experience of students.

The main properties of research competence that must be taken into account in the process of determining the structure of this concept are:

— systematicity, which allows you to combine and create a single alloy of theory and practice;

— prevention, aimed at anticipating problems, their adequate assessment and warning of environmental signals as a condition for success;

— innovation, characterized by inertia in the process of carrying out activities, the ability to go beyond the traditional;

— forecasting, which involves predicting the future taking into account scientifically based analysis;

— reframing (a shift in the idea of what an object is now and what it can achieve);

— multidimensionality, which is expressed in the application of analytical, critical, communicative and other skills, as well as common sense, in research;

— mobility, which is manifested in the ability to dynamically act in any situation and on any subject material, etc.

We consider the most optimal structure of research competence, which includes motivational-value, cognitive-activity and personal-reflective components.

The motivational-value component reflects the system of values, needs and motivations that underlie research activity and is characterized by cognitive activity, a positive attitude towards research, interest in knowledge, awareness of the significance of science in society, internal motivation, acceptance of ethical norms of scientific activity, orientation towards scientific self-expression, independence in the process of cognition, decision-making, their evaluation, etc.

The cognitive-activity component includes the level of intelligence, the set of acquired knowledge that is necessary when performing research activity (basic knowledge, knowledge of the essence and technologies of research activity, criteria for the truth of scientific knowledge, academic integrity), experimental thinking; manifestation of creativity in a problem situation, research skills (the ability to navigate the

subject area of research; the ability to identify and understand problematic research issues, planning research activities, collecting, analyzing and interpreting data during the research), individual experience of scientific and research activities.

The personal-reflective component involves the personification of oneself as a researcher, the ability to analyze the results of one's own activity, the ability to evaluate its product, the correlation of results with the set goal, the assessment of one's own results, the ability to self-regulate, etc.

The full combination of all the considered components leads to the active development of the research competence of HEI students.

The study of the requirements for the formation of competencies in the educational standards of higher education in higher education institutions of Ukraine shows that one of the types of activity, for which graduates of various fields should prepare is scientific and research activity. The acquisition of primary knowledge, skills and abilities of scientific and research work is included in the basic requirements of educational and professional programs of any specialty at the bachelor's level and is designated as an integral competence. For example, "The ability of a person to solve complex specialized tasks and practical problems in a certain field of professional activity or in the process of learning, which involves the application of certain theories and methods of relevant sciences and is characterized by the complexity and uncertainty of conditions"; "The ability to solve complex specialized tasks and practical problems, characterized by the complexity and uncertainty of conditions, in the field of management or in the process of learning, which involves the application of theories and methods of social and behavioral sciences"; "The ability to search, critically analyze and synthesize information, apply a systematic approach to solving professional tasks"; "The ability to solve complex specialized tasks or practical problems of software engineering, characterized by the complexity and uncertainty of conditions, using theories and methods of information technologies" and others.

The analysis and comparison of general competencies (GC) of a number of technical and economic areas of training demonstrate that the requirements for the ability to conduct scientific and research activities are also traced in all formulations of GC ("able to use information collection methods"; "able to apply knowledge of the basics (of science)"; "analyze and interpret results"; "present the results of one's work in oral and written form"; "formulate goals"; "experiment", etc.).

In order to identify student' main general competencies that correspond to research competence, for example, let us analyze the general competencies presented in the Educational and Professional Program "Organizational Management and Logistics" (KhNAHU) (**Table 6.1**).

Table 6.1 General student competencies that form research activity

General competencies	Skill
1	**2**
GC1	The ability to exercise one's rights and obligations as a member of society, to be aware of the values of civil (democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of human and citizen in Ukraine.

Continuation of Table 6.1

1	2
GC2	The ability to preserve and multiply moral, cultural, scientific values, achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and engineering, to use various types and forms of physical activity to lead a healthy lifestyle.
GC3	Ability to learn and master modern knowledge.
GC4	Ability to abstract thinking, analysis, synthesis.
GC5	Ability to apply knowledge in practical situations.
GC6	Knowledge and understanding of the subject area and understanding of professional activity.
GC7	Ability to communicate logically, reasonedly and clearly in the state language both orally and in writing.
GC8	Ability to communicate in a foreign language.
GC9	Ability to conduct research at the appropriate level.
GC10	Possession of a culture of thinking, the ability to perceive, generalize and economically analyze information, set goals and choose ways to achieve them.
GC11	Skills in using information and communication technologies.
GC12	Ability to adapt and act in a new situation.
GC13	Ability to generate new ideas (creativity).
GC14	Ability to act on the basis of ethical considerations (motives).
GC 15	Ability to defend your point of view without destroying relationships.
GC16	Appreciation and respect for diversity and multiculturalism.
GC17	Ability to work in an international context.
GC18	Ability to make decisions and act in accordance with the principles of inadmissibility of corruption and manifestations of dishonesty.
GC19	Desire for personal and professional self-development, ability to prioritize, set personal goals, ability to learn from your own experience and the experience of others.
GC20	Ability to critically assess personal strengths and weaknesses, and to respond constructively to criticism directed at yourself.

As we can see, most of 20 general competencies presented that must be formed in a bachelor's graduate who studied under this program, can undoubtedly be attributed to research competence (GC3, GC4, GC5, GC6, GC7, GC9, GC10, GC12, GC 13, GC 18, GC 19, GC 20).

So, based on the analysis, it is possible to determine the leading functions of research competence: personal-developmental (development of cognitive processes, motivation, mastering methods of intellectual self-development and self-improvement of future specialists); scientific-methodological (formation of a holistic view of the modern scientific picture of the world, mastering methods of scientific cognition,

forming a scientific style of thinking); cultural (entry into the world of culture of the scientific community, involvement in the culture of research activity, in the broad socio-cultural context of the development of modern science and technology); value-oriented (the ability to realize the value of one's own research activity as a condition for realizing personal meaning in learning).

6.3 PRINCIPLES AND PEDAGOGICAL CONDITIONS FOR THE FORMATION OF STUDENTS' RESEARCH COMPETENCE

While gaining knowledge in the educational process, students of higher education institutions repeatedly encounter the research environment, therefore, the presence of research competence is undoubtedly significant for them. Writing essays, completing test, laboratory, coursework, diploma projects, scientific works are some of the options for research activity, during which the student learns to clearly see the research problem, analyzes the known and unknown, and puts forward his/her subjective hypothesis on the basis of the analysis regarding the solution of a certain problem and justifies it.

In the process of learning, the student needs to create conditions for the further formation and support of the research competence development. We consider it necessary to highlight the main principles that are basic for the formation of research competence. These are the principles of systematicity, modularity, professional orientation and creative activity. In accordance with the principle of systematicity, the educational material must be complete and sufficient, and the structuring of the content into component parts must be carried out taking into account the relationships between them. It is also necessary that the content of the development of students' research competence be integrated with the content of various disciplines of the curriculum, developed taking into account the relevant inter-subject relationships. The principle of modularity involves the division of educational material into relatively independent, logically completed structural parts, taking into account the relationships between them, as well as supplementing it with methodological recommendations for mastering the content, aimed at activating students' independent work. The principle of professional orientation recognizes the need to give preference to material that reveals the role of research activity in the future profession and can be implemented in conditions close to professional research activity in the professional sphere. According to the principle of creative activity, the selection of educational material that creates a field for dynamic educational activity and stimulates creative thinking should be aimed at supporting and developing subjectivity in students, as well as teaching them to successfully overcome situations of uncertainty in the course of research activity.

These principles can be effectively implemented through the creation of certain pedagogical conditions that contribute to the effective course of the process of scientific and research activity of students from the standpoint of communication, interactions and interpersonal perception. When creating conditions for the successful organization of scientific and research activities, we consider it necessary to select educational technologies focused on students' research activities and take into account an interdisciplinary approach in the implementation of tasks of searching, processing and synthesizing scientific material in co-creation with fellow students and teachers. It is also important for students to constantly focus on

understanding the importance of developing their creative potential, forming research qualities of a person who is able to understand the problem, formulate it and find ways to solve it [11], which can be done by activating students' research activities through their participation in practice-oriented and interdisciplinary projects, competitions, the work of creative laboratories, student scientific and practical conferences, research and experimental sites of general educational institutions, etc. The formation of students' research competence will be facilitated by the creation of appropriate educational and methodological support and the development of an adequate assessment system. We consider it relevant to introduce the discipline "Fundamentals of Students' Educational and Research Activities" into the educational process, within the framework of which students will have the opportunity to master the technology of organizing and conducting scientific research, learn to generalize the experience of experimental work, as well as create an information portal on the organization of students' educational and research activities on the website of the educational institution.

Among the pedagogical conditions for the formation of students' research competence, it is necessary to highlight the solution of problem tasks and situations that contribute to the development of research skills, critical thinking, and creative intuition. O. Bida, Syroezhko, K. Shovsh emphasize the need to integrate elements of research activity into the content of academic disciplines and to activate students' cognitive activity through problem-based research tasks [12]. The content of training should include such possible methods of scientific and creative activity as independent transfer of previously acquired knowledge and skills to a new situation, identification of a new problem in a familiar situation or in a new function of an object, identification of alternative solutions to the problem, combination of previously known methods in order to create new ones.

According to M. Yevtukh and L. Borysenko, achieving optimality in the organization of scientific and research activities is facilitated by observing the following conditions: ensuring the integrity of the future specialist's formation as a researcher during professional training, systematic mastery of the independent research activity components, filling the educational process with a personally valuable meaning for each student; using the potential of the educational disciplines of the psychological and pedagogical cycle, preparing scientific works in the direction of creating a cognitive and creative atmosphere, in which the student actively develops and implements original research ideas, projects, shows research initiative and perseverance; implementing pedagogical strategies aimed at long-term prospective research, covering the material of several content modules and providing for a multi-faceted study of a certain problem, mutual coordination of experimental means, and gradual complication of scientific tasks [13].

An important condition for the formation of students' research competence is the creation of an educational and reflective environment in the educational process of higher education institutions, which will contribute to the development of the individual, self-correction and self-improvement of his/her professional socio-psychological resources. Such an innovative educational environment expands the cognitive capabilities of the educational space, ensures freedom of scientific creativity, creates conditions for changing ideas about oneself as a person and a future professional.

In the educational process of Ukrainian higher education institutions, the main way to solve the problem of forming students' research competence is traditionally their own research activity. It should be noted

that in higher education in Ukraine, students' research as an independent type of their educational activity is carried out to varying degrees in combination with other types of their theoretical and practical training. This work of students reflects the main features of professional research activity: it is a creative process, during which valuable scientific knowledge is born or new facets of already known information are revealed.

Pedagogical science has accumulated rich experience in using various technologies in the educational process. Let us consider those of them that, in our opinion, contribute to the development of research skills and involve students in research activities. Modular learning technology provides individualization of learning in terms of such parameters as the content of learning, the pace of knowledge acquisition, the level of independence, methods and techniques of learning, methods of control and self-control. The learning mechanism within such a program consists of search methods, setting cognitive tasks. Within the framework of modular technology, the student works mainly independently, learning goal-setting, self-planning, self-organization and self-control. Within the framework of this technology, students successfully develop the ability to independently acquire their own knowledge and creatively apply it in practice, as well as the ability to search, select, process, analyze and transmit information.

The use of project learning technologies, which is based on theoretical ideas about the essence and content of research competence, the internal capabilities of this technology, the conditions for its combination with the requirements of problem-based modular, concentrated learning technologies, provides for the consistent complication of projects, an increase in the level of productivity of the dominant activity, an increase in the specific weight and interdisciplinary nature of students' independent project activity, and immersion of students in situations that are as close as possible to the real conditions of professional activity, has proven effective in the work on the formation of students' research competence. Project technology is widely used in educational practice and successfully contributes to the inclusion of students in research activities. This technology is focused on the independent acquisition and application of new knowledge, skills, value orientations and relationships. The use of project technologies involves the consistent students' implementation of projects of three levels in the learning process: small mini-projects (for example, solving traditional educational tasks with practical content) of the first level, corresponding to situational activity, focused on the formation of positive motivation for research activity, the accumulation of primary experience; medium-sized projects of the second level (midi-projects), corresponding to the situational activity of the individual (for example, preparation of practice-oriented essays, reports, game modeling of professional activity, etc.); large educational projects (maxi-projects) of the third level, corresponding to the creative activity of the individual (for example, course and diploma theses). It is important in the process of implementing this activity that teachers constantly monitor the levels of formation of students' research competence.

Successful formation of research competence is possible if interdisciplinary approaches to learning are used. Students should be able to interact with different fields of knowledge, carry out joint projects with other specialties, which will not only develop their research activity, but also contribute to the emergence of new scientific ideas. The creation of project groups, where students have the opportunity to work on real scientific or social problems, gaining experience in teamwork and acquiring practical skills for solving specific tasks [14].

The technology of problem-based learning is aimed at building an educational process, the purpose of which is not only to master the results of scientific knowledge and the system of knowledge, but also to master the process of obtaining these results, the formation of the student's cognitive independence, the development of creative abilities. Problem-based learning ensures the formation of theoretical (intellectual) skills — analysis and synthesis, induction and deduction, comparison and juxtaposition, abstraction and concretization, classification and systematization, analogy and generalization, theoretical modeling and reflection.

Portfolio technology is a technology that can be used as the basis of a student's individual learning path. In the educational process, a portfolio is used as a way for students to accumulate, systematize, and generalize various educational materials. This technology contributes to the development of students' information skills, and also acts as a motivational factor for educational and research activities.

Interactive technologies involve building a research process through constant, active interaction of all students who successfully form a complex of communicative skills, participate in scientific dialogue, debates, and discussions.

Practical work experience provides an opportunity to determine the conditions for the formation of students' research competence by applying innovative learning technologies, which contributes to the implementation of important principles of learning: problem-based, scientific, professional orientation, and self-study. As common methods and means of innovative technologies, we will name discussion, brainstorming, training, role and business games, case method, presentation, project method, problem-based learning methods, etc. The value of these methods lies in the fact that they activate and actualize a certain set of knowledge that students need to master in solving scientific and educational problems, which is an effective tool for forming the research competence of future specialists.

The urgent need to involve students in scientific activity, to form and develop their research competence skills direct teachers to find ways to solve this problem using the disciplines they teach.

To develop the research competence of students, it is important to provide appropriate conditions for their study and work with scientific literature, research methods and techniques, to involve students in scientific activity, to provide them with the opportunity to participate in scientific conferences and other scientific events, to promote the creation of research and project groups.

An effective motivating factor is the creation of incentives for research by the management of higher education institutions: scholarships for scientific achievements, competitions, grants, awards, publications in student collections. This forms an awareness of the value of scientific work and increases students' self-esteem.

Specifying the teaching technologies, we can distinguish teaching methods in accordance with the previously identified components of research competence, which are reflected in **Table 6.2**.

Despite the huge potential, the formation of research competence faces a number of barriers, in particular, overloading of curricula (students do not have time for scientific activity); lack of methodological support for teachers and students regarding scientific practices; formalism in approaches to term papers and diploma works; insufficient access to high-quality sources of information due to database limitations or language barrier. Personal difficulties should also be taken into account, such as, for example, fear of

error or criticism; low self-esteem; low level of academic writing, etc. Overcoming these barriers is possible thanks to a holistic policy of HEIs, the creation of a supportive educational environment.

Table 6.2 Teaching methods in accordance with the components of students' research competence

Research competence component	Method	Method concretization
Motivational-value	Training programs, game-based learning, modular learning	Training to increase personal motivation to achieve the goal; independent cognitive activity aimed at searching, processing and assimilating information, involvement in creative activity
Cognitive –activity	business games, role-playing games, cases, interactive methods, research and project-based learning, analytical work, participation in conferences, etc.	Debates, round tables, brainstorming, professional cases, which contribute to the development of critical thinking, the ability to raise new issues, develop various arguments, make independent thoughtful decisions. Work with scientific texts, articles. Collection and analysis of information, description, generalization, writing scientific articles in conjunction with the scientific supervisor
Personal-reflective	Description of your achievements and options for developing your own career	Compilation of a portfolio, personal career plan

6.4 INNOVATIVE EDUCATIONAL ENVIRONMENT OF HEIS AS THE MOST EFFECTIVE SPACE FOR THE STUDENTS' RESEARCH COMPETENCE FORMATION

Along with the high importance of the formation of research competence in students, it is necessary to create an educational environment that would support the development of research skills in them. This path involves organizing the educational process in such a way that students are included in various types of activities and communication with the aim not only of forming knowledge and skills, but also of gaining experience in conducting research activities, communication experience, independent problem solving, etc. Involving students in productive activities as active participants in solving problems, performing research tasks and projects is a necessary condition for the formation of their research experience as a characteristic feature of research competence.

The modern development of science and technology, the digitalization of education, the challenges of globalization and the orientation towards European standards of higher education lead to the transformation of the traditional educational space. The integration of artificial intelligence (AI) into the educational process creates unique opportunities for the development of critical thinking, analytical abilities and research skills. A new type of environment is emerging — an innovative educational environment of higher education, which not only ensures the educational process, but also stimulates the development of creativity, initiative, independence, and activity in achieving the goal in students.

HEIs strive for partnerships with IT companies, industries, and startups, which allows students to conduct research focused on the real needs of society. This makes research activities meaningful and applied. Students can choose educational trajectories, disciplines, and research topics. The opportunity to participate in Erasmus+ programs, double diplomas, and international internships enhances their research potential.

An innovative educational environment is a set of content, forms, methods, and learning tools based on the transfer of achievements of modern science and technology into the educational process of HEIs and aimed at forming innovative personalities of students capable of making creative decisions in the professional field. The innovative educational environment of a modern higher education institution is a product of subject-subject relations of all participants in the educational process and is based on the innovative content of education, reflected in the author's educational programs and individual educational trajectories of students, on innovative educational technologies based on a transdisciplinary approach, interactive teaching methods and tutoring, on new forms of educational environment management based on continuous monitoring and regulation of hazards affecting the quality of education in HEIs

This environment can be presented as a set of material and technical, informational, organizational, pedagogical and value-cultural conditions, a complex system that necessarily includes digital resources (EIOS, online courses, electronic libraries), modern innovative technologies (ICT, multimedia), developed infrastructure that creates conditions for the development of students' creative thinking, their self-development, integration of science and practice, as well as the formation of students' readiness for innovative activity. An innovative educational environment provides students with free access to educational and scientific resources, supports interdisciplinary connections, functions in the logic of openness, mobility, academic integrity, actively uses digital technologies. This creates conditions for free scientific research, the development of reflection and critical thinking.

Platforms, such as Moodle, Google Classroom, Canvas, Zoom, etc., are actively implemented in the innovative educational environment of modern Ukrainian HEIs, hybrid and distance learning is used. Such technologies allow integrating analytical tasks, test models of research, and simulations into classes [15]. Working with databases (Scopus, Web of Science), using online questionnaires (Google Forms, SurveyMonkey), analytics (SPSS, Excel, Tableau), and visualizations (Canva, MindMeister) should be systematic [16]. Digital tools help to effectively collect, analyze, and present data. Effective mentoring involves not only consulting on coursework or thesis papers, but also supporting the student's research development throughout the entire period of study: from the idea to its implementation, publication, and participation in grants. This creates a sense of involvement in the student's academic community.

Undoubtedly, the integration of AI tools into the educational process increases the effectiveness of the research skills formation compared to traditional methods, but it is necessary to remember that this growth is accompanied by such new challenges as the risk of forming a superficial understanding of research procedures, excessive use of AI in writing scientific papers, the presence of false, fabricated AI information in the data.

Today, digital technologies have become an integral part of education. Especially, various online tools, simulations and virtual experiments are widely used in higher education institutions to increase the research potential of students and their orientation to independent research. These methodological approaches not only equip students with theoretical knowledge, but also develop their practical and analytical

thinking. Virtual laboratories (platforms, such as PhET, Labster and PraxiLabs) allow students to safely conduct scientific experiments. In such laboratories, students visually observe scientific phenomena, study the experimental model and analyze the results. Using digital simulation, students have the opportunity to virtually recreate real-world processes. Using online platforms, such as Google Classroom, Padlet, Miro, and ResearchGate, students participate in scientific projects, share experimental results, and develop critical thinking skills. Using ChatGPT, Scite.ai, and other AI-based tools, students apply modern approaches to information analysis, scientific research, and more.

6.5 ANALYSIS OF THE RESULTS OF THE IMPLEMENTATION OF PEDAGOGICAL CONDITIONS FOR THE STUDENTS' RESEARCH COMPETENCE FORMATION IN THE HEI INNOVATIVE EDUCATIONAL ENVIRONMENT

The implementation of the proposed pedagogical conditions for the formation of HEI students' research competence in the empirical study conducted by us on the basis of the Kharkiv National Automobile and Highway University during 2022—2025 demonstrated the following results.

The total number of participants (CG — 88 students, and EG — 86 students) was 174 people. The participants of the experiment were informed about the study and the opportunity to refuse to participate in the experiment without any consequences for their education, and they gave their consent. To verify the results of the formation of students' research competence, we conducted a comparative analysis with their testing at the beginning of their studies in the 1st year (2022—2023 academic year).

The analysis showed that before the experimental work, the formation level of research competence in the control and experimental groups did not have significant differences (**Table 6.3**).

Table 6.3 Indicators of the research competence formation level in students of the CG and EG (before the experiment)

Competence component	Level of research competence formation					
	Low		Sufficient		High	
	CG	EG	CG	EG	CG	EG
Motivational-value	57.9% (51 st.)	60.5% (52 st.)	36.4% (32 st.)	34.9% (30 st.)	5.7% (5 st.)	4.6% (4 st.)
Cognitive-activity	61.4% (54 st.)	62.8% (54 st.)	31.8% (28 st.)	31.4% (27 st.)	6.8% (6 st.)	5.8% (5 st.)
Personal-reflective	61.4% (54 st.)	61.6% (53 st.)	32.9% (29 st.)	32.6% (28 st.)	5.7% (5 st.)	5.8% (5 st.)

The data obtained after the experiment allow us to state the positive impact of the innovative educational environment, where the selection of educational technologies focused on the research activities of students, an interdisciplinary approach to the implementation of the tasks of searching, processing and

synthesizing scientific material, the integration of elements of research activity into the content of academic disciplines and the activation of students' cognitive activity through problem-based research tasks were carried out, students' participation in research practice-oriented projects, scientific and practical conferences was ensured, the discipline "Fundamentals of students' educational and research activities" was introduced into the educational process, assistance was organized to form a holistic formation of a future specialist as a researcher during his/her professional training, etc. (**Table 6.4**).

Table 6.4 Indicators of the research competence formation level in CG and EG students (after the experiment)

Competence component	Level of research competence formation					
	Low		Sufficient		High	
	CG	CG	CG	CG	CG	CG
Motivational-value	44.3% (39 st.)	18.6% (16 st.)	45.5% (40 st.)	60.5% (52 st.)	10.2% (9 st.)	20.9% (18 st.)
Cognitive-activity	34.1% (30 st.)	18.6% (16 st.)	53.4% (47 st.)	54.7% (47 st.)	12.5% (11 st.)	26.7% (23 st.)
Personal-reflective	45.4% (40 st.)	15.2% (13 st.)	43.2% (38 st.)	59.3% (51 st.)	11.4% (10 st.)	25.5% (22 st.)

Thus, the study yielded the following results: the number of students who are at a high level of research competence formation increased in the experimental and control groups, respectively (differences are statistically significant): according to the criterion of the motivational-value component – by 16.3% in the EG and 4.5% in the CG; according to the criterion of the cognitive-activity component – by 20.9% in the EG and 5.7% in the CG; according to the criterion of the personal-reflective component – by 19.7% in the EG and 5.7% in the CG. The number of students who have a sufficient formation level of this competence increased, according to the criterion of the motivational-value component, by 25.6% in the EG and 9.1% in the CG; according to the criterion of the cognitive-activity component – by 23.3% in the EG and 21.6% in the CG; by the criterion of the personal-reflective component – by 26.7% in the EG and 10.3% in the CG. The number of students with a low formation level of this competence decreased by the criterion of the motivational-value component by 41.9% in the EG and 13.6% in the CG; by the criterion of the cognitive-activity component – by 44.2% in the EG and 27.3% in the CG; by the criterion of the personal-reflective component – by 46.4% in the EG and 16.0% in the CG.

The analysis and interpretation of the results of our experimental study proved the effectiveness of the pedagogical conditions implementation and the use of the proposed methods for the formation of research competence in students in the conditions of the HEI innovative educational environment. The indicator of the research competence formation level had statistically significant differences between the groups after the experiment at $p < 0.05$.

It can be concluded that the results of the empirical part of the study confirmed the correctness of our theoretical consideration of the problem of forming students' research competence, and the proposed

pedagogical conditions and methods of their implementation in the HEI innovative educational environment.

6.6 DISCUSSION OF THE STUDY RESULTS

The conducted study allows us to state that the formation of research competence has not only academic, but also professional significance, since it ensures the student's readiness to participate in innovative projects, allows him/her to work effectively with large amounts of information, develops such emotional and volitional qualities as perseverance, self-discipline, responsibility in him/her, and also increases the competitiveness of the graduate in the labor market.

In our opinion, competence in the field of scientific research can be defined as an integral, unalienable characteristic of the personality of a future specialist of any profile. Research competence is a set of personal qualities that involves the possession of research knowledge and skills. We include three components in the structure of research competence: motivational-value, cognitive-activity, and personal-reflective.

Summarizing the theoretical analysis of scientific sources, we have identified pedagogical conditions and specific technologies and teaching methods that, when implemented into the educational process of the innovative educational environment of higher education institutions, will contribute to the development of students' research competence. Carrying out research activities under the conditions we have defined activates students' awareness of their own position, forms skills of discussion, argumentation, tolerant exchange of opinions, develops a scientific worldview, systems thinking, information analysis skills, promotes the development of leadership qualities (preparation and management of projects, participation in conferences, management of research groups), civic activity (through volunteer initiatives, analytics of social processes), ethical responsibility (observance of academic integrity, scientific ethics), etc.

The prospects of scientific research are to reveal the pedagogical potential of the innovative educational space of higher education institutions in the digital environment for the formation of students' research competence through the organization of systematic work in the digital environment based on cloud, mobile technologies, online courses and global resources of the Internet space; the inclusion of independent research activities based on digital environment resources (scientific portals, online courses, etc.) in the personal educational experience of students, etc.

REFERENCES

1. Nykorak, Ya. (2017). Scientific and research competence of future teachers of humanitarian subjects: functional and content aspect. Mountain School of Ukrainian Carpaty, 17 (1). https://doi.org/10.15330/msuc.2017.17.199-204
2. Popadych, O. O. (2017). Research-based learning as a means of forming production functions for future higher education teachers. Naukovyi visnyk Uzhhorodskoho, universytetu: "Pedahohika. Sotsialna robota", 1 (40), 223—226. Available at: https://dspace.uzhnu.edu.ua/jspui/handle/lib/15277

3. Holovan, M. S. (2012). Model formuvannia doslidnytskoi kompetentnosti maibutnikh fakhivtsiv u protsesi profesiinoi pidhotovky. Pedahohichni nauky: teoriia, istoriia, innovatsiini tekhnolohii, 5 (23), 196–205.
4. Bondarenko, L. (2017). Diagnostics of Formation of Research Competence of Future Teachers of Higher Educational Institutions. Visnyk Luhanskoho natsionalnoho universytetu imeni Tarasa Shevchenka. Pedahohichni nauky, 7 (312), 11–18.
5. Momot, O., Khomenko, P., Zaitseva, Yu. (2025). Formation of scientific and research competence of students. Pedahohichna Akademiia: naukovi zapysky, 18. https://doi.org/10.5281/zenodo.15455730
6. Vysochan, L., Yudenkova, O., Kapranov, Ya. (2023). Formation of research competence of students of higher education institutions. Pedagogy of the Formation of a Creative Person in Higher and Secondary Schools, 87, 110–113. https://doi.org/10.32840/1992-5786.2023.87.19
7. Burke, L. E., Schlenk, E. A., Sereika, S. M., Cohen, S. M., Happ, M. B., Dorman, J. S. (2005). Developing Research Competence to Support Evidence-Based Practice. Journal of Professional Nursing, 21 (6), 358–363. https://doi.org/10.1016/j.profnurs.2005.10.011
8. Wester, K. L., Borders, L. D. (2014). Research Competencies in Counseling: A Delphi Study. Journal of Counseling & Development, 92 (4), 447–458. https://doi.org/10.1002/j.1556-6676.2014.00171.x
9. Agricola, B. T., Prins, F. J., van der Schaaf, M. F., van Tartwijk, J. (2018). Teachers' diagnosis of students' research skills during the mentoring of the undergraduate thesis. Mentoring & Tutoring: Partnership in Learning, 26 (5), 542–562. https://doi.org/10.1080/13611267.2018.1561015
10. Paricahua, E. W. P. et al. (2022). Research Competencies: A Comparative Study in Public and Private Universities. Eurasian Journal of Educational Research, 99 (99), 297–312.
11. Kozarenko, O. M. (2019). Evaluation criteria for research work of students in a foreign language and the principles of their development. XLinguae, 12 (2), 195–209. https://doi.org/10.18355/xl.2019.12.02.16
12. Bida, O., Syroiezhko, O., Shovsh, K. (2022). The role of research competence in the training of future specialists. Academic Notes Series Pedagogical Science, 1 (206), 12–17. https://doi.org/10.36550/2415-7988-2022-1-206-12-17
13. Ievtukh, M. B., Borysenko, L. L. (2012). Naukovo-praktychni pidkhody do problemy formuvannia naukovo-doslidnytskoi kompetentnosti maibutnikh ekonomistiv. Dukhovnist osobystosti: metodolohiia, teoriia i praktyka, 5 (48), 42–51.
14. Slodynytska, Yu. R. (2025). Formation of scientific and research competence of higher education students in an innovative university environment. Akademichni vizii, 42. Available at: https://www.academy-vision.org/index.php/av/article/view/1877
15. Prykhodko, S., Riazantseva, D., Uvarova, T., Borysova, A., Alekseenko, T.; Kholodov, A., Levchenko, I. (Eds.) (2023). Multimedia technologies in teaching the Ukrainian language as a foreign language. Problems and prospects of training in higher school: pedagogical, philological, psychological and intercultural aspects. Kharkiv: TECHNOLOGY CENTER PC, 50–68. https://doi.org/10.15587/978-617-7319-94-7.ch4
16. Opryshko, N., Horobets, A., Tsypniatova, I., Shcherbakov, Y., Aizikova, L. (2025). Comprehensive assessment of CALL technologies for language instruction at higher education institutions. Eduweb, 19 (3), 328–341. https://doi.org/10.46502/issn.1856-7576/2025.19.03.21