

THEORETICAL AND METHODOLOGICAL ASPECTS OF PREPARING FOR SCIENTIFIC RESEARCH ACTIVITIES

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Abstract. *In the modern world, advancing science, overcoming challenges in education and research requires reforming higher education. This article discusses the requirements for the content and structure of students' research activities in the field of pedagogy. It highlights the importance of a scientific-theoretical approach to the educational process when guiding students in their research work.*

Keywords: *science, education, higher education, theoretical knowledge, empirical research, hypothesis, problem, fact, inquiry, development, scientific research.*

Аннотация. *В современном мире развитие науки, преодоление проблем в сфере образования и научных исследований требуют реформирования системы высшего образования. В данной статье рассматриваются требования к содержанию и структуре исследовательской деятельности студентов в области педагогики. Подчеркивается важность научно-теоретического подхода к образовательному процессу при организации и руководстве научно-исследовательской работой студентов.*

Ключевые слова: *наука, образование, высшее образование, теоретические знания, эмпирическое исследование, гипотеза, проблема, факт, исследование, развитие, научное исследование.*

Abstract. *In the modern world, the advancement of science and the resolution of challenges in education and research require reforms in higher education. This article examines the requirements for the content and structure of students' research activities in the field of pedagogy. It emphasizes the significance of a scientific and theoretical approach to the educational process in guiding students' research work.*

Keywords: *science, education, higher education, theoretical knowledge, empirical research, hypothesis, problem, fact, inquiry, development, scientific research.*

Introduction. One of the most important aspects of scientific work is that each student should be able to choose a research topic based on their own interests, abilities, and capabilities, as well as to select and collect facts and information from relevant literature and other sources, and organize them systematically. It is crucial for a researcher to gather scientific facts and information carefully and patiently, to study them thoroughly, and to compare and analyze them.

A.N. Ogurtsov, in his textbook “Основы научных исследований”, states that “Scientific (research) activity is an activity aimed at acquiring and applying new knowledge.” Furthermore, he emphasizes that “Scientific research is a goal-oriented activity aimed at comprehensively studying an object, process, or phenomenon, including its structure and relationships, obtaining results beneficial to humans, and applying them in practice. Its object may be a material or ideal system, while its subject is the system's

structure, the interaction of its elements, various characteristics, laws of development, and so on" [1, p. 8].

Before starting to write a scientific work, it is important to thoroughly study all sources related to the topic, collect scientific facts and information, organize, classify, and analyze them in depth. Only after this can a plan reflecting the content of the topic be developed, and this plan is provisional, allowing for adjustments during the writing process. In this way, research experience is accumulated, and relevant skills and competencies are developed.

Literature analysis and methodology. In higher education institutions, students' scientific research works, in turn, require them to acquire deep and solid knowledge. Without independent and thorough knowledge, it is impossible to approach practical tasks creatively or to successfully carry out educational research and scientific research work. For any state to compete with developed countries of the world in social production and cultural-educational spheres, labor must be organized on a scientific basis.

A.N. Ogurtsov studied the specific and interrelated aspects of theoretical and empirical knowledge in guiding students toward scientific research; M. Ochilov and N. Ochilov examined that in higher education, students' research work is primarily carried out in professional pedagogical and educational-training directions; and B. Xodjayev, A. Choriyev, and Z. Saliyeva explored the importance of motivational and creative orientation in teachers for developing scientific research potential [1], [2], [5].

Research Methodology The article analyzes the stages of guiding students toward scientific research, the study and analysis of the forms and methods of research, the types of scientific research in the field of science according to the normative-legal framework, the forms of scientific research based on its duration, and emphasizes that the presence of a need for and ability in motivational and creative orientation among teachers is the basis for the effective organization of research activities.

Analysis and results. In higher education institutions, each academic subject has, to a certain extent, the potential to form and develop research skills. Particular attention should be paid to this issue not only in general education subjects, but also in general professional, specialized, and pedagogical disciplines. Specialized subjects are closer to real production conditions, and organizing the teaching process together with elements of research largely prepares students for active participation in modern production.

In higher education, students' scientific research activities are mainly carried out in professional-pedagogical and educational directions. In this process, the following tasks are implemented:

- to develop students' interest in research activities and creative inquiry, and to form skills of applying a scientific approach to educational work;
- to develop research skills and competencies during the study of specialized and other academic disciplines;

- to enhance the ability and skills to study and analyze literature and other scientific sources;
- to acquire skills and competencies to identify problems in educational processes with learners, as well as in specialized subject areas, and to conduct scientific research in these fields;
- to learn scientific research methods and apply them in practice.

Students' scientific research activities are organized in two directions: the first is research activities related to academic classes, that is, educational research work;

the second is scientific research activities related to the research areas of departments.

[2, p. 102]

The following are included in research activities related to academic classes:

- studying and critically analyzing scientific literature and sources, internet information, works of domestic and foreign scholars, as well as literature on the methodology and methods of scientific research;
- collecting and preparing experimental and practical materials for practical classes in academic subjects;
- research activities related to preparation for and performance of laboratory classes;
- educational research work related to the study of special courses and seminars;
- preparing abstracts, reports, and lecture texts based on collected research materials;
- conducting individual and group research activities based on academic tasks during pedagogical, industrial, and field practices, as well as during educational expeditions.

The following are included in students' scientific research activities related to the research directions of departments:

- students' work in scientific (subject) clubs. In these clubs, students learn how to select research topics, compile bibliographies, study methods of scientific cognition and research methods, prepare scientific reports and presentations based on literature, internet, and other sources, present their own research findings, and participate in discussions and debates on scientific problems;
- participation in scientific research conducted by department teachers and senior researchers, as well as in research projects carried out by enterprises and scientific-methodological institutions within the public education system;
- participation in archaeological, ethnographic, and other expeditions organized by scientific research institutions;
- participation in design bureau activities and in research projects conducted on the basis of grants and contracts;

- designing instruments, creating technical teaching aids and visual materials, and studying the scientific organization of labor in collective enterprises and educational institutions;
- participation in competitions and olympiads based on the results of their own scientific research;
- preparation and defense of qualification graduation works and master's theses, as well as preparation and publication of scientific articles and monographs, and other related activities.

Based on the above, a foundation is created for the development of students' scientific research activities.

A.N. Ogurtsov, in his textbook "ОСНОВЫ НАУЧНЫХ ИССЛЕДОВАНИЙ", classifies scientific research according to its duration into long-term, short-term, and rapid research. He also distinguishes types of research based on their forms and methods, including experimental, methodological, descriptive, experimental-analytical, historical, and biographical research, as well as mixed types of research.

In normative-legal documents, scientific research in the field of science is classified according to its purpose into fundamental, applied, exploratory, and developmental research. [1, p. 8]

Fundamental scientific research is experimental or theoretical activity aimed at acquiring new knowledge about the fundamental laws of structure, functioning, and development of humans, society, and the natural environment. For example, research on the laws governing the functioning of biological systems and their interaction with each other and with the environment can be classified as fundamental.

Applied scientific research is primarily aimed at applying new knowledge to achieve practical goals and solve specific problems. In other words, it focuses on addressing issues related to the application of scientific knowledge obtained through fundamental research in practical human activities.

Exploratory research is defined as scientific research aimed at identifying prospects for working on a topic and finding ways to solve scientific problems.

Development is a goal-oriented activity aimed at implementing the results of specific fundamental and applied research into practice.

In the theory of knowledge, there are two levels of research: theoretical and empirical.

At the theoretical level of research, logical methods of cognition predominate. At this level, facts obtained through logical concepts, conclusions, laws, and other forms of thinking are examined and processed.

Here, the studied objects are analyzed intellectually, generalized, and their essence, internal relationships, and laws of development are understood. At this level, cognition through the senses (empirical) is also present.

The structural components of theoretical knowledge include the problem, hypothesis, and theory.

A **problem** is a complex theoretical or practical task whose solutions are unknown or not fully known.

Underdeveloped problems are characterized by the following features:

1. they arise on the basis of a certain theory or concept;
2. they involve non-standard and complex tasks;
3. their solution is aimed at resolving contradictions in knowledge;
4. the ways of solving the problem are unknown.

For developed problems, there are more or less specific guidelines for their solution.

A **hypothesis** is something that requires verification and proof. It is understood as an assumption about the cause that produces a certain effect, about the structure of the studied objects, and the nature of internal and external relationships of structural elements.

A scientific hypothesis has the following characteristic features:

1. relevance and consistency with facts;
2. testability through experience, observation, or comparison with experimental data (except for non-testable hypotheses);
3. consistency with existing scientific knowledge;
4. explanatory power — the hypothesis should allow deriving a certain number of facts and results that confirm it; the greater the explanatory power, the more valuable the hypothesis;
5. simplicity — the hypothesis should not contain arbitrary assumptions or subjective elements.

There are descriptive, explanatory, and predictive hypotheses.

A **descriptive hypothesis** is an assumption about the properties of objects and the nature of relationships between their individual elements.

An **explanatory hypothesis** is an assumption about cause-and-effect relationships.

A **predictive hypothesis** is an assumption about trends and the laws of development of the studied object.

A **theory** is logically organized knowledge, a system of knowledge that adequately and comprehensively reflects a particular area of reality. It has the following characteristics:

1. theory is one of the forms of rational cognition, a product of intellectual activity;
2. theory is an integral system of reliable knowledge;
3. theory not only describes a set of facts, but also explains them, reveals the origin and development of phenomena, and studies processes along with their internal and external relationships;
4. all provisions and conclusions presented in the theory are substantiated and proven.

Theories are classified according to the subject of research. There are social, mathematical, physical, chemical, psychological, ethical, and other types of theories. In modern scientific methodology, the following structural elements of a theory are distinguished:

1. initial foundations — concepts, laws, axioms, principles, etc.;
2. an idealized object — a theoretical model representing certain aspects, essential features, and relationships of the studied phenomena and objects;
3. the logic of the theory — a set of certain rules and methods of reasoning;
4. philosophical views and social values;
5. a system of laws and principles obtained as a result of the theory.

The structure of a theory is composed of concepts, judgments, laws, scientific positions, doctrines, ideas, and other elements.

A **concept** is a thought that reflects the essential and necessary properties of a certain set of objects or phenomena.

A **category** is a general, fundamental concept that reflects the most important properties and relationships of objects and phenomena. Categories can be philosophical, general scientific, or related to a specific field of study.

A **scientific term** is a word or combination of words that denotes a concept used in a particular field of science. The set of terms used constitutes the conceptual apparatus of the respective discipline.

A **judgment** is a thought that affirms or denies something.

A **principle** is the basic starting point or leading idea of a theory. Principles can be theoretical and methodological.

An **axiom** is a position or starting point that cannot be proven, from which other rules are derived according to established norms.

A **law** is an essential, internal, necessary, and stable connection between phenomena and processes.

A **concept** (in the sense of a conceptual framework) is a system of theoretical views combined with a scientific idea. Theoretical concepts define the existence and content of legal norms and institutions.

The **empirical level of research** is characterized by the predominance of sensory knowledge (studying the external world through the senses). At this level, forms of theoretical knowledge exist, but they have a subordinate meaning.

The interaction between the empirical and theoretical levels of research consists of the following:

1. A collection of facts or assumptions forms the practical basis of a theory;
2. Facts can support or refute a theory;
3. Scientific facts are always integrated with a theory, because they cannot be formed without a system of concepts or interpreted without theoretical ideas;

4. In modern science, empirical research is predetermined and guided by theory. The structure of empirical research consists of facts, empirical generalizations, and laws (connections).

The concept of a “**fact**” is used in several senses:

1. An objective event, a result related to a purpose, reality (a fact of reality), or a truth in the domain of consciousness and knowledge;
2. A verified event demonstrating the reliability of knowledge about a phenomenon;
3. A statement encompassing knowledge obtained through observation and experiments.

Empirical generalization is a system of specific scientific facts.

Empirical laws reflect regularities in phenomena and the stability of relationships between observed events. These laws are not theoretical knowledge. Unlike theoretical laws that reveal the essential connections of truth, empirical laws reflect relationships at a superficial level.

Based on the theoretical information reviewed above, when conducting research activities, it is important to pay attention to the research tasks presented by Roziqova L.T. in her monograph *Talabalarda tadqiqotchilik ko‘nikmalarini shakllantirish va rivojlantirishning ilmiy-pedagogik asoslari*, as these tasks should require the completion of all stages of the research process. Therefore, it is appropriate to consider the following tasks: Observing and studying evidence and phenomena.

1. Identifying unknown phenomena that need to be investigated (formulating the problem).
2. Proposing a hypothesis (assumption).
3. Developing a research plan.
4. Implementing the plan by determining the relationships between the studied processes and other phenomena.
5. Verifying the solution.
6. Forming practical conclusions regarding the applicability and necessity of the acquired knowledge. [4, p. 24]

Additionally, in the article *Структура и содержание научно-исследовательской деятельности студентов* the authors, based on accumulated practical experience, emphasize that the integration of scientific research and educational work in higher education is a guarantee of the successful development of science and education. They highlight the following points:

- Increasing students’ interest in learning new things;
- Ensuring maximum participation of students in scientific research activities;
- Revealing the potential of students as future scientists by obtaining their own results in line with the modern pace of global development;

- Attracting talented and highly capable young individuals to the field of education, thereby contributing to the advancement of society to a new intellectual level.

Based on the above, it is concluded that there is a need to improve the existing system for involving students in scientific activities, further develop the work of scientific circles and young scientists' councils, and expand programs to support talented youth. [3, p. 46]

In the textbook *Pedagogik tadqiqotlar metodologiyasi* by B. Xodjayev, A. Choriyev, and Z. Saliyeva, it is stated that for teachers to possess scientific research potential, they must have a motivational and creative orientation, as well as the corresponding needs and abilities. The following aspects are highlighted:

1. Identifying non-standard approaches to solving pedagogical tasks;
2. Conducting exploratory and research activities;
3. Utilizing existing knowledge and developing it to apply innovations in practice;
4. Implementing pedagogical reflection;
5. Quickly adapting to changes in socio-economic and pedagogical conditions. [5, p.59]

The theoretical information provided serves as a source for practically developing students' scientific research activities.

Conclusion. The primary goal of higher education institutions is to develop students' skills in conducting scientific research activities. Based on the ideas presented in this article, the following points should be highlighted:

1. When guiding students in scientific research, work should be carried out in professional pedagogical and educational-training directions;
2. Students should have initial knowledge about the types, forms, and methods of research;
3. To foster a scientific and creative environment in both academic and independent activities, students should be supported materially and morally, and conditions should be provided for conducting scientific inquiries. This support serves as a foundation for carrying out scientifically substantiated research in the field of science.

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