JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
VOLUME 5, ISSUE 06
MONTHLY JOURNALS
ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08

FORMS AND METHODS OF FORMING A SCIENTIFIC WORLDVIEW IN STUDENTS

Mamadaliyeva Irodakhon Shavkatjon kizi
Master's student of the Pedagogical Department of the Oriental University
https://doi.org/10.5281/zenodo.20590116

Abstract: This article examines the pedagogical forms and methods through which a scientific worldview can be systematically formed in school students. A scientific worldview is interpreted not as a simple accumulation of facts, but as an integrated intellectual, axiological and methodological orientation that enables learners to explain natural and social phenomena on the basis of evidence, causality, critical reflection and responsible inquiry.

Keywords: scientific worldview, students, inquiry-based learning, critical thinking, interdisciplinary education, pedagogical methods, problem-based learning, scientific literacy, reflective learning, educational technology.

INTRODUCTION

The problem of forming a scientific worldview in students occupies a central place in contemporary pedagogy because the quality of a learner's worldview determines not only the level of knowledge acquisition, but also the way in which the learner interprets reality, evaluates information, makes decisions and participates in social life. In the modern educational environment, students encounter a rapidly expanding flow of digital information, competing value systems, simplified pseudo-scientific explanations and fragmented representations of the world. Under such conditions, the school is required to move beyond the transmission of subject content and create a pedagogical space in which learners develop the ability to understand the world through evidence, logic, causality, systematic observation and independent reasoning. A scientific worldview is therefore a multidimensional educational result: it includes scientific concepts, methodological culture, rational argumentation, openness to verification, intellectual honesty and the capacity to connect knowledge with practical and ethical responsibility[1].

The relevance of the topic is strengthened by the transformation of education toward competence-based, learner-centered and inquiry-oriented models. Traditional instruction, when limited to memorization and reproduction, cannot fully ensure the development of a scientific worldview, because worldview is formed through internalized ways of thinking rather than through isolated information. Students need to understand how scientific knowledge is produced, why evidence matters, how facts differ from opinions, how hypotheses are tested, and how theories can be revised in response to new data. For this reason, the forms and methods used by teachers must be directed not only toward explaining ready-made knowledge, but also toward involving students in cognitive activity: observing phenomena, formulating questions, constructing assumptions, comparing alternative explanations, using simple research procedures, discussing results and reflecting on the reliability of conclusions[2].

In pedagogical terms, a scientific worldview performs several interrelated functions. First, it has a cognitive function: it organizes knowledge about nature, society, technology and the human being into a meaningful system. Second, it has a methodological function: it teaches students to rely on analysis, evidence, comparison, generalization and verification. Third, it has a

value-oriented function: it develops respect for truth, responsibility for the consequences of human activity and a rational attitude toward social and ecological problems. Fourth, it has a practical-regulative function: it helps students choose adequate actions in educational, everyday and civic situations. Consequently, forming a scientific worldview cannot be reduced to the lessons of natural sciences alone; it must be supported by the entire educational process, including history, literature, geography, technology, social studies, ethics, mathematics and extracurricular research activities[3].

The concept of scientific worldview also demands a careful distinction between knowledge and belief. A student may possess a certain amount of scientific information, yet still interpret the world through uncritical stereotypes or accidental impressions. Conversely, a scientifically oriented learner demonstrates the ability to justify statements, separate cause from coincidence, evaluate sources, use concepts correctly and accept the provisional nature of scientific knowledge. This distinction is especially important in the digital era, when students are exposed to attractive but unreliable content. The formation of a scientific worldview therefore requires media literacy, information hygiene, digital research skills and the habit of checking claims before accepting them. These competencies should be cultivated through practical tasks: source comparison, analysis of data visualizations, interpretation of experiments, mini-research projects and reasoned debate[4].

From the point of view of educational forms, the development of a scientific worldview is most effective when lessons are connected with laboratory work, field observation, project activity, discussion clubs, science weeks, interdisciplinary seminars and problem-oriented tasks. Such forms create a bridge between theoretical knowledge and empirical experience. For example, a biology lesson can become a basis for ecological responsibility; a physics experiment can develop understanding of causality and measurement; a history lesson can teach the logic of evidence and source criticism; a literature lesson can encourage reflection on the relationship between human values and scientific progress. Thus, the scientific worldview is not a narrow technical construct, but a universal educational orientation that helps students see the unity of knowledge and the complexity of the world[5].

The methodological basis of this topic is also connected with developmental pedagogy. If teaching is organized only as a transfer of ready answers, the learner remains a passive recipient. If teaching is organized as guided inquiry, the learner becomes an active subject of cognition. Therefore, the teacher's task is to design pedagogical situations in which students experience intellectual difficulty, search for explanations, test ideas, communicate findings and revise initial assumptions. Problem-based learning, heuristic conversation, research assignments, case analysis, experiments, modeling, concept mapping and reflective writing are among the methods that can transform scientific knowledge into a personally meaningful worldview. These methods stimulate not only memory, but also analytical thinking, scientific imagination, argumentation and self-regulation[6].

Another important dimension is the socio-cultural context of education. In Uzbekistan and in the broader global educational space, the formation of a scientifically literate generation is directly connected with modernization, innovation, sustainable development and the preparation of young people for responsible participation in society. Students who possess a scientific worldview are more likely to understand social reforms, technological changes, environmental challenges and health-related issues through reasoned judgment. They can resist manipulative information, participate in constructive dialogue and apply knowledge in solving real problems. Therefore, the topic has not only pedagogical, but also social significance: it is related to the

intellectual security of society, the culture of public reasoning and the development of human capital[7].

The purpose of this article is to theoretically substantiate the main forms and methods of forming a scientific worldview in students and to describe how these methods can be organized in a coherent pedagogical system. The article focuses on the integration of cognitive, methodological, communicative and reflective components of learning. It proceeds from the assumption that scientific worldview formation becomes effective when the teacher combines subject knowledge with inquiry, dialogue, interdisciplinary connection, digital literacy and value-based reflection. In this sense, the scientific worldview is viewed as a dynamic educational outcome that develops gradually: from curiosity and empirical observation to conceptual understanding, critical analysis, research competence and responsible application of knowledge.

LITERATURE REVIEW

The analysis of pedagogical literature shows that the formation of a scientific worldview has been interpreted as a complex process of intellectual development, methodological preparation and value orientation. In Uzbek pedagogical discourse, this problem has been addressed through the ideas of interdisciplinary teaching, the development of students' thinking, the teacher's communicative mastery and the modernization of educational content. A relevant contribution is associated with Zulfiya Karimovna Qodirova, whose work on forming a scientific worldview among primary school students emphasizes the need to raise the intellectual development of the younger generation to a qualitatively new level and to introduce innovative forms and methods into the educational process. Her approach is significant because it connects scientific worldview formation with the age-specific characteristics of learners and with the pedagogical conditions that make interdisciplinary learning productive. In this interpretation, a scientific worldview emerges when the student does not receive isolated subject fragments, but gradually constructs a coherent picture of nature, society and human activity through integrated educational experience[8].

Another important line of analysis is represented by Sh. B. Do‘sanova, whose research discusses the didactic role of the teacher's oratorical and communicative mastery in developing students' scientific worldview. This perspective broadens the issue by showing that worldview formation depends not only on curriculum content, but also on the quality of pedagogical communication. A teacher who explains concepts logically, uses scientifically grounded arguments, formulates questions clearly and organizes discussion effectively creates the conditions for students to adopt rational modes of thought. Do‘sanova's position is especially relevant for the methodology of classroom interaction: scientific worldview is strengthened when speech culture, reasoning, evidence and dialogue become regular components of instruction[9].

The ideas of Qodirova and Do‘sanova can be interpreted as mutually complementary. Qodirova foregrounds the structural and interdisciplinary organization of learning, while Do‘sanova emphasizes the communicative and didactic mechanism through which scientific meanings are transmitted, discussed and internalized. Together, these approaches make it possible to understand scientific worldview formation as a pedagogical system in which content, method, communication and reflection are interconnected. In addition, recent Uzbek educational publications on this topic highlight problem-based learning, critical thinking, observation, experimentation and project activity as effective ways of strengthening students' evidence-based reasoning. These studies show that the formation of a scientific worldview should not be

postponed until upper grades; it must begin in primary and middle school through age-appropriate inquiry, simple research tasks, interdisciplinary links and carefully guided discussion.

Foreign pedagogical thought also provides a strong theoretical foundation for the topic. John Dewey's concept of reflective thinking and learning through experience demonstrates that knowledge becomes meaningful when it is connected with inquiry and problem solving. Lev Vygotsky's cultural-historical theory explains why scientific concepts develop most effectively in social interaction, under the guidance of a teacher, within the zone of proximal development. Jerome Bruner's ideas on discovery learning and curriculum structure further support the claim that students should master not only facts, but also the principles by which knowledge is organized. Thus, the literature indicates that scientific worldview formation requires a methodological shift from passive assimilation to active investigation, from fragmented information to systemic understanding and from teacher monologue to dialogic and research-based learning.

METHODOLOGICAL PART

This article used a theoretical-analytical and integrative methodological approach appropriate to the study of pedagogical forms and methods of forming a scientific worldview in students. The methodological basis was constructed through the synthesis of comparative-pedagogical analysis, system-structural interpretation, content analysis of educational literature, conceptual modeling, pedagogical generalization and prognostic reflection. Comparative-pedagogical analysis was used to identify common and distinctive features in Uzbek and foreign approaches to scientific worldview formation, especially with regard to interdisciplinary instruction, inquiry-based learning and the communicative role of the teacher. The system-structural method made it possible to treat scientific worldview not as a single skill, but as a structured educational formation consisting of cognitive, methodological, axiological, communicative and practical components. Content analysis was applied to determine how the concepts of scientific literacy, critical thinking, problem-based learning, evidence, observation and reflection are represented in pedagogical sources and how they can be adapted to school practice.

The article also relied on the method of pedagogical modeling, because the formation of a scientific worldview requires the design of a coherent process that connects aims, content, forms, methods, means and expected outcomes. Within this model, the teacher acts as a facilitator of inquiry; the student acts as an active subject of cognition; and the educational environment functions as a space of observation, experimentation, discussion and reflection. The method of pedagogical generalization was used to formulate principles that can be applied across subjects: scientific validity, interdisciplinarity, developmental complexity, connection with life, dialogic communication, evidence-based reasoning and reflective assessment. In addition, the article used a prognostic method to determine possible educational effects of the proposed forms and methods: growth of scientific literacy, strengthening of critical thinking, improvement of research skills, development of responsible judgment and resistance to pseudo-scientific information. The methodological logic of the article is therefore based on the continuous movement from theory to pedagogical design and from pedagogical design to expected educational transformation.

RESULTS

The results of the theoretical analysis show that the formation of a scientific worldview in students is most successful when it is organized as a gradual, continuous and interdisciplinary

pedagogical process. The first result is the identification of the key components of a scientific worldview: conceptual knowledge, causal explanation, evidence-based reasoning, methodological awareness, critical attitude toward information, value responsibility and practical application. These components demonstrate that scientific worldview cannot be formed by a single subject or a single method; it requires a system of educational influences distributed across lessons, extracurricular activities, projects and communication practices. The second result is the classification of effective pedagogical forms. The most productive forms include problem lessons, laboratory and practical work, field observations, interdisciplinary projects, scientific discussions, student conferences, research circles, digital inquiry tasks and reflective seminars. Each form contributes to a different aspect of worldview formation: experiments develop empirical verification; discussions develop argumentation; projects develop integration; observations develop attentiveness to facts; reflective writing develops self-awareness and the ability to generalize experience.

The third result is the determination of methodological tools that can be used by teachers. Among them, problem-based learning, inquiry-based learning, heuristic conversation, case analysis, modeling, concept mapping, source criticism, comparative analysis, experiment interpretation and portfolio assessment are particularly effective. These methods support the transition from reproductive learning to productive thinking. They encourage students to justify their answers, work with evidence, see relationships between phenomena and understand the provisional yet reliable nature of scientific knowledge. The fourth result is the recognition that the teacher's communicative culture is a decisive condition. Scientific worldview develops when the teacher consistently uses logical explanation, precise terminology, reasoned questioning, respectful debate and feedback based on evidence. The fifth result is the importance of digital and media literacy. In the contemporary information environment, students must learn to distinguish reliable scientific information from manipulation, pseudo-scientific claims and emotional persuasion. Therefore, the formation of a scientific worldview should include tasks that require checking sources, comparing data, interpreting infographics and evaluating the credibility of online information.

The general result of the study is the conclusion that scientific worldview formation should be designed as an integrated pedagogical technology. This technology includes a diagnostic stage, where the teacher identifies students' initial ideas and misconceptions; a motivational stage, where curiosity and problem situations are created; a cognitive stage, where scientific concepts are mastered; a research stage, where students observe, compare and test assumptions; a communicative stage, where results are discussed and defended; and a reflective stage, where students evaluate what has been learned and how it changes their understanding of the world. Such a sequence enables the educational process to move from knowledge acquisition to worldview development.

DISCUSSION

The discussion of this topic can be deepened through a polemical comparison of two influential foreign thinkers: John Dewey and Lev Vygotsky. Dewey would argue that the scientific worldview of students is formed primarily through experience, problem solving and reflective inquiry. From his perspective, students should not be treated as passive receivers of knowledge, because genuine understanding appears when learners face a problematic situation, investigate it, test possible solutions and reconstruct their experience. Dewey's position strongly supports project work, experimentation, practical tasks and democratic discussion in the classroom. In this view, the method is not secondary to content; it is the very mechanism through

which scientific thinking becomes part of the learner's personality. A student who solves real problems, observes consequences and reflects on evidence gradually acquires the habit of scientific reasoning.

Vygotsky, however, would emphasize that scientific concepts do not arise only from spontaneous experience. They require systematic instruction, language, social interaction and guidance by a more competent participant. According to this view, experience becomes educationally productive only when it is mediated by concepts, signs, teacher explanation and collective dialogue. Vygotsky's argument is important because it prevents an overly simplified interpretation of active learning. If students are merely placed in practical situations without conceptual guidance, they may remain at the level of everyday impressions. The teacher must therefore organize the zone of proximal development, introduce scientific terminology, guide comparison, correct misconceptions and help students move from empirical observations to generalized concepts[9].

The polemic between Dewey and Vygotsky is not a contradiction that forces educators to choose one side; rather, it reveals the dialectical structure of scientific worldview formation. Dewey protects education from verbalism and passive memorization, while Vygotsky protects it from unstructured activity and superficial empiricism. In modern pedagogy, both positions must be integrated. Students need experience, inquiry and problem solving, but they also need conceptual scaffolding, language development, teacher mediation and cultural tools. Therefore, the most effective methods are those that combine activity with explanation, observation with theory, freedom with guidance and discussion with evidence[10].

CONCLUSION

The formation of a scientific worldview in students is one of the most important tasks of modern education because it determines the learner's ability to understand reality on the basis of evidence, rational explanation and responsible judgment. The analysis carried out in this article shows that a scientific worldview is not limited to knowledge of natural sciences; it is a holistic intellectual and value-based orientation that integrates concepts, methods, critical thinking, communication, digital literacy and social responsibility.

REFERENCES

1. Xusanov B., Yusupova M. Yangi pedagogik texnologiyalar-ta 'lim tarbiya jarayonlarni yaxlitligini taminlaydi //Modern World Education: New Age Problems–New solutions. – 2025. – T. 2. – №. 5. – C. 23-28.
2. Yo'ldoshev Q., Pedagogika nazariyasi va tarixi, "Fan" nashriyoti, Toshkent, 2020, 336 b
3. Yoqubova G. Zamonaviy pedagogik texnologiyalarning chet til ta'limida tutgan o'rni va ahamiyati //Ta'lim innovatsiyasi va integratsiyasi. – 2025. – T. 47. – №. 4. – C. 45-48.
4. Александров В. Б. Научное мировоззрение: философский смысл и проблемные интерпретации // Вестник Московского университета. Серия 7: Философия. Москва: МГУ, 2023. № 4. С. 15–29. 152 с.
5. Вербицкий А. Теория и технологии контекстного образования. – ЛитРес, МПГУ, 2017.
6. Джумаева С. А. и др. Pedagogik texnologiyalar va innovatsion metodlarning ta'lim sifatiga ta'siri //Ta'lim innovatsiyasi va integratsiyasi. – 2025. – T. 45. – №. 4. – C. 244-246.
7. Иванова Е. М. Научное мировоззрение в философии В. И. Вернадского и его значение для современного образования // Философия образования. Новосибирск: СО РАН, 2021. № 3. С. 42–56. 180 с.,

8. Иванова Е. М. Научное мировоззрение в философии В. И. Вернадского и его значение для современного образования // Философия образования. Новосибирск: СО РАН, 2021. № 3. С. 42–56. 180 с.
9. Маматкулов С. Т. Дунёқараш ва ҳаётий позиция: структуравий таҳлил //falsafa va hayot xalqaro jurnal философия и жизнь международный журнал philosophy and life. – 2020. – С. 48.
10. Рустамова С. Ш., Ахмедова М. Т. Ёшларда илмий дунёқарашни шакллантириш ва уларни ақлий тарбиялашнинг ўзига хос хусусиятлари. – 2022.