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DEVELOPING METHODOLOGICAL COMPETENCIES OF FUTURE PRIMARY SCHOOL TEACHERS THROUGH THE ORGANIZATION OF NATURAL SCIENCE TEACHING BASED ON MODERN PEDAGOGICAL APPROACHES

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Abstract.

This article examines the development of methodological competencies of future primary school teachers through organizing the teaching of natural sciences based on modern pedagogical approaches. In the course of the study, the theoretical foundations of integrative education, its didactic potential, and its role in the primary education system were analyzed. Furthermore, the level of methodological preparedness of future teachers was investigated, and existing challenges were identified. The article substantiates the pedagogical conditions, methods, and tools for organizing the teaching of natural sciences based on modern pedagogical approaches. The results of the study demonstrate that the implementation of a pedagogical model aimed at developing methodological competencies of future primary school teachers not only enhances the effectiveness of the educational process but also significantly increases learners' engagement in acquiring fundamental knowledge.

Keywords

integrative approach, natural sciences, primary education, methodological training, future teacher, pedagogical competence, interdisciplinary integration, STEAM education, innovative methods, teaching methodology, educational effectiveness

Introduction.

In the context of ongoing globalization and rapid informatization processes, the requirements imposed on the education system are undergoing fundamental transformation. Particularly at the stage of primary education, it is of great importance to develop learners' scientific worldview, foster a conscious attitude toward the environment, and ensure the acquisition of fundamental knowledge based on natural sciences. From this perspective, organizing the teaching of natural sciences on the basis of modern pedagogical approaches is considered one of the

most акtуal and essential tasks. In recent years, the integrative approach has gained particular significance in education. This approach ensures the interconnection between different disciplines, facilitates the acquisition of knowledge as a holistic system, and promotes the development of learners' analytical and creative thinking.

Through the integrated teaching of natural sciences, opportunities expand for developing learners' skills in solving real-life problems. In this process, the methodological preparedness of future primary school teachers serves as a decisive factor. This is because the teacher acts as the key agent in implementing the integrative approach in practice, ensuring interdisciplinary connections, and effectively organizing learners' cognitive activities. Accordingly, improving the methodological training of future teachers acquires particular scientific and practical significance

The relevance of the topic "Improving the methodological preparedness of future primary school teachers in teaching natural sciences based on an integrative approach" is determined by several factors. Firstly, the modern education system is increasingly developing on the basis of a competency-based approach, which requires the formation of learners' independent thinking, problem-solving abilities, and life skills. This, in turn, necessitates teaching natural sciences not in isolation but in an integrated manner. Secondly, in the practice of teaching natural sciences at the primary education level, a traditional and fragmented approach still prevails. This creates challenges in ensuring the systematic and holistic acquisition of knowledge by learners. The integrative approach is recognized as an effective means of overcoming these shortcomings. Thirdly, within the system of teacher training, the methodological preparedness of future primary school teachers has not yet been sufficiently developed in accordance with modern educational requirements. In particular, there is a need to enhance their skills in designing lessons based on an integrative approach, ensuring interdisciplinary connections, and applying innovative teaching methods. Fourthly, in the process of teaching natural sciences, fostering ecological thinking, instilling the ideas of sustainable development, and developing learners' responsible attitudes toward the environment are among the most important tasks of today. These objectives can be effectively achieved only through the implementation of an integrative approach. Based on the above considerations, the topic "Improving the methodological preparedness of future primary school teachers in teaching natural sciences based on an integrative approach" is of both theoretical and practical significance and necessitates further scientific research in this field.

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LITERATURE REVIEW. The issue of improving the methodological preparedness of future primary school teachers in teaching natural sciences based on an integrative approach has long been studied in the fields of pedagogy and psychology. An analysis of the conducted scientific research shows that the organization of education on the basis of an integrative approach, especially the improvement of the methodology of teaching natural sciences in primary education, has been investigated by many foreign and domestic scholars.

Among foreign researchers, John Dewey advanced the ideas of connecting education with life and teaching on the basis of experience, thereby laying the theoretical foundations of the integrative approach. In his view, knowledge should be acquired not as separate fragments but as a unified system [9].

At the same time, Jean Piaget substantiated the importance of developing thinking through integrated knowledge in his theory of the stages of learners' cognitive development [14].

Jerome Bruner's concept of "spiral teaching" also holds particular significance in the development of integrative education, emphasizing that knowledge should be progressively deepened across various disciplines [3].

In addition, Howard Gardner's theory of multiple intelligences strengthens the pedagogical foundations of the integrative approach, since it demonstrates the importance of interdisciplinary connections in the development of learners' diverse abilities [6].

Among representatives of the Russian psychological and pedagogical school, Lev Vygotsky's sociocultural theory of development also occupies an important place in the scientific substantiation of the integrative approach. According to him, knowledge in the learning process is formed in an interconnected way through social collaboration [5].

Likewise, the concept of developmental education developed by the Russian scholars Vasily Davydov and Daniil Elkonin substantiates the significance of the integrative approach in the formation of theoretical thinking in learners [7, 10]. In research related to the methodology of teaching natural sciences, the problem of interdisciplinary integration has been studied separately, with the formation of learners' scientific worldview, the development of ecological thinking, and the acquisition of practical skills identified as major objectives. In particular, the modern STEAM education concept предусматривает the teaching of natural sciences in integration with technology, engineering, and mathematics. Uzbek scholars have also conducted a number of scientific studies in this field. Pedagogical scholars of Uzbekistan have paid special attention to the teaching of natural sciences in primary education, the improvement of teaching methodology,

the development of teachers' professional competencies, and the introduction of innovative pedagogical technologies. In their studies, organizing lessons on the basis of an integrative approach is evaluated as an effective means of increasing learners' cognitive activity, developing their independent thinking, and ensuring the systematic nature of knowledge.

In particular, in the research of the pedagogical scholar N.A. Muslimov, the issues of forming teachers' professional competence and developing their methodological preparedness are analyzed on the basis of a systemic approach. The scholar emphasizes that a teacher's readiness for innovative activity is a key factor in the effectiveness of modern education [12].

Pedagogical scholar Sh.S. Sharipov, in his scientific works, addressed the issues of introducing pedagogical technologies, modernizing the teaching process, and developing integrated education. He evaluates the integrative approach as an effective means of activating students' cognitive activity [15].

Likewise, in the studies of Uzbek pedagogical scholars R.H. Juraev and U.N. Nishonaliyev, the issues of ensuring interdisciplinary connections in primary education and using modern methods in teaching natural sciences were examined. They substantiated the importance of an integrated approach in shaping students' scientific worldview [11, 13].

In addition, local studies have explored issues such as ecological education, the formation of a conscious attitude toward the environment, and the development of students' research skills in close connection with the integrative approach. An analysis of the existing scientific studies shows that the methodological preparedness of future primary school teachers specifically for teaching natural sciences on the basis of an integrative approach has not yet been sufficiently investigated in a comprehensive manner. Although most studies have covered general pedagogical approaches, practical methodological mechanisms, lesson design technologies, and the formation of integrative competencies have not been deeply researched.

An analysis of the studies conducted by foreign and local scholars makes it possible to draw the following scientific conclusions:

the integrative approach ensures the systematicity and integrity of knowledge in the educational process;

interdisciplinary connections in teaching natural sciences contribute to the development of students' scientific worldview;

the methodological preparedness of future primary school teachers is the main factor in the effective implementation of the integrative approach;

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although the theoretical foundations have been sufficiently developed in existing studies, the issues of practical methodological mechanisms and the introduction of the integrative approach into teacher education systems require further in-depth research.

Thus, the analyzed scientific sources demonstrate that the theoretical and methodological foundations of the integrative approach have been sufficiently developed. However, a systematic approach to their application in the process of teaching natural sciences in primary education, especially from the perspective of developing the methodological preparedness of future teachers, remains insufficient. Therefore, this study is of scientific and practical significance in that it is aimed at filling this gap.

METHODS: historical, retrospective, and theoretical-methodological analysis of sources; generalization and interpretation of the obtained data; observation; interview; questionnaire; content analysis; qualimetry; and expert evaluation.

DISCUSSION. Within the framework of the study, the issue of improving the methodological preparedness of future primary school teachers in teaching natural sciences on the basis of an integrative approach was analyzed as a multifaceted pedagogical problem. The examined theoretical sources and existing practical experience indicate that the integrative approach is an important didactic factor in increasing the effectiveness of the educational process.

First of all, the essence of the integrative approach is explained by its focus on forming a holistic scientific worldview in learners through ensuring interdisciplinary connections. This approach requires natural sciences to be taught not as separate subjects, but as an interconnected system. From this perspective, integrated teaching at the primary education stage is also consistent with the age-related and psychological characteristics of learners.

The analysis of the research results shows that, in practice, the level of use of the integrative approach in teaching natural sciences remains insufficient. In many cases, lessons are still conducted in a traditional, subject-oriented manner, which leads to the fragmentation of students' knowledge. As a result, learners encounter difficulties in applying their knowledge to real-life situations.

Furthermore, the level of methodological preparedness of future primary school teachers was given particular attention in the discussion process. The analysis revealed that although knowledge related to the integrative approach is provided in higher pedagogical education institutions, its practical application has not yet been sufficiently developed. In particular, there is a need to improve skills related to designing lessons on an integrative basis, identifying interdisciplinary connections, and applying interactive methods.

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In addition, it was determined that the following pedagogical conditions are of great importance for the effective implementation of the integrative approach:

organizing special training sessions and courses aimed at developing teachers' methodological competence;

making broad use of innovative and interactive methods in teaching natural sciences;

introducing STEAM elements into the educational process;

developing practical skills by involving learners in research activities;

and improving textbooks and instructional materials on the basis of the integrative approach.

Another important aspect identified in the course of the discussion is that the integrative approach has a positive impact not only on knowledge acquisition but also on the personal development of learners. In particular, this approach contributes to the development of independent thinking, problem-solving ability, creative approaches, and communicative competencies among learners.At the same time, it was identified that there are certain challenges in implementing the integrative approach in practice. In particular, teachers' lack of readiness to abandon traditional thinking, insufficient methodological support, and the heavy academic workload hinder the effective organization of integrated education. Based on the above analysis, it can be emphasized that teaching natural sciences on the basis of an integrative approach serves as an important means of improving the methodological preparedness of future primary school teachers. However, for the effective implementation of this approach, it is necessary not only to provide theoretical knowledge but also to develop practical methodological skills and to organize the educational process on the basis of modern pedagogical technologies.

RESULTS. During the research process, theoretical and practical work was carried out aimed at improving the methodological preparedness of future primary school teachers in teaching natural sciences based on an integrative approach, and the following results were achieved. *Firstly,* the didactic potential of the integrative approach was analyzed, and its importance in increasing the effectiveness of teaching natural sciences in primary education was substantiated. The results showed that lessons organized on the basis of interdisciplinary integration ensure the systematic and holistic acquisition of knowledge by learners and contribute to the development of their logical and critical thinking. *Secondly*, the level of methodological preparedness of future primary school teachers was diagnosed, revealing insufficient knowledge and skills in applying the integrative approach. In particular, difficulties were observed among students in designing lessons on an integrative basis, identifying interdisciplinary connections, and using interactive

methods. *Thirdly,* within the framework of the study, a pedagogical model aimed at improving the methodological preparedness of future teachers was developed. This model included the following components: a motivational-competence component; a content (theoretical) component; an activity-oriented (practical) component; and a reflective-evaluative component. *Fourthly,* based on the developed model, a system of methodological recommendations and training sessions was introduced into practice. Integrated lesson plans, project-based tasks, and activities based on STEAM elements were developed and applied in experimental work. *Fifthly*, the analysis of experimental results showed that the educational process organized on the basis of the integrative approach significantly improved the methodological preparedness of future teachers. In particular, students developed skills in designing integrative lessons; their ability to identify and apply interdisciplinary connections increased; the effectiveness of using interactive and innovative methods improved; and their competencies for independent and creative work were enhanced. Sixthly, the introduction of the integrative approach into the educational process also led to positive changes in learners' academic activities. Their interest in lessons increased, their engagement in performing practical tasks strengthened, and their skills in analyzing real-life situations were developed. The results of the conducted research demonstrated that teaching natural sciences on the basis of an integrative approach makes it possible to effectively develop the methodological preparedness of future primary school teachers. The developed pedagogical model and methodological recommendations proved their effectiveness in practice, and it was determined that their broad implementation in the educational process is highly advisable.

CONCLUSION. The findings of the study showed that improving the methodological preparedness of future primary school teachers in teaching natural sciences on the basis of an integrative approach is not limited merely to providing theoretical and practical knowledge, but is also directly related to pedagogical and psychological conditions that ensure the development of skills in designing lessons on an integrative basis, identifying interdisciplinary connections, and applying interactive methods. In particular, it was established that the integrative approach is an important didactic tool for ensuring the integrity and systematic nature of knowledge in the educational process.

Teaching natural sciences on the basis of interdisciplinary connections expands opportunities for forming learners' scientific worldview, developing logical and critical thinking, and applying acquired knowledge to real-life situations. The results of the study also revealed that the level of using the integrative approach in teaching natural sciences in practice remains insufficient, while there is a clear need

to develop the relevant knowledge and skills of future primary school teachers in this area.

On this basis, a pedagogical model aimed at improving the methodological preparedness of future teachers was developed and introduced into practice. As a result of applying this model, students' skills in designing integrative lessons, identifying interdisciplinary connections, and using innovative methods improved significantly.

The results of the experimental work confirmed that the educational process organized on the basis of the integrative approach is highly effective not only in enhancing the methodological competence of future teachers, but also in developing learners' cognitive activity, independent thinking, and creative approach. In conclusion, teaching natural sciences on the basis of an integrative approach serves as an important factor in shaping the professional preparedness of future primary school teachers in accordance with modern educational requirements. Therefore, the wide introduction of this approach into the system of teacher training, its methodological improvement, and its alignment with educational practice are of great significance.

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