

ANNOTATION

**Doctoral dissertation of Kozhabekova Elmira Kurbanalikyzy
for the degree of Doctor of Philosophy (PhD)
in the specialty «8D01502 - Preparation of a physics teacher» on the topic
«Training of the future physics teacher to form the worldview of students
based on interdisciplinary communication»**

Relevance of the topic: in the Address of the President of the Republic of Kazakhstan K. K. Tokayev in the newspaper "Ana tili" dated January 3, 2025 on the self-development of youth in modern civilization it is said: "The fate of our country is in the hands of youth. He noted that we are tasked with raising a generation that shows true patriotism and has a high culture, and also emphasized that the reform does everything for the benefit of youth, and these are not just beautiful words, but the essence of the state strategy. In addition, the President informed the youth that: our young citizens must be creative in terms of worldview, constructive in terms of thinking, they must be able to distinguish between good and bad. Kassym-Jomart Kemelovich noted the importance of natural sciences in modern civilization in the message "Fair State. United Nation. Prosperous Society", it was said about strengthening the teaching of natural sciences in connection with global scientific and technological progress. Government meetings were held to implement the President's Messages, where they discussed increasing the number of hours in such natural sciences as physics, mathematics, chemistry and biology. It can be noted that the achievements of the natural sciences always determine the political, economic and military power of any people, state, reflecting their invaluable role.

In secondary education institutions, students must be ready to reveal their abilities, to live in a world of high-tech competition, and for this it is necessary to have scientific and pedagogical training of a new format teacher, especially physics teachers, ready to effectively implement new technologies, capable of acting in accordance with social changes.

In particular, it is very important that the subject of physics, as the basis of natural sciences, is closely connected with other fields of science. Thanks to such interdisciplinary connections, future physics teachers make a great contribution to broadening the horizons and forming the scientific worldview of students. They get the opportunity to make the educational process innovative, meaningful and visual, effectively using interdisciplinary connections in their teaching activities. In addition, the training of future teachers based on interdisciplinary connections increases their professional competence and develops creative abilities in teaching activities. This allows them to plan and implement educational programs that meet modern requirements. Teachers who have undergone such training contribute not only to the in-depth learning of students, but also to their spiritual, moral and worldview development.

In order to solve the tasks set by the state to prepare a new format teacher and to improve the status of a teacher in the Republic of Kazakhstan, a number of measures are being taken, i.e. the law "On the status of a teacher" has been adopted; the Government of the Republic of Kazakhstan systematically increases teachers' salaries; the threshold score for admission to pedagogical specialties has been increased to 110; scholarships for students of pedagogical specialties have been increased (twofold); the cost of the state grant has increased, etc.

Nevertheless, in solving the following issues, there are unresolved problems: there is a shortage of highly qualified personnel of the middle professional level, qualified physical and pedagogical personnel with fundamental, natural science education, capable and ready to effectively implement the priorities of the Republic of Kazakhstan.

Kazakhstan is experiencing a shortage of competent engineering and technical specialists. It is obvious that it takes decades, not years, to form a highly qualified, creative human resource potential for the country, and their training should begin at school (a sentence from the article).

Currently, graduates do not view their professional activities as an integrated process; they cannot adapt to the changing technical and technological environment. In this regard, Western experts believe that today science and technology are developing rapidly, that after graduating from university it is necessary to "learn" and "achieve" the current level of development of high-tech production, to integrate into intensive scientific activities aimed at future professional employment, it is necessary to start "on the bench in a higher educational institution" .

The ways of improving the training of future teachers in higher education institutions are considered in detail in the works of A. V. Usova , n.d. Khmel, A. E. Abylkasymova.

Zh. K. Ermekova, M. A. Ligay, N. M. Stukalenko in their works indicated that a teacher, a teacher-scientist is the quintessence of any education system, a practical executor of important new conceptual approaches in the field of training and education.

M. E. Ermaganbetova., Zh. K. Aganina., K. A. Zhumagulova., R. Zh. Bazarbekova, A. M. Mukhanbetzhanova, A. M. Absatova., A. Usenova., S. Seitenova., L. Nurpeisova in their works they demonstrated the features of interdisciplinary connections.

Our country has the capacity to train such specialists, as the country has achieved great success in successful progressive development for the benefit of each person and the entire nation. The global event - the international exhibition EXPO 2017, held in Astana, reflects the significance of the above. In addition, Kazakh scientists Umanova G.A., Seiteshov A.P., Mukanova B.I., Ozgambaeva R.O., Duisembekova Sh.D. , T.R. Abdrakhmanov, O.Z. Imangozhina , N.B. Ishmukhamedova, S. Saudabaeva. These scientists have shown that the process

of professional training at the development level can influence academic success and the activities of a specialist in various areas.

And the scientists who studied the problem of forming the ideological professional orientation of students in higher educational institutions were L. Kh. Mazhitova, Sh. Abdraman, L. A. Zhadrayeva, I. A. Abeuova. The studies of these scientists suggest that the ideological professional orientation is associated with various professions.

To ensure education is in line with societal development trends, a network of innovative educational organizations has been established and is being implemented on a large scale in secondary schools in the Republic of Kazakhstan (Binom, Zhayly Mektep, and Quantum schools, private schools with in-depth study of a range of academic subjects, multidisciplinary schools, and others). These newly opened schools aim to develop students' intellectual potential, abilities, and worldviews, as well as the development of essential life competencies. Accordingly, it is known that the educational content in secondary schools, the forms of instructional organization, and teaching methods also require change.

However, as is known from surveys conducted among school teachers and observations, the measures taken in the school education system to develop students' worldviews in physics instruction are insufficient. School teachers emphasize the need to address the challenges that arise in developing students' worldviews in physics instruction. It has been revealed that the methods used to develop students' worldviews in physics instruction are insufficient and that a methodological system is needed. This creates a contradiction between the need for specialized teacher training to create and implement a unified, scientifically sound system for developing students' worldviews in modern schools and the insufficient availability of methodological tools for teachers to develop students' worldviews in physics instruction in comprehensive schools, as well as the insufficient development of the scientific and methodological aspects of this research problem.

Thus, the current agenda in the field of teacher training, including physics teachers, is relevant, that is, the training of teachers of a new format capable of shaping the worldview of students and improving the quality of teaching based on innovative pedagogical technologies. Therefore, our research is aimed at preparing future physics teachers to shape students' worldview through the use of subject integration.

In our research work, we study the issues of preparing future physics teachers to form students' worldviews based on interdisciplinary connections in order to improve the students' integrative knowledge.

Thus, the issue of training natural science teachers, including physics teachers, i.e. teachers of a new format who can form students' worldviews and improve the quality of education based on innovative teaching technologies, is considered on the modern agenda.

Therefore, the concept of interdisciplinary connection is better correlated with the concept of integration of a scientific direction. Therefore, in the dissertation work, along with the research work, we considered the concept of integration, equal to the concept of interdisciplinarity of disciplines.

However, when analyzing the teaching experience, curricula, educational standards, and the results of the pedagogical experiment based on the integration of future physics teachers, the following **contradictions** were identified during the study:

- the problem of the need to form the worldview of students and develop the level of knowledge of the future physics teacher in this area;
- the need to prepare future teachers to form the worldview of students and the availability of an educational and methodological complex;

In search of a solution to these contradictions, the basis was laid for choosing the topic of the dissertation work «**Preparing a future physics teacher to form the worldview of students based on interdisciplinary connections**».

The purpose of the study: to develop a methodological complex with a theoretical and methodological justification for preparing a future physics teacher to form a worldview of students based on interdisciplinary connections.

Object of the study: the process of preparing a future physics teacher in pedagogical universities.

Subject of the study: to prepare future physics teachers to shape students' worldview using an interdisciplinary approach in teaching physics.

Scientific hypothesis of the study:

If the process of preparing future physics teachers to develop the worldview of students is provided with didactic conditions for integrated education and the educational process is organized on the basis of a specially developed model and methodological system, this will not only increase the cognitive interest of students, but also raise the level and quality of training future physics teachers to develop a scientific worldview of students aimed at forming a picture of the world.

In accordance with the stated goal and subject of the study, the developed forecast defined the **objectives of the study**.

- to analyze the current state of physics teachers' training for the formation of students' worldview;

- to develop a model for training future physics teachers to form a student's worldview based on interdisciplinary connections;
- to create a methodological system for the formation of students' worldview based on interdisciplinary integration in physical education;
- to evaluate the potential of integrated physics education in shaping students' worldview through pedagogical experiment.

The theoretical and methodological foundations of the research were used to solve the problems of the dissertation.

Research methods: theoretical research methods (analysis, synthesis, interpretation, comparison, classification, induction, deduction, generalization, etc.), empirical research methods (observation, conversation, interview, survey, documentation study, experiment), statistical methods of analyzing experimental data (qualitative and quantitative analysis of the studied data).

Methodological foundations of the research: theory of modes of action; personality theory; theories of the content of education; theories of integrated professional education; basic principles and principles of the theory and methodology of teaching physics.

Theoretical basis of the research: analysis of philosophical, psychological, pedagogical, methodological and integration works on the research problems; generalization of methodological foundations and approaches to the formation of students' worldview.

Main stages of the research

At stage I (2020-2021), in order to determine the current state of the problem under study, an analysis of scientific and methodological literature on the formation of students' worldviews was carried out, and the relevance of the research topic was determined. The analysis of educational programs and teaching aids in the field of "Physics teacher training" in higher educational institutions for the training of modern teachers is carried out. The ascertaining stage of the pedagogical experiment was carried out.

At stage II (2021-2022), a model for training future physics teachers to shape students' worldviews was developed, an elective course "Integrated Methods of Teaching Physics" was created, its essence, content and structure were determined. The initial stage of practical and experimental work on the methodology of integrated teaching of physics was carried out. Work was organized to introduce the developed teaching aids into the educational process, the curriculum, teaching aids and syllabus of the elective course "Integrated Methods of Teaching Physics" were developed and introduced into the educational process.

At the III stage (2022-2024), the results of the conducted experimental research work on the use in the educational process of the elective course "Methodology of integrated teaching of physics", a specially developed model for training future physics teachers to form the worldview of students, were

summed up. The obtained data were processed based on statistical methods, scientific and methodological recommendations were proposed.

Research bases: research work of the Physics Department of the South Kazakhstan Pedagogical University named after Uzbekali Zhanibekov, the Technical Physics Department of the L.N. Gumilyov Eurasian National University.

Scientific novelty of the study:

1) The first result is new, since the importance of training physics teachers in higher education institutions for the formation of students' worldview has been substantiated and the features of integrated physics education have been identified.

2) The second result is new, since a methodological system of integrated physics education has been developed, aimed at preparing future physics teachers to form students' worldviews.

3) The third result is new, as the optional course "Methodology of Integrated Physics education" for future physics teachers has been developed and tested, aimed at shaping students' worldview.

Theoretical significance of the study:

- a theoretical analysis of the theory and practice of forming students' worldview has been carried out;

- the importance of interdisciplinary integration in teaching physics is substantiated;

- a model has been developed for preparing future physics teachers to form a student's worldview based on interdisciplinary connections;

- the content of the concept of "readiness" is revealed, which characterizes the result of training future physics teachers to form a student's worldview, consisting of the main components: value-motivational, content-cognitive, and activity-creative.

The readiness of a future physics teacher to form a student's worldview is defined by us as the theoretical, practical and spiritual readiness of a future teacher to effectively implement pedagogical activities aimed at forming a scientific worldview of students at professional, pedagogical, methodological, personal and value levels.

- Training sessions have been developed aimed at shaping the worldview of students in the process of teaching physics.

Practical significance of the study:

- a special elective course "Methodology of integrated teaching of physics" for future physics teachers has been developed and methodologically supported, and this course is methodologically supported by the following manuals:

- "Collection of integrated problems";

- "Laboratory work on the methodology of teaching physics";

- Textbook "Physics";

- <https://physics-integration.kz/> an online platform and «Master Physics Teaching Methodology» <https://readdy.link/preview/d2465969-f577-4c81-b743-86fe022fa659/3291829> an online course has been developed;;

- copyright certificates have been received.

- The results of the conducted scientific research, articles published in scientific journals, and tested works are recommended for use in secondary

educational institutions, by physics teachers of higher educational institutions, in centers for advanced training of teachers.

Key provisions recommended for defense:

- the results of the analysis of the current state of possibilities and problems of using integrative knowledge in the training of physics teachers to form the worldview of students in higher education institutions.

- Effective management of students' worldview formation in physics lessons can be implemented within the framework of the model developed by us, which is a single, interconnected system.

- A methodological system has been developed that substantiates the importance of interdisciplinary integration in teaching physics and is recommended for use in the educational process.

- The results of the pedagogical experiment are presented, confirming the effectiveness of the methodological system, that is, the developed model and the prepared elective course.

Approbation of the research results. The research work was discussed at the scientific coordination council of SKPU named after U. Zhanibekov, at meetings of the physics department. Conclusions, materials and current issues of the research work: Pre-Service Physics Teachers' Perceptions of Interdisciplinary Teaching: Confidence, Challenges, and Institutional Influences Educ. Sci. 2025, 15(8), 960; (Q1-percentile 84) (Switzerland 2025), Scientific Herald of Uzhhorod University. Physics Series, No. 55, 924 – 933, (Ukraine, 2024), (Q1 – percentile 80), Scientific Herald of Uzhhorod University. Physics Series, No. 55, 1177-1187, (Ukraine, 2024), (Q1 – 80th percentile), Science and Life of Kazakhstan. No. 12/7 (153) (Almaty, 2020), E3S Web of Conferences this link is disabled, 2021, 258, 10002 (France, 2021), E3S Web of Conferences this link is disabled, 2023, 449, 07012 (France, 2023), young educational institution on the publication of a scientific article No. 41 (331) (Moscow, 2020), Scientific Journal. "CHRONOS: Multidisciplinary Sciences" No. 10 (49) (Moscow 2020), Science and Education. Science and Education.

International Center for Scientific Cooperation. MK-1191, No. 018, (Penza.2021), The Creative Person: International Interdisciplinary Collective Monograph. Nice-Sicily. (Moscow, 2021), Eurasian Union of Scientists. Moscow No. 10 (91) Volume 1 (Moscow, 2021), 16th International Congress on Social Sciences - Humanities and Education. (Istanbul, 2024), 20. Uluslararası Bilimsel Araştırmalar Kongresi. (Ankara, 2024), Zhetysu University named

after I. Zhansugurov. Scientific Journal. No. 3 (100). (Taldykorgan, 2022), at the International Scientific and Practical Conference "The Turkic World in World Conditions: Language, Society, Literature" dedicated to the 63rd anniversary of Aziza Utegenovna Karibayeva (Taraz, 2022), XV International Scientific Conference on Solid State Physics (Astana, 2022), Bulletin of KarU "Pedagogy" No. 4 (108) (Karaganda, 2022), Bulletin of SKU named after M. Kozybaev / Bulletin of SKU named after M. Kozybaev. No. 4 (56). (Petropavlovsk, 2022), Bilim times No. 10 (66), Republican magazine (Almaty 2022), "Zhanibekov's readings - 2" (Shymkent 2025), "the phenomenon of Uzbekali Zhanibekov: lessons and pedagogical values", research results were discussed at conferences.

Structure and content of the dissertation. The dissertation consists of normative references, designations and abbreviations, an introduction, two sections, a conclusion, which presents the main findings of the study, a list of literature used during the study, and an appendix. The introduction voiced the relevance of the research problem. The purpose of the study, its object and objectives were formed. The research methods, scientific novelty and practical significance are described, the main provisions submitted for defense, etc. are set out, a brief summary of the dissertation is given.

The first chapter, "Theoretical Foundations of Preparing Future Physics Teachers to Form Students' Worldviews," - the issues of forming students' worldview using an integrative approach in teaching physics are considered, the importance of interdisciplinary connections in teaching physics in higher education institutions is revealed, the fields of physics application are studied, the essence and principles of integrative teaching concepts are analyzed; the features of improving the theoretical foundations of preparing students for the formation of a worldview in teaching physics in the framework of training future physics teachers are studied.

The second chapter, "Methodology for Preparing Future Physics Teachers to Form Students' Worldviews Based on Interdisciplinary Connections," - defines the purpose and content of the model for preparing future physics teachers to form students' worldviews based on interdisciplinary connections. In the process of preparing physics teachers to form students' worldviews based on interdisciplinary connections, methods for solving problems based on interdisciplinary connections and their application are considered.

The third chapter "Experimental work on preparing a future physics teacher to form students' worldviews" - describes the progress of pedagogical experimental work on implementing the formation of students' worldviews in the process of teaching the elective course "Methodology of integrated teaching of physics" and assessing the effectiveness of forming students' worldviews based on interdisciplinary connections.

In conclusion, methods, means, and modern potential for implementation in scientific, domestic and foreign educational institutions in preparing a future physics teacher to form students' worldviews based on interdisciplinary connections are formulated.

The list of references includes 136 scientific and methodological works used in the dissertation research.

The appendices present the questionnaire questions we developed for students, diagnostic questionnaires, and supporting documents of teaching aids introduced into the educational process.