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IMPROVEMENT OF THE PROFESSIONAL AND METHODICAL TRAINING OF FUTURE PHYSICS TEACHERS

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ABSTRACT

The relevance of this study is conditioned by the fact that the law on education in the Republic of Kazakhstan was updated in 2020, which allows for considering the training of a future physics teacher from a new perspective. The purpose of this study is to develop and introduce instructional foundations for improving the system of professional and methodical training of future physics teachers in the Republic of Kazakhstan. Several models of this system are considered in detail: structural and multilevel. It has been proven that the basis of the system of methodical training for a future physics teacher is the course "Methods of teaching subjects (physics)". For this purpose, the following research methods were used: analysis and synthesis, design, logical analysis, and the positions of scientific objectivity, systematisation in the study of the professional and methodical training of future physics teachers in the Republic of Kazakhstan. The paper provides a detailed description of the analysed discipline (goals, objectives, principles of choosing the content and design of pedagogical material, and features of the organisation of the educational process). This study provides vital insights into the development and implementation of improved training systems for future physics teachers in Kazakhstan. By focusing on both theoretical and practical aspects of teacher training and aligning them with labor market demands, it sets a precedent for creating more effective and adaptable educational frameworks. These advancements not only enhance the professional competencies of future physics teachers but also promise to elevate the quality of physics education in the region, ultimately contributing to the betterment of educational standards and practices.

Keywords: professional training; physics teacher; training methods

INTRODUCTION

Future physics teachers often struggle with gaps in their knowledge of physics concepts and principles, as well as deficiencies in pedagogical competencies like utilizing effective instructional strategies, designing engaging curriculum, leveraging technology, making content relatable to students, conducting meaningful assessments, managing classrooms, and coping with heavy workloads and challenging behaviors. This leaves them unprepared for the realities of teaching physics, resulting in reduced student engagement, learning, and interest in the subject. Targeted improvements are needed in both deepening conceptual physics mastery and developing critical teaching skills through quality teacher education programs that bridge theory and practice. Addressing knowledge gaps, pedagogical weaknesses, and disconnects between university physics and secondary school teaching is crucial for equipping future physics educators with the tools they need to teach the subject successfully and foster students' scientific curiosity and capabilities.

Currently, educational organizations are seeking new types of teachers who can work creatively and successfully in the ever-changing modern school system. In the context of higher education for teachers, there are certain challen-

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ges that need to be addressed, such as aligning standards between educational and professional criteria to meet diverse expectations (Jesus & Nardi, 2019). This necessitates reorienting teacher training programs towards contemporary educational goals, ideas, content interpretations, and organizational forms (Lopes et al., 2023). It is imperative to review the current professional and methodological training system for future physics teachers in Kazakhstan. During university education, these teachers must learn independently, apply acquired knowledge in new contexts, transfer learning to solving novel educational and practical problems, and be prepared for productive, transformative activities — not merely reproductive ones. This will enable graduates to be competitive, in-demand professionals in the labor market (Darmaji et al., 2019).

The content of professional and methodological training should align with the theoretical and practical foundations of systematic, personalized, active, contextual approaches and principles. It must account for higher education's challenges (Shoiynbayeva et al., 2021). This training system aims to prepare future physics teachers for school-level physics education involving setting goals, selecting content, utilizing methods and tools, organizing activities, and evaluating outcomes (Humeniuk, 2018; Shoiynbayeva et al., 2021). The components vary based on specific conditions, like aligning objectives with standards, incorporating scientific processes, humanization, democratization, personalization, student autonomy, traditional and innovative forms, continuous assessment, and resources (Bahri & Waremra, 2018).

However, there is limited research on enhancing this training system specifically for Kazakhstan's context. Very few studies have analyzed the training components systemically or proposed comprehensive models aligned with updated educational principles. There is a lack of research evaluating current training practices, highlighting gaps, and suggesting improvements in a holistic manner. The novelty and urgency of this study lie in addressing these research gaps by conducting an in-depth systemic analysis of professional training for future physics teachers in Kazakhstan. The purpose of this study is to reveal limitations and issues and propose solutions through updated models, active learning approaches, and continuous assessments. The study has the potential to significantly improve physics education quality in Kazakhstan by creating competent, engaged teachers.

METHODS

The improvement of professional and methodical training as a process is of particular interest from the standpoint of the professional training of future physics teachers. In the research papers by Acevedo-Rincon (2020), Cameron and Grant (2017), Leta et al. (2021), Haagen-Schützenhöfer and Joham (2018), and other researchers addressed the issues of improving the training of future physics teachers, focusing on modern educational standards.

The study employs an array of research methods, including analysis and synthesis, logical analysis, design, scientific objectivity, systematization, literature review, qualitative analysis, comparative analysis, content analysis, and potential case studies, to comprehensively investigate the multifaceted landscape of professional and methodical training for future physics teachers in the context of the Republic of Kazakhstan. Collectively, these methods show how different parts of training are connected, find underlying principles, set up structured frameworks, stay neutral, group parts into categories, put them in the context of other knowledge, explain complexities, compare systems, read texts, and maybe even look into specific cases (Hansson & Leden, 2016). The research process was divided into several stages (Figure 1).

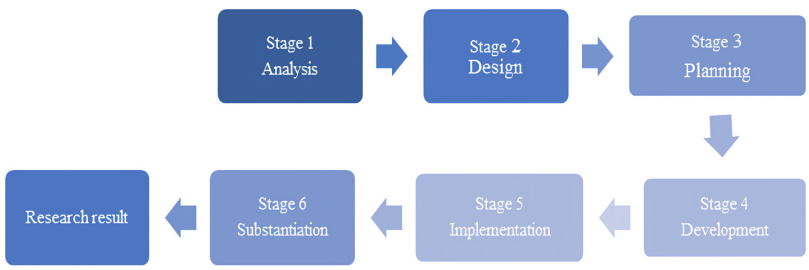

Figure 1. Stages of the Conduct of the Study

The primary method utilized was analysis, serving both as a method of scientific understanding and as a research stage (Arcoverde et al., 2022). Within this analysis, key study concepts such as "educational standard," "physics teacher," and "professional and methodical training" were dissected, while the study's sections elaborated on the structure and principal aspects of future physics teacher training. Notably, pedagogical concepts were also explored, defining pedagogy as the science governing education, youth and adult development, and the management of development in alignment with contemporary societal needs, requirements, and challenges (Khudayberganovich & Kuronboyevich, 2020).

The first stage was indicated above, after which it was transferred to the design stage, where the results of the analysis were used and a general concept of conducting a study on the topic "Improving the professional and methodical training of future physics teachers" was formed. This method allowed for the modeling of a specific prototype, the structure of the entire study, which determines the impact of each stage of the study on problems that arise at an early stage (Costa Junior et al., 2018). The planning method was also divided into several stages, since the solution of all the tasks set must be consistent and complementary; otherwise, the course of the study may not follow the intended path or stop at one of the stages if sequences are skipped or replaced. The next step was the development of a research course, which is the technical side of any study. A choice was made of the methods that would be used to achieve this goal and methods for describing materials, and the number and volume of structural elements in the project. At this stage, special attention was paid to the clear application of tools for summarising the results of the entire study and coordinating the results of the study with a goal that will determine the originality and practical side of the work performed (Sabirova et al., 2019).

The stage of research implementation allowed assessing the validity of all previous stages, i.e., the design stages and the research development stages. At this stage, the effectiveness of the methods chosen for the study was determined. The objective was achieved by supplementing the structural elements of the material with information, which was formulated during the design phase (Zhai et al., 2018).

At the third stage of the study, the theoretical and practical provisions were substantiated. The methods of scientific objectivity, systematisation, theoretical generalisation, and classification of findings were carried out. The design of the research materials for the entire study has been developed.

RESULTS AND DISCUSSION

The entire cultural component of the preparatory training of the future teacher is based on the knowledge in the fields of cultural studies, philosophy, and sociology that students acquired during the study of the courses "Cultural Studies", "Philosophy", "Sociology". The basis of the psychological and pedagogical component is the skills, knowledge, and abilities in the field of psychology and pedagogy, which are formed by students during the study of the courses "Psychology" and "Pedagogy". The subject-educational component is represented by the skills and knowledge that students acquire when studying the main subjects "General and experimental physics", "Theoretical physics", and the optional courses "Physics of natural phenomena", "History of physics", "Real problems of the science of physics", "Methods of cognition in science", "Integration processes in the teaching of natural sciences", "Physics in the context of the modern natural world" and many other disciplines, the content of which is the material focused on the value of nature (for example, a cultural element of the course of general physics, an element of regional content; material containing philosophical, methodological, historical, scientific, and other knowledge) (Tokarev, 2019).

The content of the theoretical component of training is determined by the knowledge and skills that future teachers possess when considering: (1) the issues of discipline and the laws of the state educational standard "Methods of teaching subjects (physics)"; (2) the presence in future physics teachers of orientation to the values of education in the field of methods of teaching physics and the values of education in physics (Bolshakova et al., 2019); (3) knowledge and skills acquired by students during the qualification courses of methodical courses "Methods of modern physics experience", "Solution of physical problems", "Development of students when teaching physics at school", "Technology of physics at school", "Modern technologies", "Modern means of evaluating the results of teaching physics and mathematics", "Management projects and research activities of students in extracurricular activities", "Modern physics course at school", and other disciplines. The skills, knowledge, and abilities acquired by students in the application of the theoretical part of the training of future physics teachers are used in the teaching of the 4th and 5th courses (during the practical component of training).

The basis of the research component is the skills and knowledge acquired by students during the course "Basic principles of research work in the field of teaching physics and mathematics" and the implementation of specific research offered to students in the course "Methods of teaching subjects (physics)", methodical faculties (Kabbassova et al., 2021). The research component of targeted training contributes to the creative understanding of students as future physics teachers of their own activities to implement the process of teaching physics to students, their creative self-actualisation. The content of this component is aimed at organising the creative work of future physics teachers, the result of which may be, for example, the creation of an original pedagogical system on the problems of teaching physics to students at school.

The structural model of the system of methodical training of a future physics teacher should be integrated with the mattress model to identify the content, organisational, procedural, and personal training, and the features of training future physics teachers. Next, the study considers a more detailed system-level model of methodical training for a future physics teacher. When constructing this model, the authors relied on the model of preparing students for teaching physics in an interdisciplinary school, proposed by Dammer et al. (2022), and on the model of the level of preparation of a future physics teacher for research activities. The model of the level of the system of methodical training of the future physics teacher, presented at the level of appearance, is generalised. This model has three aspects: basic, organisational, procedural, and personal.

An important aspect of teaching is the problem blocks that form the content of the methodical training of the future physics teacher: the goals and objectives of the methodical training of the future physics teacher. Theoretical foundations of the methodology of teaching physics (general and particular, methodical issues of teaching physics), schools of physical experiment. Organisational and procedural training determines the possibility of organising methodical training of a future physics teacher through the educational system when independently performing tasks in the classroom and outside of school, in pedagogical practice, when developing qualifications, diploma courses, documents, etc. (Mansurjonovich, 2022). In addition, the organisational and procedural aspects of training determine the specifics of the organisation of the process of monitoring the basic principles of methodical activity of students (Nasri et al., 2023). These functions include a modular assessment system for organising the educational process and building an individual educational trajectory for each student.

The aspect of the personal level of training allows for considering the methodical training of a future physics teacher, taking into account the personal qualities of the student. This allows each student to master the basics of instructional work and study the problems of the school physics course, contributing to the development of a generalised methodology and research activity for a future physics teacher at a sufficient level that meets their personal capabilities, interests, and needs (Semenikhina et al., 2021).

From an organisational standpoint, this is possible if the methodical education of a future physics teacher has one level of character: the level of general basic training (level 1) – within the legal branches of the federal state educational standard. The level of group training (level 2) – in accordance with the methodical structure and specialisation, is focused on methodical courses, performing creative tasks in the pedagogical practice of students in the 4th and 5th years of study. The level of individual training (level 3) is the organisation of educational and research work with individual students during the course and final qualification work. Thus, this model is personality-oriented, since the student as a future physics teacher is the object of training and their own development (Jons & Airey, 2023).

At the first level (the level of general basic education), it is assumed that all students will develop knowledge and skills corresponding to school education (Kozar et al., 2017). At the second level (the level of group training), there is a constant development of skills, a gradual expansion of knowledge and skills about the problems of a school physics course, and their creative application in new non-standard situations for some students who have shown an increased interest in these problems. At the third level, individual preparation of students for performing education tasks in physics is carried out during the preparation of lessons and final qualification work (Salmerón Aroca et al., 2023). The creative work of students at the third level consists of creating their own original methodical system. This may be the development of a programme of activities for a physics teacher for the establishment of universal educational actions for students in the field of teaching physics at school. Creation of a system of personal lessons; scientific and methodical analysis of the topic of the school physics course, which is based on an individual approach to the student; development of their own technology for teaching physics.

As mentioned above, the basis of the system of methodical training for a future physics teacher is the compulsory subject "Methods of teaching subjects (physics)". Next, the study will consider this subject in more detail. The organisation of the educational process within the framework of the course "Methods of teaching subjects (physics)" is aimed at the implementation of the subject and personal goals listed below (John Scheid, 2016):

(1) The considered goals are to master the scientific and pedagogical framework and value orientations in the field of teaching methods and knowledge of the content and organisation of the educational process in physics in educational institutions in general and the content of the professional activities of future physics teachers (Pérez Gracia et al., 2019). Establishment of an educational level corresponding to the personal potential, interests, and needs of students, and the opportunity to start their professional career as a physics teacher.

(2) Goals: development of logical skills, analysis, critical thinking, and readiness for personal development.

(3) Training in personnel decision-making and the development of general abilities: communication and cooperation, accuracy, and productivity in solving problems; assistance to the development of the personality of a future physics teacher, in particular, the development of personal and professional positions as a necessary condition for the effective organisation of the educational process at school.

(4) The implementation of goals is carried out with the help of certain tasks: the accumulation of knowledge about the theoretical foundations of the methodology of teaching physics (setting goals, choosing and designing the content of a physics course, the technology of teaching physics, etc.); the accumulation of knowledge about the application of a theoretical framework; conducting pedagogical research; understanding personal work) (Larsson, 2021).

When choosing the content of the discipline and the organisation of the educational material, the following was taken into account (Ismailov, 2022): (1) reflection of the processes taking place in science (fundamentality, humanisation, integration and interaction of sciences, various forms of knowledge, and research methods); (2) the idea of studying the basic methods of teaching physics, preparing for solving professional problems of the school physics course, personal and professional development, as a necessary condition for the effective organisation of the educational process at school (Pérez-Martínez et al., 2021); (3) the correspondence of the value of methodological knowledge in science, practice, and research – the functions of this knowledge (scientific-theoretical, ideological, value-oriented, constructive, predictive, reflexive).

As regulators of content selection and organisation of courses, the principles governing the standards that contain requirements for the level of training of future teachers focus on the desire to participate in teaching activities in the context of contemporary schooling. This includes the following principles (Bitzenbauer & Meyn, 2021): (1) the decisive organisational principle in education, upbringing, and profession is the sustainable motivation to implement the methodology of independent research as a physics teacher based on the implementation of ideas of personal education with the participation of various forms of organisational training; (2) meaningful and procedural integration of training a future physics teacher (Hernández-Silva et al., 2017): training of the future teacher of the primary discipline (physics) and the psychological and pedagogical disciplines.

An important aspect of understanding the future development of different kinds of skills for the physics teacher is the study of the principles of teacher training (Table 1).

Improving the training of future physics teachers is of utmost importance to ensure a high-quality science education system. When teachers receive better training, they become better equipped to effectively impart knowledge, skills, and enthusiasm for physics to their students (Batsurovska & Dotsenko, 2022). This, in turn, can significantly impact students' learning experiences and their overall interest in science. To achieve this, it is essential to update the physics curriculum and teaching approaches.

Table 1. Principles of Physics Teacher Training in the Science Context

Principles	Description
Fundamentality	Concentrating educational material around the main ideas forms the core of the lesson. This principle ensures that essential concepts are thoroughly understood by future physics teachers during their professional training.
Humanisation	Promoting a dialogical approach to the educational process, encouraging self-discovery and self-organization, control, and self-control. The principle emphasizes interactive learning, allowing students to explore various perspectives and attitudes during their research activities.
Practical (technical) orientation	Focusing on the practical application of methodical connections between science and practice. This principle emphasizes the relevance of real-world applications and the practical implications of physics concepts in the classroom setting.
Integrity of the course	Ensuring unity among different parts of the physics course, with a clear succession of ideas, relations, and fundamental concepts. This principle emphasizes the interconnections between physics and other disciplines, such as psychology and pedagogy.
Modular design	Structuring the course content in a holistic manner with modular units that can be flexibly adjusted. The principle of modular design allows for the incorporation of additional elements to cater to specific learning needs and create adaptable blocks of information.
Differentiation of levels	Acknowledging the diverse characteristics of future physics teachers' professional development and providing educational material on different levels (basic, advanced, in-depth). This principle ensures that the training addresses individual learning needs effectively.

Source: compiled by the author based on Malavoloneque and Costa (2022)

The curriculum should be aligned with the latest scientific discoveries and developments, reflecting the dynamic nature of the field (Bonnes & Hochholdinger, 2020). By incorporating cutting-edge research and emerging scientific knowledge into the curriculum, future physics teachers can provide students with up-to-date and relevant information, fostering a deeper understanding of scientific concepts.

Hands-on and inquiry-based learning approaches are vital components of effective physics education. Encouraging future physics teachers to use hands-on experiments, problem-solving activities, and open-ended investigations can engage students actively in the learning process. This approach allows students to explore physics principles firsthand, igniting their curiosity and critical thinking skills (Kovrizhnykh, 2022). In today's digital age, technology plays a significant role in education. Future physics teachers need to be proficient in using educational technology to enhance their teaching methods. Integrating technology into the classroom can make learning more interactive, visual, and enjoyable for students. Virtual simulations, online resources, and multimedia presentations can bring complex scientific concepts to life and make them more accessible to learners.

Inspiring passion for science is at the heart of effective physics teaching. Future physics teachers should be enthusiastic about the subject and be able to convey that passion to their students. A passionate teacher can ignite a love for science in their students, motivating them to explore and pursue careers in STEM fields (Campos-Nava et al., 2021; Wood, 2023). A comprehensive approach to improving the training of future physics teachers involves updating the curriculum, embracing hands-on and inquiry-based learning, integrating technology, developing pedagogical skills, promoting reflective practice, fostering collaboration and mentorship, providing continuous professional development, employing research-informed teaching practices, inspiring passion for science, and implementing effective teaching assessment. These efforts collectively contribute to a more engaging, effective, and inspiring science education system that nurtures the next generation of scientists and innovators (Silva André & da Silva, 2022).

The study proposes structural and multilevel models for physics teacher training in Kazakhstan. These models align with previous research showing the importance of incorporating diverse components like subject knowledge, pedagogy, theory, and practice (Tokarev, 2019; Shoiynbayeva et al., 2021). It emphasizes active learning approaches in physics methodology courses. This aligns with evidence that problem-based activities, discussions, and simulations enhance engagement and learning (Costa Junior et al., 2018; Dammer et al., 2022). The principles outlined for teacher training, like fundamentality, integration, and differentiation, have been highlighted in other studies as important for quality physics education (Abend, 2018; Malavoloneque & Costa, 2022).

The study recommends preliminary, formative, and summative assessments using diverse tools. Similar multifaceted evaluation frameworks have proven effective for gauging physics teaching competence (Sultanova et al., 2020; Arevalo & Terrazzan, 2020). It underscores continuous professional development for physics teachers. Many studies confirm that ongoing training and self-education are key to successful teaching (Buabeng et al., 2018; Bonnes & Hochholdinger, 2020). The proposed systemic analysis, models, active learning approaches, and assessment tools align with and build on previous research on physics teacher preparation. The findings are supported by evidence from studies focused on specialized training components, instructional principles, and professional skills evaluation.

The content of the course "Methods of teaching subjects (physics)", selected in accordance with the above principles, is aimed at familiarising students (future teachers) with the theoretical principles of the methodology of teaching physics, with the logic and methods of pedagogical research, and is used when considering the problems of the school physics course; it provides for the development of methodical activities of students in the field of physics. The organisation of the educational process within the framework of the discipline "Methods of teaching subjects (physics)" lectures, seminars, practical classes, and lab classes, where future physics specialists independently work on the introduction of teaching methods for future physics teachers, has a number of features (Prada-Núñez et al., 2020): (1) modular organisation and nominal cost of the educational process; (2) implementation of the idea of variability and differentiation of levels in the organisation of courses; (3) use of contextual and personally active approaches in the organisation of educational, cognitive and educational-professional activities of students; (4) flexible and changeable management of students' educational activities in the classroom; problems and dialogue of the educational process (Carli et al., 2023); (5) participation of students in the educational process as interested parties; (6) use of active and interactive forms and methods of teaching in the organisation of the educational process in the classroom; (7) inclusion in the content of courses of a special curriculum – a set of pedagogical tasks; (8) practical thinking and self-assessment of students in the classroom (Dammer et al., 2018).

Next, the study will consider these features.

(1) A system for evaluating the modular organisation of the entire educational process has been developed. The main purpose of the modular system for evaluating the organisation of the educational process is the most effective application of the methodology of preparing a future physics teacher for school educational education and creating more favourable conditions for the development of the student's personality as a future physics teacher. This is possible by integrating each individual student into training at the level of social activity, taking into account the construction of an individual educational trajectory that allows each student to achieve a level of technical and professional education that corresponds to their personal composition, abilities, interests, and needs as a future specialist (Buabeng et al., 2018).

(2) Implementation of the idea of variability and differentiation of levels in the organisation of disciplinary courses. The implementation of the idea of variability allows students to independently choose the course of study for the material in the classroom. According to the idea of level differentiation, students are invited to study the material at the basic, intermediate, or advanced levels.

(3) Implementation of contextual and personal approaches in the organisation of educational, cognitive, educational, and professional activities of students. Admittedly, the educational, cognitive, didactic, and professional activities of future specialists have a number of features: structure, goals, means and methods of solving problems, analysis, and evaluation of activities. The content aimed at achieving the main goal of promoting the development of the professional competence of future teachers, as a result, the contextual use of classroom learning technology is focused on achieving this goal (Mahdi et al., 2014). This contributes to the improvement of the creative nature of students' activities, the development of the creative personality of the futu-

re physics teacher, and provides opportunities for self-development and self-realisation.

(4) Introduction of flexible management of students' learning activities in the classroom. Flexible and changeable management of students' educational activities is aimed at mastering the main methodical activities, preparing the future physics teacher for research activities on the problems of the school physics course (Mahligawati et al., 2023). This includes creating conditions for the development of cultural methods among schoolchildren, important professional and personal characteristics necessary for the successful career of future physics teachers, orientation and value attitude to the problems of the school physics course by including methodological knowledge, skills, and abilities of students related to the generalised study of nature in the context of future professional activity.

(5) Problems of dialogue and the educational process. The solution to the problem situation used in the classroom determines the principle of intensive mental activity, the manifestation of independence in students. Often, solving problems leads to original, non-standard ways of activity and results. The form of dialogue allows all students to have a dialogue, both with themselves and with other students, with the teacher in the classroom, and when doing homework.

(6) Participation of students in the educational process as subjects of activity. Future physics teachers should participate in the educational process in the classroom as a subject of educational activity, which contributes to the establishment of thematic links, including for students, teachers, and students, and improves the cognitive abilities of students.

(7) The use of active and interactive forms and methods of teaching in the organisation of the educational process in the classroom. When studying theoretical material on the course "Methods of teaching subjects (physics)", active and interactive forms of training should be used (problem lesson, conference, press conference, etc.), and active and interactive forms of training: modelling and simulation of games, seminar-discussion, research, defence of research programmes, solving educational problems, acquaintance with the situation presented in a particular case, on a specific topic, development, substantiation and defence of a specific curriculum on topical issues of the school physics course, etc., in lab classes, students can be offered various types of physical experiments, although it is recommended to use training technologies in their work. The last lesson is recommended to be conducted in the form of a corporate game, where each student acting as a physics teacher is shown a fragment of a physics lesson, including a school physical experiment (Ke et al., 2023). The use of active and interactive forms and methods of teaching contributes to the development of professional skills, the process of personal and professional self-development of the future physics teacher, and their personal and professional actualisation as competent, creative individuals who are able to actively improve themselves.

(8) The inclusion of a number of educational and methodical tasks in the content of the lesson. In the classroom, it is necessary to use a set of educational activities as a special pedagogical tool that provides active training of future physics teachers in business methods through the formation of didactic skills and to study the problems of the school physics course with the development of general research skills.

(9) Implementation of thinking and self-assessment by students in the classroom. When conducting classes, students should be offered special diagnostic programmes; questions for reflection and self-assessment should be considered according to their own methodical training in physics. System thinking and self-assessment allow students to independently analyse and adjust planned goals aimed at mastering methodical actions, compare planned and achieved goals, and conduct a self-assessment of their activities.

As mentioned earlier, one of the main components of the system of methodical training for future physics teachers is the task of the future physics teacher to assess the results of the implemented educational process. According to the state educational standard of higher professional education, a future physics teacher should, first of all, assess professional skills. Assessment of the level of professional skills of future specialists should be carried out based on several types of testing: preliminary, current, midterm, and final (Parmanov, 2023).

Next, the study considers the goals and essence of the above types of control used in the framework of the course "Methods of teaching subjects (physics)". The purpose of the preliminary testing is to record the initial level of education of all students, including the teachers of the courses "Pedagogy", "Psychology", their existing knowledge and skills related to future teaching activities. This type of control is of great importance for identifying the cognitive abilities of students and applying individualisation and differentiation of diagnostics of the initial state of students' learning to track their further progress in learning (that is, the dynamics of learning) (Foppoli et al., 2019).

The purpose of the current testing is to systematically monitor and evaluate the progress of students in specific subjects in individual classes, regularly manage the educational activities of students, and adjust them. It provides constant information about the progress and quality of the educational material and, based on this, quickly makes changes to the educational process. A midterm examination is aimed at checking the strength of the assimilation of acquired knowledge and skills, as it is carried out after a long period of training (Berikkhanova et al., 2022). The midterm examination is carried out after studying the modules and sections and is aimed at systematisation and generalisation of students' knowledge. By teaching a holistic vision of a large block of educational information and related activities, the quality of the student's assimilation of the structural basis and the relationship of the target section, their personal educational growth in previously identified areas is diagnosed (Kozlovska et al., 2020).

The purpose of the final test is to identify and evaluate the knowledge, skills, and abilities of students in the discipline as a whole. The final examination is conducted at the end of the disciplinary study and includes full control over the implementation of all key discipline issues throughout the course. Thus, the system of evaluation tools for the establishment of professional skills in a future physics teacher in the course "Methods of teaching subjects (physics)" should structurally consist of four elements: means of evaluating the previous control; means of evaluating the current control; means of evaluating the control threshold; and means of evaluating the final control (Arevalo & Terrazzan, 2020).

The fund of assessment tools should include conventional tools (testing, laboratory, practical work, research, oral and written exams, interviews, exams, and other tools). Innovative enterprises, role-playing games, standardised tests, methodical plans, portfolios, situational analysis, pedagogical specifications, essays, and other forms of certification (Ivanchenko & Kanibolotska, 2017). To conduct a preliminary knowledge audit, it is recommended to use the following forms of certification: tests and control sections of knowledge on individual topics. To conduct an audit, it is necessary to apply the following forms of certification: methods and tasks, methodical standards, assignments, methodological, creative, tests, group projects, tasks, creative journals, essays, cases, business games, discussions, educational, and situational modelling based on situation-oriented practice (Dragnić-Cindrić et al., 2023). The midterm examination should include the following forms of certification: presentation of academic work developed by students, monitoring of work, corporate game (generalisation lesson), final testing, interview, and round table. For the final exam, it is recommended to use the following forms of certification: portfolio presentation, testing, which involve the development and presentation of a scientific and methodical analysis of a particular topic of a school physics course (Sultanova et al., 2020).

Notably, in modern socio-cultural conditions, an increasingly common approach states that the essence of any education is self-education. Today, instead of the classical ideas about the possibility of forming a versatile personality, there is an understanding of the fundamental imperfection of human education. The flow of professional information is not only increasing but also qualitatively updating, so personal growth is recognised as the main value of education (Batyrbekova et al., 2020). The need for self-education as a special form of professional activity and as a way of life for a person in a developed information space, is steadily growing. The establishment of professional competence among future physics teachers is a cyclical process, since in the process of training, professionalism must constantly increase, and each time these stages are repeated, but with a new quality (Qurbonov, 2023). As a rule, the process of personal development is biologically dependent and is associated with the socialisation and individualisation of a person who consciously organises their own life and, consequently, their own development.

The process of forming professional competence in future physics teachers also strongly depends on the environment, so the environment should contribute to professional personal growth. It is clear that the solution to the main problems of general education depends primarily on the professional competence of the teaching staff (Yekimov et al., 2022). One thing is clear: only teachers with a high degree of professionalism can educate a person with a modern mindset who can successfully fulfill themselves in life. The concept of professionalism includes not only the professional, communicative, informational, and legal components of the teacher's competence but also the potential personality of the teacher, the system of professional values, their beliefs, and prerequisites that give high-quality educational results of integrity (Abend, 2018).

The researchers emphasise the importance of using different assessment tools in physics teaching, from traditional approaches to innovative methods. With the development of technology, the evolutionary nature of education is also noted, in which self-education and continuous personal growth are of paramount importance for future physics teachers. The environment is the most important factor in the formation of the teacher's professional competence and the improvement of the teacher's effectiveness. In turn, continuous professional development implies the use of effective educational assessment strategies and teacher development programmes that highlight key elements for achieving high performance in physics teaching and producing competent and committed physics teachers.

CONCLUSION

This research underscores the importance of enhancing the professional and methodological training of future physics teachers in Kazakhstan and adapting it to meet labor market needs and individual institutions' requirements. The study also highlights the necessity of developing specific professional skills by engaging all stakeholders in the educational process. Ongoing evaluation is critical for ensuring training effectiveness and preparing competent, successful teachers capable of addressing modern education's challenges. The key purposes of this study were to analyze the current training system for future physics teachers in Kazakhstan, identify limitations and gaps, propose solutions through systemic models and active learning approaches, and develop frameworks for continuous skills assessment. The findings make important contributions towards these goals by providing a detailed investigation of training components, principles, instructional methods, and evaluative tools specifically tailored to the Kazakh context. The study's novelty lies in its systemic analysis of physics teacher preparation, presentation of updated models and techniques, alignment with labor demands, focus on professional skill-building, emphasis on continuous evaluation, and consideration of personal qualities and stakeholder involvement. These novel aspects can significantly improve physics education quality in Kazakhstan by developing well-prepared, engaging physics teachers to ultimately benefit students and the education system. Further research can build on these findings to continuously enhance physics teacher training. But this study represents an important step in revealing current issues and proposing research-based solutions.

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