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Methodological foundations of the continuity of teaching the physics course in the "school-university" system

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Abstract

Relevance. The relevance of this study lies in the fact that ensuring the continuity of education plays an important role in the modernisation of the education system in the Republic of Kazakhstan and requires a detailed study of the updated content of physics lessons in the "school-university" structure.

Purpose. The primary aim is to analyze the methodological foundations for ensuring continuity in physics education within the "school-university" system in Kazakhstan. This involves examining the educational standards and practices at both school and university levels to identify and implement effective methods for seamless educational progression.

Methodology. The methodological basis of this study was formed by psychological, philosophical and pedagogical concepts of cognition of the educational process, and methodological foundations of physics and definitions of didactics, achievements and directions of theory and teaching methods of the modern physics course.

Results. The study reveals a need for methodological adjustments in teaching physics to ensure a coherent educational trajectory from school to university. Key findings include the significance of developing educational programs that foster scientific thinking, adapt to students' physiological development, and incorporate modern technological advancements. The analysis also underscores the importance of interdisciplinary integration and the cultivation of critical thinking and problem-solving skills among students.

Conclusions. The materials of this article can be used by teachers of universities of the Republic of Kazakhstan to prepare materials for teaching physics. The presented material may also be of interest to students in the direction of "Natural science disciplines" during preparation for seminars and practical classes that are preparing to teach physics as a science in the future.

Keywords: educational process; basic level; physics teacher; preparatory courses; cooperation; self-determination.

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Introduction

The last decade of the last century was a very significant period for the Republic of Kazakhstan in the analysis and development of educational issues. These years are considered to be the revival of the social and educational movement, which led to educational reforms and, consequently, to a huge innovative work of teachers. In the last decade, conditioned upon the rapid development of science, the amount of new knowledge has increased significantly. This is what has increased the role of fundamental science, including in the methodology of studying the course of physics. The education system of the Republic of Kazakhstan currently has several interrelated components: programmes, state standards and requirements, institutions and organisations, management bodies. A necessary condition for the development of continuous modern education is, first of all, the continuity of the educational process at different levels and directions. Continuity in education is a system of connections that ensures the interaction of the most important tasks, content, methods of teaching and development for the organisation of a single continuous process of education at adjacent stages of development of students. The most important condition for the continuity of education is a methodical approach to cognition and practical actions at school and university, which today is a system of multi-stage additional education "school – university". The continuity of this educational chain is based on a combination of values and goals, content, forms, methods and results of education and upbringing [1-3].

Research in the field of nanotechnology, physics and evolutionary processes has significantly accelerated the development and progress of modern technologies. Thanks to the achievements of science and the creation of new technologies, the engineering profession has become prestigious and in demand [4-7]. A modern specialist in the Republic of Kazakhstan is a creative person with important professional knowledge and skills, ready to quickly adapt to new types and conditions of professional activity. Thinking skills, research skills, the ability to apply theoretical knowledge to solve practical problems are instilled in future specialists from the first year of study at the university in the field of natural sciences, in particular physics. Physical knowledge is also the basis of general and special disciplines (for example, radio engineering, electronics, electrical engineering, etc.) [8; 9]. Generalisation of the experience of pedagogical higher education, analysis of modern pedagogical and scientific and methodological literature shows that the modernisation of school education of the physics course does not always correspond to the expected result [10; 11]. Despite efforts to ensure continuity between school and university education, students who have just entered the university are overwhelmed by a huge flow of theoretical material, to which it is difficult to adapt at the beginning of their studies. This is preceded by many reasons. Firstly, in school, unlike university, they teach only the basics of knowledge of the theory of physics. Secondly, the degree of didacticism of topics is closely connected with the mathematical training of students who do not always comply with the methodological requirements of studying some areas of physics at school and university. Thirdly,

teaching methods and the complexity of the educational material should consider the age characteristics of students [12-15].

As it is known, the state component of the state standard for teaching physics includes a mandatory content minimum of basic educational programmes for schools and higher educational institutions of the Republic of Kazakhstan. This document specifies the meaning of the subject "Physics" in the curriculum, gives a general description of the subject, highlights the tasks of teaching in physics lessons, indicates the general skills and abilities that are taught after training, shows the content of training [16; 17]. Thus, the quality of the physics course determines the qualification level of a young specialist, which is required by the modern economy of the Republic of Kazakhstan. Continuity plays a special role in teaching physics through a combination of school and university offers. The introduction of continuity for students not only saves academic time for further study of a new subject, but also contributes to a faster "acclimatisation" of new students, which is certainly important for the development of their personality [18; 19].

The purpose of the entire study is to analyse the methodological foundations of the continuity of the physics course in the "school-university" education system in the Republic of Kazakhstan.

Materials and Methods

The reform of the current school and higher education in the Republic of Kazakhstan is caused by global modifications in the modern post-industrial society, associated with the emergence of new technologies and electronic devices, the growth of information, the coexistence of diverse cultures and the acceleration of the rhythm of life. The methodological basis of this study was the scientific works of the following scientists: M.V. Vedishenkova, E.V. Efimova, E.V. Ryabova [3], R.S. Nagovitsyn, O.E. Danilov, A.V. Tutolmin [4], N. Babic [6], J. Bezemer and G. Kress [11], A. Villani, E. Barolli, W.E. Nascimento [13], R. Araujo, V.S. Dias [15], X. Zhai, M. Zhang, M. Li [18], A. Siorenta and A. Jimoyiannis [20] and many others who studied the standards of education (physics course) at the present stage in the Republic of Kazakhstan.

The main method in conducting this study was the analytical method, which was used as a method of scientific cognition, including as one of the stages of research. This method of scientific cognition consists in figurative division of an object into components in order to study them in detail according to different criteria. The analysis takes into account central research terms such as "continuity of learning", "educational process", "physics course", "pedagogical concepts of cognition", the structure and principles of the concept of continuity, all this is reflected in the paragraphs of this article. There is also a list of future results of the study of the material, its correlation with the actual results obtained in the "Conclusions" section. Methods of analysis that allow to achieve the purpose of the study, namely, technologies that provide the process of additional education in physics in the "school-university" system in the Republic of Kazakhstan. The process of this study itself was divided

into three stages, the first of which was already mentioned above, after which the study moved to the design stage, where the results of the analysis stage were used and the general concept of the study was presented. This method allowed simulating a specific prototype, the structure of the entire study, to determine the impact of each stage of the study on the tasks set at the initial stage.

The design method is also divided into several stages, because the solution of all tasks must be consistent and complementary, otherwise the course of the entire study may "make a move" not according to the intended trajectory or stop at one of the stages, in case of skipping or substitution of components and the sequence of all actions. The next step at this stage was to develop the course of the study, reflecting the technical side of any study. The selection of methods of scientific cognition that will be used to achieve this goal, and methods of presentation of the material, the number and volume of structural elements of this article was made. At this stage, special interest is paid to the establishment of tools for summing up the results of the study and the correspondence of the final information of the study on the topic to the set goal, which will give the probability to designate the novelty and practical importance of the work done. At the last stage of the study, the theoretical and practical aspects of the entire study were clarified. The results of the entire study were worked out, theoretically generalized, systematised and classified into a holistic material of a scientific and pedagogical article.

Results

During the historical development, people discovered many laws of nature. Each of us is more or less able to understand the world around us. However, if a person did not have the opportunity to study the laws of the world, it is unlikely that science would have played such a decisive role in his life, all this allowed humanity to lay the foundations of science. Of course, it is impossible to get all the knowledge at school, not only because of time constraints, but also because of the age characteristics of the students. Thus, the school provides a superficial knowledge base that can be supplemented during higher education. In this sense, the issue of continuity of education in the "school-university" system becomes relevant. Continuity in the content of teaching the subject, and continuity in teaching as a whole, assumes as a basis on the studied material the use and further development of existing knowledge, skills and abilities among students, the acquisition of new ones, based on the study of selected and recorded in the educational material in accordance with the socio-pedagogical forecasting of educational information [6]. Consequently, consistency in the content of teaching implies reasonable control and promotion of all material in academic disciplines (educational and program documentation of textbooks, manuals for practical classes, didactic materials, etc.).

The main and initial point in the implementation of continuity in the content of teaching a physics course is the development of educational programmes. The provision of continuity in the system of general and professional teaching allows the implementation of the principle of integration, in which the consistency and continuity of all links of the educational process is noticed. During the

study of the issues, the materials of many popular scientists were studied and analysed, and under the influence of this material, a methodology for designing educational programmes was formed considering the needs of the labour market, which is based on the following principles [7]:

1. The principle of scientific and age differences. Scrupulous control of transmitting fundamental knowledge, currently characterised principles, the establishment of burning concepts used in modern science. The ratio of the material provided to the degree of preparation of students for learning, the degree of physiological development and processes related to the student's psyche (attention, perception, thinking, etc.).

2. The principle of integration. Mutual integration of subjects of natural sciences in higher education with the content of mathematics, physics, chemistry, biology, geography in secondary school in connection with the industrial and innovative development of society, training of future teachers in accordance with their professions. Integration is the unification of a content system consisting of subjects similar in content in order to transfer knowledge from one of them to another to meet their enlargement and deepening. Through the principle of integration, it is possible to form ideas about the unity of the world, the interrelation of its phenomena. Integration of secondary school and high school ensures continuity in the content of general secondary education and higher education; transition from in-depth study of the content of the school course to the content of basic disciplines and the profile cycle of 1-2 bachelor's courses; strengthening the content of knowledge and methodological disciplines in accordance with the actualisation of secondary education in the cycle of specialties.

3. The principle of interdisciplinary relations. This principle presupposes the comprehensive use of knowledge obtained in basic and specialised disciplines in any lesson, i.e. it is recommended to effectively use the knowledge obtained in disciplines designed for a deeper study of the content of the school course on the subject of teaching methods. This contributes to the unification of the content of fundamental academic disciplines, the search for relationships with methodological disciplines, the development of professional and methodological training of students, logic games.

4. The principle of implementing the updated content of secondary education. This principle presupposes the preparation of students for their future profession using updated content in natural sciences, the latest teaching methods and technologies, active teaching methods, and the organisation of the educational process, i.e. the organisation of teaching methodological disciplines carried out in accordance with the updated content. This contributes to the solution of various tasks of higher pedagogical education, considering the peculiarities of the updated content of education, the development of the intensity of problem solving.

5. The principle of productive creativity. The content of the educational programme is aimed not only at teaching and educating discipline, but also at developing the creative activity of students. This develops at different times conditioned upon the development of students' heuristic abilities, the development of educational

activities, interests and abilities, critical thinking, a wide range of skills, the use of information technology, etc., the issuance of tasks aimed at creating new results.

6. The principle of culture. The content of any discipline involves improving the general culture of students, their spiritual, moral and social consciousness. This includes the gradual development of various relationships, starting with family hygiene, coverage of cultural centers, achievements of people in any field, not only within the republic, but throughout the history of mankind.

7. The principle of "geographical location". This principle requires studying each section of the discipline in connection with local materials. This, of course, requires a methodical search for teachers and a large amount of additional materials.

8. The principle of practice. In accordance with the updated content of education, it is necessary to develop functional literacy of students, implement practical directions of the content of each discipline, solve real life situations. Conditions are being created in higher educational institutions to meet the requirements of training and education in all specialties of natural science education through the implementation of updated educational programmes in compliance with such didactic principles. In the process of training, the issue of ensuring high-quality training of future teachers is realised based on the implementation of these didactic principles [8].

Based on the data provided by many modern scientists, monitoring at the initial stages of higher education revealed the following problems related to the continuity of the physics course: misunderstanding of the structure and logic of the subject; slow assimilation and application of knowledge; inability to combine old and new knowledge; limited knowledge transfer. No other profession makes such high demands on a person as the profession of a teacher. And in modern conditions, these requirements have become even more stringent, since there is a new professional standard. Let's take a closer look at what tasks of modern school education require fundamental changes in the professional thinking of physics teachers, and what problems arise in their preparation for higher professional education. A graduate of a modern school, in addition to basic knowledge, should have the ability to analyse emerging problems, understand the essence and solve problems in a broader sense. These requirements are formulated in the state standard of secondary education through general education activities. However, in practice, the implementation of these requirements faces objectively existing difficulties, including the need to consider new features of modern human thinking. Such properties existed before, but they have both positive and negative manifestations [9]: a tendency to uncertainty, a change in the ratio of rational and irrational components, including displacement.

Their consideration requires such changes in the ways and conditions of knowledge and skills transfer to compensate for objective shortcomings in the field of intellectual activity. One of the main characteristics of a successful modern person is the ability to build a chain of sequential actions from the existing situation to the goal. The development of such chains does not imply the presence of a "framework", but increases the long-term

thinking, that is, the need to develop analytical abilities. These qualities are traits of scientific thinking, the possession of which, at least for some, becomes a competitive advantage. This is one of the most important tasks of education for everyone, not just for a select few. In addition, to prepare a person not only for professional activity, but also for life in general, it is necessary to form a worldview with an adequate scientific worldview corresponding to the content of science at this historical stage of its development. The analysis of methodological principles is very important for an adequate understanding of the problem of continuity, its psychological, pedagogical and organizational aspects. The methodological principles of continuity in the process of development are the dialectical laws of unity and struggle of opposites, the transition from quantitative to qualitative changes and the negation of negation. This last law plays a special role. As you know, the new negates the old, but it gradually becomes old and then retains its characteristics [10].

The general guidelines for continuity in the development of such sciences as pedagogy and psychology are being implemented. Pedagogy should focus not on yesterday, but on the future development of students' personality. Only then will they be able to transfer those development processes that are now in the sphere of direct development, the learning process. In support of this standpoint, it is worth noting that education and school development are as closely linked as the sphere of direct development and the level of modern development. Recently, they have played an important role in understanding the nature of continuity in building a system of lifelong learning and reforming higher education. The positions of humanisation of all educational structures are defended. Therefore, there are relatively new models of building the educational process based on the patterns of student development, the development of his social activity. The problem of continuity in education is complex, its solution requires the joint efforts of specialists in various fields: doctors, psychologists, teachers, sociologists and others (Figure 1).

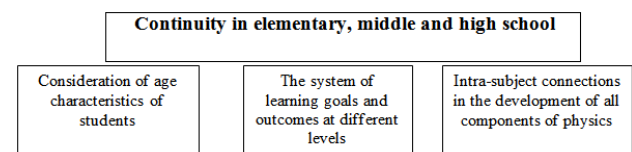


Figure 1. Continuity in teaching the physics course in the school system

The efforts of Kazakh scientists to solve the problem of introducing such a process as continuity into the educational process have identified a number of collective features of its use in the "school-university" system [11]: the introduction of higher education configurations in the form of lecture material and practical seminars, the process of organising conditions in schools of the Republic of Kazakhstan for further development of the educational process in physics in higher the need for careful coordination of the content of the discipline in a logical and chronological order at all levels of education at school; considering the personal characteristics of students at different levels of modern education. The role of physics

in the system of education in secondary schools is determined by the specific features of physics "as one of the sciences in the system of sciences". Today physics is the so-called nodal key of knowledge about the world around us, the backbone of scientific and technological progress, one of the essential components of human culture. Physics is a theoretical science that reveals the most important laws of nature. Theories and methods of research in physics are increasingly penetrating into other natural sciences (chemistry, astronomy, biology, etc.). The content, systematics and methodology of physics open up great opportunities for students to form a scientific worldview, form practical skills, and work effectively and independently. These activities develop students' mental abilities, especially students' logical thinking as a reflection of higher logic – the logic of nature. Physics as a science has great educational potential.

According to researchers, the essence of the continuity of school and university can be interpreted in the development of students' personality, starting with self-determination in life, through adaptation and practical integration into the profession, the development of ideological and moral qualities. Higher education should be based on the full use of knowledge and skills acquired by students at earlier stages of education. Continuity at this stage means the connection of different educational institutions, which leads to difficulties associated with the dialectic of the educational process in different schools. The problem of continuity is contradictory in itself, it is worth noting that contradictions can be natural and artificial. In this sense, it is necessary to approach the problem of continuity and apply this principle to a holistic approach, including epistemological, ontological, systemic, technological, personality-oriented and interactive approaches. The content of educational activities aimed at ensuring the continuity of education is reflected in the functions, requirements and rules of continuity. There are methodological, reflecting the theory of the organisation of the educational process, and normative, related to the implementation of the continuity function [12].

Discussion

Learning outcomes depend on the correct definition of learning goals and content, and means to achieve goals and methods. The learning process is a two-way process that combines the educational activities of a teacher and the educational activities of students. Thus, the teaching method is a system of purposeful actions of teachers, organising the cognitive and practical activities of students, thereby ensuring their assimilation of pedagogical content and thereby achieving the goals of education. The history of didactics and private methodology has shown that teaching methods depend on the goals and content of a particular training. The educational method is a social category, since it depends on the social classification of society as an educational institution. As you know, the educational goals of the younger generation were changed and supplemented in accordance with the public goals and the image of society. In addition to the development of knowledge, skills and abilities of students, that is, solving pedagogical tasks, the school faces a number of tasks related to the development and upbringing of the younger

generation. Now the tasks of developing thinking, cognitive activity and independence of students, the development of a modern worldview are put forward to the fore. This has changed the system of methods used in the learning process, among which a special place is occupied by methods that organise the cognitive activity of students at different levels [13].

Thus, generalisation began to develop as a traditional method of teaching at school, interest in non-traditional, creative tasks arose, elements of independent research experience in physics began to be introduced into educational laboratories. The system of teaching methods used depends on the content of the training. Any change in the content of education – the volume of pedagogical knowledge, their structure – affects the choice of teaching methods. Therefore, the principle of generalisation has had a significant impact on the teaching methodology of the physics course in general and on the teaching methodology in particular: the role of deductive learning in a new subject has increased; the share of teaching methods that encourage students to work independently and increase their cognitive activity has increased. Physics is one of the main disciplines studied in absolutely all educational institutions, because it is the science of the laws of nature, their changes and the relationship of phenomena that study the properties of matter or everything that surrounds us.

The study of the properties of matter and the laws of nature meets the natural desire of every person to know the world around them. This knowledge represents most of what is commonly referred to as human culture. Science, especially physics, is very practical. The events described by physics inform in advance about the course of certain phenomena in nature. The engineer knows how the machine works, what is necessary for its proper use; the customer at the company knows what materials are suitable for the construction of roads, houses, bridges and what load they can withstand [14-16]. Physics differs from other sciences in that when studying its laws, quantities are introduced that need to be measured and described by numbers and mathematical expressions. Galileo Galilei also said that the language of physics is mathematics, so physics as a discipline is introduced into school education, starting from the first grade, when schoolchildren know less mathematics [17; 18]. From the first steps in the study of these sciences, children touch the secrets of nature, learning what force, density, speed, formulas for solving them and ways to change these quantities are.

The main goal of higher education is to promote the spiritual, moral, emotional and physical establishment of the individual, the comprehensive development of his creative potential, a worldview based on universal values, humanistic relations and the provision of various conditions for the development of personality, of the student's individuality based on his age, education is focused on the personality [19-22]. Such education is directed towards the student, his personal qualities, culture, creativity as a way of independent decision-making in culture and life. The principle of a differentiated educational process contributes significantly to the development of the personality of students, confirming the essence and goals of general secondary education. Continuity is understood as the consistent development of the higher education system in dialectical connection with

the higher education system in order to form a student as a subject of higher education and upbringing. Continuity in education is manifested as follows [15]:

- in the further development of students, all the positive things that were achieved at the previous stages of education and training;

- ensures the harmonisation of knowledge and the development of the content, forms and methods of teaching;

- in additional education and training, which ensures the further development of all students;

- in the advanced use of the content, methods and forms of education that contribute to the improvement of each individual.

It should be understood that the socio-psychological conditions of interaction between a school and a university in conditions when the best combination of pedagogical factors (relationships, resources, etc.) is a university, regardless of its available educational resources. Such conditions include [16]: knowledge of teachers of secondary and higher education about the socio-psychological characteristics of students; ensuring continuity of forms, methods and techniques of education between secondary and higher education; teaching students of secondary schools methods and techniques of self-education and self-control, and methods of higher education; creating an educational atmosphere in a pedagogical university (conducting credits, sessions, diploma defense, etc.). Students transferring from secondary schools to universities of the Republic of Kazakhstan do not have such an experience of learning in this environment. There is a discrepancy between the new status of students (former school students) and their previous readiness to study in a new environment. An important basis for resolving this disagreement is the interaction of universities and schools at all levels [23; 24].

Based on the provisions mentioned above, to achieve continuity of school and vocational education in the Republic of Kazakhstan, in partnership with the Abai Kazakh National Pedagogical University and the Kazakh National Women's Teacher Training University, training seminars, thematic tests, project work, competitions are held. The moral duty of teachers and schools is to give students the basic knowledge they need in their daily life and work. After communicating with the teacher, the student should rely on his own strength, be confident in his great inner potential. He should be inspired by the idea that he can not only create something new, but also train his skills in solving complex and non-standard tasks. Helping each student find themselves, their interests, abilities and hobbies is a perfect job for a teacher. It is very important to develop the creative spirit of all young people for the development of science and production. This will affect students when choosing a profession [17].

Improving the quality of education, the possibility of successful continuation at the next level, the need for self-determination of young people, career guidance – all this is an inexhaustible list of tasks to be mastered as part of the continuity of physical education at school. The school and university system in Kazakhstan. Physiological conditions, skills and abilities in a specific specialty. The need to solve the problem of competitiveness of universities forces us to

look for new forms and directions of preschool education and career guidance for young people [25]. The negative consequences of the education reform have intensified in recent years, especially in terms of preparation for university entrance exams. This has strengthened the role of additional education in the transition from secondary education to higher education. Until now, the main tasks of pre-university training of applicants have been to create conditions to meet the needs of higher education and obtain the necessary knowledge about access to education [26]. However, many applicants of such preparatory structures, having successfully completed their studies, are still not ready to study at a university, and have poorly developed skills of self-organisation, self-preparation, work with popular science literature, interpersonal communication.

The so-called pre-university preparatory courses were made to create a holistic educational process within the framework of additional education in the system of continuity of education in physics "school-university", ensuring the interaction of general education and vocational education based on the continuity of their training. The system of vocational education has different forms of organisational work with applicants. Such programmes, as a rule, include several hours of training, allow the use of traditional forms of higher education (for example, lectures, internships and seminars), which attracts applicants to study at future universities [18; 27]. The effectiveness of the interaction between the school and the university largely lies in solving the problem of organisational and pedagogical harmonisation of the educational process in secondary and higher education. These issues include: determining the content of a physical degree by study profiles and on the basis of meaningful organisational forms and methods of general and higher education; the possibility of using different forms of cooperation between colleges and universities (opening specialised departments for a particular university, conferences, research); ensuring effective control over students' education and their desire to continue studying at universities; high the level of development of resources in the educational process (teachers, residents, citizens, finance, etc.) [28-30].

Today, the interaction of schools and universities of the Republic of Kazakhstan is mainly focused on the desire of students to receive a high-quality higher education. On the part of teachers and lecturers, such interaction is ensured, first of all, by the desire to maintain a high level of education and ensure that students understand the need for continuity of the educational process in the chosen field of physics. Every university is interested in attracting not only talented students, but also students who have professions in certain areas of physics [31; 32]. As a result of the joint practical work of schools and universities of the Republic of Kazakhstan, specialised training courses for pedagogical and technical universities were created. As part of the joint practical work of schools and universities of the Republic of Kazakhstan, it is planned to organise the creation of special classes aimed at preparing future students to study physics in a specific pedagogical university of the Republic of Kazakhstan [33]. To help students determine their personal abilities and skills, and to reduce the number of mistakes that they and their parents make when choosing a future subject without taking into

account individual abilities, many sixth grade schools have introduced job tests [34]. The curricula of schools cooperating with pedagogical institutes of the Republic of Kazakhstan include such forms of higher education as lectures and seminars. This is how school graduates get used to the education system of universities of the Republic of Kazakhstan [19; 35].

In cooperation with the Abai Kazakh National Pedagogical University, they attract not only specialists of general educational institutions, but also university teachers with experience in presenting lectures and conducting practical seminars, use research elements and the latest scientific knowledge, work with materials of physics courses. As for school teachers, their advantage is mastering the methodological techniques of individual work with students and teaching at several levels, considering the age psychology of students. The result of all these interactions is the creation of a unified teaching methodology in the "school-university" system, acceptable both for working with schoolchildren and students in the Republic of Kazakhstan. The interaction of schools and universities in the Republic of Kazakhstan is: improving the educational level of students, ensuring comprehensive personal development, creating a system of early career guidance, successful admission of graduates to universities as a result of interaction programmes, successful admission of students to universities and their comfortable development in the university environment [36; 37]. It is all this that ensures the continuity of physics teaching in schools and universities. At the same time, there is an integration process of secondary and vocational education in the Republic of Kazakhstan [20; 38].

Conclusions

At the end of the provided research on the topic of studying the methodological foundations of teaching physics courses in the school-university system through continuity, it should be noted that the natural science content of higher pedagogical education should be aimed at implementing the principle of continuity and professional orientation in teaching physics courses, i.e. the integration of interrelated sections of disciplines. Including methodological disciplines, which significantly improves the quality of professional training of future teachers of natural sciences. The quality of education of graduates of pedagogical universities of the Republic of Kazakhstan depends on the

quality of education of secondary school students, i.e. on the prospects of general scientific education. Thus, the modernisation of higher education in the Republic of Kazakhstan takes place in the context of global and interdisciplinary competencies (including communication skills, research and entrepreneurial skills), including updated secondary education content programmes.

The new educational programmes will focus on the development of flexible and professional skills necessary in a rapidly changing world, involving lifelong learning. To ensure continuity of content between the levels of secondary and higher education, cross-cutting core competencies were identified in educational programmes, accumulating throughout the entire educational trajectory. Competencies are divided into subject and general. Clearly and concisely formulated competencies will reflect the ability of students to demonstrate knowledge, understanding, skills, that is, what they learned during the study of the physics course. It is these competencies that will become the basis for determining the meaning and content of the state mandatory standard for all levels of education in the Republic of Kazakhstan. This will allow future teachers of secondary schools, especially teachers of natural science subjects, to provide methodological training and acquire skills in considering the subject as a whole, i.e. in its methodological and logical connection. It will also improve the quality of professional training of future teachers in natural science subjects. The implementation of continuity in the content of teaching the subject will be most complete if the most professionally-oriented education considers data from both socio-economic forecasting of individual industries and data from socio-pedagogical forecasting for individual regions of the republic. In conclusion, it should be noted that the quality of education of schoolchildren in the Republic of Kazakhstan, and hence the future of natural science education, depends on the quality of training of graduates of the Abai Kazakh National Pedagogical University and the Kazakh National Women's Teacher Training University.

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None.

Conflict of Interest

None.

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Методологічні засади наступності навчання курсу фізики в системі “школа-університет”

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Анотація

Актуальність. Актуальність даного дослідження полягає в тому, що забезпечення безперервності освіти відіграє важливу роль у модернізації системи освіти в Республіці Казахстан і вимагає детального вивчення оновленого змісту уроків фізики в структурі “школа-університет”.

Мета. Основна мета – проаналізувати методологічні засади забезпечення безперервності фізичної освіти в системі “школа-університет” у Казахстані. Це передбачає вивчення освітніх стандартів і практик як на шкільному, так і на університетському рівнях для визначення та впровадження ефективних методів для безперервного освітнього прогресу.

Методологія. Методологічну основу дослідження склали психологічні, філософські та педагогічні концепції пізнання навчального процесу, методологічні основи фізики та визначення дидактики, досягнення і напрями теорії та методики навчання сучасного курсу фізики.

Результати. Дослідження виявляє потребу в методологічних корективах у викладанні фізики для забезпечення послідовної освітньої траєкторії від школи до університету. Ключові висновки включають важливість розробки освітніх програм, які сприяють розвитку наукового мислення, адаптуються до фізіологічного розвитку учнів та включають сучасні технологічні досягнення. Аналіз також підкреслює важливість міждисциплінарної інтеграції та розвитку критичного мислення і навичок розв’язання проблем серед учнів.

Висновки. Матеріали цієї статті можуть бути використані викладачами вищих навчальних закладів Республіки Казахстан для підготовки матеріалів для викладання фізики. Представлений матеріал також може бути цікавий студентам напряму “Природничо-наукові дисципліни” при підготовці до семінарських і практичних занять, які готуються до викладання фізики як науки в майбутньому.

Ключові слова: навчальний процес; базовий рівень; вчитель фізики; підготовчі курси; співпраця; самовизначення.