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## **PREPARATION OF FUTURE TEACHERS FOR THE ORGANIZATION OF STUDENTS' WORK WITH A MODERN PHYSICS TEXTBOOK**

**Abstract.** The article examines the problem of training a future physics teacher to implement innovative learning technologies in a new Ukrainian school with a modern physics textbook. It was determined that the issue of the practical component of the conceptual basis of the professional training of future physics teachers in higher education institutions at the current stage requires a deeper study in order to form a specialist of the new generation in accordance with the requirements of today. The urgent need to solve the problem of forming the readiness of future physics teachers to implement innovative learning technologies under various forms of organization of the educational process in general secondary education institutions has been clarified. Attention is focused on the scientific analysis of the researched problem and the current state of implementation of the technology of group educational activities of students in the educational process of a comprehensive school, which testifies to the dominance of individual and collective forms of work and the insufficiency of the implementation of creative approaches to the organization of group educational activities of students. Methodical approaches to the formation of the future physics teacher's readiness for effective professional activity in the new Ukrainian school and the principles of partnership and cooperation technologies are proposed. The basic foundations of educational changes, determined by the Concept of the New Ukrainian School, determine the need to make changes in the professional training of future physics teachers by introducing new or modernizing the content of the existing educational components of the methodological direction of the OPP with the aim of forming the professional competences of future specialists, in accordance with the Professional Standard of a teacher of a general secondary education institution. Attention is focused on the peculiarities of the organization and implementation of the practical component of the preparation of the future physics teacher for the implementation of the technology of group educational activities of students training of future physics teachers by introducing new or modernizing the content of the existing

educational components of the methodological direction of the OPP with the aim of forming the professional competences of future specialists, in accordance with the Professional Standard of a teacher of a general secondary education institution. Attention is focused on the peculiarities of the organization and implementation of the practical component of the preparation of the future physics teacher for the implementation of the technology of group educational activities of students.

**Keywords:** training of future physics teachers, a modern textbook on physics, innovative teaching technologies, group educational activities of students in the study of physics.

**Introduction.** The problem of the development of the system of professional training of the physics teacher in the conditions of the educational information space, which acquires dynamic changes in accordance with the historical development of world requirements, is determined by the need to fulfill a number of important tasks of the modern higher pedagogical school, which include: the fundamentalization of the general physics course as a basic element of the professional training of the teacher physics; the connection between conceptual changes in approaches to student learning and traditional ways of organizing the educational process in pedagogical institutions; development of teaching methods of general physics in conditions of application of innovative technologies and approaches; development of teaching methods of general physics in conditions of application of innovative technologies and approaches, including ICT.

In this context, the focus on innovative processes in the teaching of general physics leads to significant changes in the content and procedural components of physics teacher training, determines the modernization of the traditional teaching system of this fundamental course, the development and implementation of a new methodological system based on the provisions that make up the theoretical and methodological foundations of the professional training of a physics teacher [10], the leading one of which in the methodical system of teaching general physics to students of pedagogical universities should be the principle of integration of fundamentality and professional orientation of the content, forms, methods and means of education.

The content of professional physical education is improved not only by updating subject courses, but also by creating integrative courses. The modern stage of the development of physics didactics, in particular the theory of the school textbook as the core of the elementary methodological complex in physics and the collection of problems as an integrated and coordinated methodological supplement, is in dynamic development, which is associated with the following phenomena [14, 17-19].

**Aims.** The analysis of the state of professional training of future physics teachers in higher education revealed some formalism and fragmentation of knowledge and skills, lack of motivation among students to study the disciplines of



the professionally oriented cycle of training, inability to properly use knowledge and skills regarding the design of professional activities by means of educational literature, in particular textbooks and collections tasks.

Since the content of the professional training of future physics teachers in higher education should meet the goal of providing a synthesis, a comprehensive study of regularities, phenomena and processes in their general connection, interaction and movement, one of the effective ways to overcome the separation of knowledge and the separation of their study in the educational process, ensuring a holistic perception of the surrounding world, the completeness of scientific physical knowledge, the integration of the content of education is recognized. In recent years, with the development of the theory and practice of using an integrative approach, the efforts of scientists and practicing teachers have introduced a system of integrative subject-based education. Its principles are: the orientation of education to the current requirements of social development, the formation of a holistic system of knowledge, a unified picture of the world, a scientific worldview, a combination of integrative and differentiated approaches to education;

- development of the concept of competences;
- introduction of specialized training;
- the emergence of a variety of methodological lines of school textbooks and problem books;
- changing the content and procedural components of a teacher's professional activity;
- a change in society under the influence of the development of information technologies (the appearance of electronic manuals that complement traditional textbooks).

In connection with these phenomena, there is an urgent question of teaching future physics teachers the scientific basis of building and using textbooks and problem sets for school as an element of teaching aids in accordance with the tasks of developing and improving school education (in general), and physical education in particular, taking into account historical development didactics of physics [9; 14].

**Aims.** The analysis of the state of professional training of future physics teachers in higher education revealed some formalism and fragmentation of knowledge and skills, lack of motivation among students to study the disciplines of the professionally oriented cycle of training, inability to properly use knowledge and skills regarding the design of professional activities by means of educational literature, in particular textbooks and collections tasks.

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holistic perception of the surrounding world, the completeness of scientific physical knowledge, the integration of the content of education is recognized. In recent years, with the development of the theory and practice of using an integrative approach, the efforts of scientists and practicing teachers have introduced a system of integrative subject-based education. Its principles are: the orientation of education to the current requirements of social development, the formation of a holistic system of knowledge, a unified picture of the world, a scientific worldview, a combination of integrative and differentiated approaches to education.

**Methodology** The implementation of a modern approach to the design of a system of professional training of a physics teacher, which should be based on scientific, theoretical and methodical principles, conditions the formation of future physics teachers in professional competences regarding the ability to use such didactic tools as a school textbook and a collection of physics problems in the conditions of the dynamic formation of information and educational an environment that requires the application of historical aspects of the study of physics methods.

The development and improvement of the system of professional training of physics teachers in higher pedagogical institutions was carried out in several directions: theories and practices of the formation of the content of education (O. Bugayov, S. Goncharenko, E. Korshak, O. Lyashenko, M. Martyniuk, V. Savchenko, M. Sadvoy, V. Sergienko, V. Syrotyuk, N. Sosnytska, V. Sharko, M. Shut, etc.), integration of natural and scientific knowledge, including knowledge of nature by means of physics (N. Burynska, G. Dobrov, V Ilchenko, V. Razumovskyi, A. Stepaniuk, N. Talalayeva, P. Fedoseev, O. Yavoruk, etc.); Ya. Sobko, N. Sosnytska, S. Tkachenko, etc.); problems of interdisciplinary interaction and professional orientation of education (L. Voronina, I. Zverev, O. Ivanytskyi, V. Ilchenko, A. Kaspersky, N. Loshkaryova, O. Sergeev, V. Fedorova, V. Sharko, etc.).

Many scientists studied the theory of textbooks both on traditional paper media (V.P. Bepalko, L.P. Dolbaev, L.Ya. Zorina, D.D. Zuev, V.V. Kraevsky, etc.) and on electronic media (O. I. Bugayov, M. I. Zhaldak, Yu. O. Zhuk, O. I. Lyashenko, M. T. Martyniuk, V. I. Sumsy, etc.).

The methodology of solving educational physical problems as a means of learning was considered by domestic methodologists O. Bugayov, S. Honcharenko, E. Korshak, O. Lyashenko, O. Sergeev, A. Pavlenko, S. Vozniuk, O. Ivanov, G. Rozenblat, A. A. Usova, I. Shvaichenko.

The works of O. Bugayev, A. Voloshina, M. Golovko, V. Matsyuk, O. Sergeev, N. Sosnytska, O. Shkoly, M. Shuta and others are devoted to the problems of using the historical approach in researching the development of the history of physics didactics and relevant educational literature.

However, not enough attention has been paid to the issue of the main approaches to the formation of professional competences in the future physics teacher regarding the organization of work with a school textbook and a collection



of physics problems in the conditions of an informational educational environment by means of an integrative course, which determined the topic of our research.

**Results.** Integration, as a requirement to combine some parts or elements into a whole, is considered a necessary didactic tool, with the help of which it is possible to create a holistic picture of the world in students.

O. Ivanytskyi believes that a significant improvement of the professional training of the future physics teacher, strengthening of its prognostic orientation is possible under the condition of developing the theoretical and methodical foundations of the training of the future teacher for the implementation of innovative physics teaching technologies [12]. The conceptual basis of the design and implementation of acmeological technologies should be the contextual training of students in a coordinated combination of forms, methods and means of teaching physics as components of specific teaching technologies, the orientation of special training of the future physics teacher on the creation of a highly effective professional author's system of activity as the core of the methodical system of the work of a physics teacher.

Results. Basic research of the content of physical education, the historical dynamics of its didactic guidelines and conceptual foundations revealed integrative trends in the structuring of educational material, methods, organizational forms of education, and the evolution of the school textbook. Studies of the genesis and development of the problem-based approach to teaching physics have proven the historical expediency of using collections of problems in the educational process of physics. The expansion of the didactic functions of textbooks and collections of physics problems in the context of ICT makes it necessary to consider the modern informational educational environment as an effective instrumental means of teaching physics [9]:

- In the context of the above, the developed course should integrate three components, which, according to the program, is structured into three content modules:
  - Genesis and development of the content of the school physics textbook;
  - Genesis and development of the content of the school book of physics problems;
  - Modern digital interpretations of school textbooks on physics (on local media and network).

The relevance of the study of the first module is determined by the historical and methodological approach to the issues of textbook creation in the context of the periodization of the development of the physical education system, which takes into account the connections and interdependence of the textbook as part of the educational and methodological complex of physics as a phenomenon of the educational system, which is the most effective [14].

The criteria for the analysis and evaluation of school textbooks on physics in

the evolutionary context are considered as historically fluid and acquire the status of a historical object that transforms together with the content and functions of the regulatory sphere, requirements for the scientific content of the subject of physics, for the socio-political and socio-economic order of the quality of physical education, to the content of educational standards, curricula, programs and physics textbooks, to the components of the professional competence of a physics teacher. The system of physics textbook functions is a strategic and tactical learning model that develops over time in accordance with the evolution of physics didactics.

The theory of the school textbook on physics, in which the content of physical education is realized in the most complete and profound form, contains [14; 17]:

- the general theory of the school textbook, the subject of which is the universal principles of its construction (generally didactic level);
- a partial theory of the school textbook, which finds its expression in the implementation of the general principles of creating a specific textbook, taking into account the peculiarities of the subject of physics, the age characteristics of students, the type of school, etc. (methodical level).

According to this theory, the physics textbook is considered as an information model of the educational process. The textbook is considered as an element of the regulatory sphere in which learning is the object of construction, and performs a dual function - as one of the tools and as part of the program of learning activities. The textbook embodied and programmed not only the activity of the student, but also the expected activity of the teacher.

Despite different approaches to the interpretation of the essence of the physics textbook phenomenon based on the historical approach, their analysis allows us to determine the following most important characteristics of it [14]:

- the textbook as a carrier of educational content and a means of learning;
- the textbook as an embodiment of the unity of content and procedural aspects;
- the technology of the textbook, the relationship between teaching and learning with an orientation to the leading concepts of the learning process.

A school textbook is a materialized carrier of the content of physical education (educational model) and an organizer of the process of active assimilation of this content by students. The new form of construction of the textbook should be flexible, dynamic and contain theoretical material and methodical components, should orient students to work by means of search and problem-based learning methods. At the same time, the structure of the physics textbook should be renewed according to the development of the educational field. In addition, the textbook must be supplemented with an interactive component, as a result of which a fundamentally new type of educational and methodological product is formed.

The textbook is a kind of complex information model of the educational process. The textbook reflects the purpose and content of education, didactic



principles, and education technology. The textbook covers such learning stages as setting a task, presenting information, revealing ways to solve problems, summarizing and systematizing, consolidation and control, independent research, homework.

When building a physics textbook, it is necessary to focus on the same defining principles as when developing an educational model, that is, on a global goal, an educational standard (plan), management. And if these moments (not only in terms of content, but also in terms of activity) find their embodiment in a specific physics textbook, then this makes it a specific means of accumulating, transmitting and assimilating social experience. This means that the textbook simultaneously acts as a carrier of the content of modern education (educational standard) and a project of the process of assimilation of the relevant educational material [1,13 15-16]. Thanks to the second role - the process of assimilation of educational material by the student - the textbook gives rise to, initiates its most important function: management of the process of assimilation of educational material. In this case, the problem of purposeful management of the learning process is solved through the action of a hierarchical series of components: the main requirements for the content of education (educational doctrine) are outlined, the global goal of education is formulated, an educational standard is built, and on this basis, the curriculum, curriculum, textbook, and methodology are developed. However, this management is carried out only at the level of substantive and organizational components of activity (hard management without feedback), when a specific subject of educational and cognitive activity is placed in conditions of "no choice", when management decisions are made on the basis of control of the final result of the activity . In such management activity, the operational component of educational and cognitive activity, through which, in fact, the problems of feedback and individualization in education, and in general, flexible management of educational and cognitive activity are solved [1, 2, 5-7, 11].

V. Kraevsky considers the question of determining the functions of the textbook in the learning process as a methodological problem of didactics, and the methods of substantiating the functions of the textbook - as a partial case of scientific substantiation of education. The system and nomenclature of didactic functions of the textbook is not stable, it is dynamic, mobile and open, it can change depending on the type of educational subject, didactic concept, type of textbook and the aspect of actual goals of the learning process.

A full-fledged textbook forms a teacher's pedagogical consciousness and reveals to him the logic of teaching physics. Thus, the textbook serves for the teacher as a guide to the organization of the educational process. For a student, a textbook is a source, content and tool for assimilation of educational material and development, formation of key competencies. At the same time, it is not the only carrier of educational information, so in its content the student should find guidelines

for further work in accordance with his cognitive abilities and needs to learn independently. Thus, the textbook acts as an anticipatory tool for the organization of education. Its functions are expanding, acquiring new content, the role of individual functions is being strengthened: motivational, integrating, systematizing, development of key competencies in the field of physical sciences, development of independent cognitive activity (self-education in the field of physical knowledge) outside the information space of the textbook. The last function acquires a dominant meaning, as it stimulates the student's orientation in the media-educational information space. A modern textbook on physics should have clear signs of a certain pedagogical technology and thus give the teacher a model of a good technology of learning and development.

At the current stage of the development of pedagogical science, the physics textbook is considered as a complete system that belongs to a more complex system of education, acquires a systemic quality, loses some of its characteristics inherent in it in the past, when it was a universal means of education. Gradually, the functions of the textbook will be distributed among other elements of the educational and methodological complex of the physics course: manuals (paper, electronic, network resources), problem books, notebooks with a printed basis, test tasks, reference books, physics textbooks, methodical guides for the teacher, etc. This structure of the teaching-methodical complex in physics is due to the tendency to systematization, hierarchization and the identification of the specifics of all elements of the regulatory sphere, to be taken into account in the process of textbook creation.

**Literature review.** How fully the educational, educational and developmental functions of the problem-based approach to teaching physics will be realized depends on the quality of the collections of physical problems and the corresponding methodical manuals. A physics teacher's knowledge of the methodological requirements that physical problems must meet, the criteria for the content, structure and functions of problem books is a necessary condition for a competent and creative approach to the organization of the educational process in physics. The development of the didactic base of the technology for solving physical problems (problem books, educational and methodological aids, etc.) has a historically determined character, which was reflected in the principles of structuring and selection of their educational material. The creation of modern technological collections of problems and methodical manuals requires a systematic approach. Implementation of the problem-based approach in the modern school is determined by the following factors [3; 8]:

– the development of the didactic base of the technology for solving physical problems (problem collections, teaching and methodical aids, etc.) has a historically determined character, which was reflected in the principles of structuring and selection of their educational material. The creation of modern technological collections of problems and methodical manuals requires a systematic approach;





– as a result of the integrative trend of scientific knowledge at both the theoretical and applied levels, the development of the theoretical foundations of the integrative methodology for solving and composing physical problems at the general scientific and philosophical levels of the methodology (A. Pavlenko), which are the scientific foundations of development and implementation in school practice of scientifically based didactic technologies;

– expansion of the range of didactic functions of educational physical tasks (developmental-research, educational, pragmatic, methodological, informative, generalizing, control-corrective);

– the use of a systematic approach to the educational process leads to the creation of technologically oriented educational and methodological complexes using modular strategies, in particular in the field of solving and composing physical problems;

– strengthening the role of information technologies in improving the problem-based approach in the process of solving educational-research and creative educational physical problems based on the creation of program-methodical complexes on the basis of computer modeling and the implementation of the rating system (tasks-tests).

**Results.** Since the physics textbook ceases to be the only carrier of educational information, the student in its content must find reference points for further search and creative activity in accordance with his cognitive abilities and needs to learn independently, therefore the functions of a modern physics textbook in the conditions of the application of information and communication technologies acquire a new meaning : the development of key competencies in the field of physical sciences, the development of self-education in the field of physical knowledge, which stimulates the student's orientation in the media-educational information space outside the information space of the textbook.

A prominent place in the formation of the system of professional training of a physics teacher is occupied by the ability to organize work with a textbook and a collection of problems (a procedural component of the competence of a specialist), a necessary condition for mastering which we consider to be knowledge of the theoretical foundations of the construction of a textbook of a collection of problems and how to use them in physics lessons (a content component of the competence of a specialist ). On the other hand, the specified neoplasm can be considered a competence provided that it is perceived as a value, that is, there is a positive motivation for this activity (motivational component of the specialist's competence). Historical-pedagogical analysis of the patterns of development of the school textbook and physics collection will allow future physics teachers to receive the necessary historical-methodological training, using a specific example to investigate the historical transformation of the main didactic principles, target, content and procedural components of school physical education.

**Conclusions.** The purpose of the course: integration and deepening of students' knowledge of the theoretical foundations and practice of textbook creation in physical education; acquainting them with available methods of analysis and evaluation of textbooks and collections of problems in physics; formation of the ability to organize work with a textbook and a collection of problems in physics lessons, theoretical and practical training of future specialists in the formation of a scientifically based approach to the use of modern school textbooks and collections of problems in physics, mastering the principles of construction, updated functions of modern textbooks and collections of problems in physics, creative their use in the educational process, as well as:

- to acquaint students with the theory of the school textbook and the modern didactic functions of the school textbook and the collection of physics problems, through which the updated content of modern physical education is implemented;
- to reveal the genesis and development of the content of the school textbook and collection of physics problems in Ukraine as integral, historically conditioned and purposeful processes;
- raise the educational process to a qualitatively new level based on strengthening the methodological and worldview function of methodical science through the implementation of the historical approach;
- to deepen cognitive interest, cognitive activity of students, developing creative thinking, raise the level of their pedagogical culture;
- to systematize, generalize and synthesize the natural, scientific and humanitarian knowledge of students regarding the content of the school textbook and the collection of physics problems as historical objects;
- to acquaint students with the achievements and trends in the development of modern school textbooks and collections of problems in physics.

The tasks of the course are:

- to reveal the formation and development of the school textbook and collection of physics problems from its inception to the present day;
- highlight the main concepts of textbook creation in physical education in their historical development with the aim of deepening students' knowledge;
- highlight the modern idea of educational literature in physics in the context of alternative development of textbooks and problem books and expansion of didactic functions by means of ICT;
- to equip future physics teachers with knowledge of the history of the development of the textbook and collection of physics problems.

**Conclusions.** As a result of studying the integrative course "Evolution of the content of school textbooks on physics", future physics teachers will gain theoretical knowledge about:

- the main directions of the development of the theory of the school textbook and the collection of physics problems;



- basic concepts of the theory of a modern textbook and collection of physics problems;
- didactic functions of a modern school textbook and collection of physics problems;
- the structure of a modern school textbook and collection of physics problems;
- criteria and methods for assessing the quality of a modern school textbook and collection of problems in physics;
- criteria for the periodization of the evolution of the school textbook and collection of physics problems;
- the evolution of the content of the school textbook and collection of physics problems,
- the main features of each period of development of a modern school textbook and collection of problems in physics;
- scientific activity and achievements of scientists, methodologists-physicists regarding the school textbook and collection of physics problems;
- criteria for compliance of the content of textbooks and collections of physics problems with educational programs;
- the main trends in the development of a modern school textbook and collection of physics problems;
- the method of working with a textbook and a collection of problems in physics lessons. Acquire practical skills:
  - analyze the structure of a modern school textbook and a collection of physics problems;
  - to determine the didactic functions of a modern school textbook and a collection of physics problems;
  - evaluate the quality of a modern school textbook and collection of problems in physics according to the nomenclature of indicators;
  - determine the place of the physics textbook in the education system and establish the relationship (interaction) of the textbook with other tools of the educational and methodological complex;
  - methods of working with textbooks and collections of physics problems in class and when students perform various types of independent work outside of class;
  - characterize the history of the development of the modern school textbook and collection of problems in physics as a consistent change of scientific pictures of the world and didactic systems;
  - freely navigate when choosing a modern school textbook and collection of physics problems;
  - to organize work with a textbook and a collection of problems in physics lessons.

Therefore, the introduction of the special course "Evolution of the content of

school textbooks on physics" into the educational process of pedagogical universities contributes to the formation of the key competencies of physics teachers, raising their methodical culture, preparing them to work with alternative school textbooks on physics, including in the conditions of an educational environment designed by means of IC.

Prospects for further research consist in studying the historical aspects of the place and the role of educational and methodological complexes in physics in the professional training of a physics teacher.

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