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Requirements for the Training of Masters of Natural Sciences of Pedagogical Higher Educational Institutions

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Article

The article deals with the issues of training future teachers of natural sciences; findings: what requirements for professional education are typical for the training of a teacher of a new formation; what role in the professional development of specialists of pedagogical HEI has professional training and what shortcomings in the training of masters of natural sciences occur at the present stage of development of higher education; areas of modernization of vocational education and physical education, in particular, are identified by scientists.

Keywords: masters of natural sciences; professional activity; training of masters; educational and cognitive activity.

Higher pedagogical education performs a special, key function in the formation of a modern human, his intellectual and spiritual potential. The development of Ukraine is determined in the general context of European integration with a focus on the fundamental values of world culture. According to the “Action Program for the Implementation of the Bologna Declaration into the System of Higher Education and Science of Ukraine”, approved

by the Ministry of Education and Science of Ukraine, the reform of higher education provides for the transition to the education of specialists, the introduction of two-cycle training (bachelor's, master's), their mastery of modern innovative technologies is expected.

The purpose of the article is to substantiate the theoretical foundations of training masters of natural sciences of pedagogical universities; the main task is to define the essence and substantiate the scientific bases of pedagogical education of masters. The relevance of the study is determined by a set of factors: the need to increase the level of professionalism of teachers; pedagogical education of masters becomes a necessary condition for the growth of professionalism of specialists. The need to increase the pedagogical professionalism of masters is also caused by new approaches to education, according to which the center of the pedagogical process becomes the individual as the highest value of society. The objective need for such a study is due to the need to develop pedagogical science, analysis of negative trends in full pedagogical education, and identify their causes. The implementation of the tasks of professional training of masters largely depends on the level of scientific knowledge of ways and means of improving full pedagogical education, which, in turn, is impossible without an analysis of modern vocational pedagogical education.

The analysis of modern tendencies of development of higher education in the world and Ukraine allowed establishing requirements to the preparation of masters of natural sciences.

Starting to consider the issue of training future teachers of natural sciences, we tried to find out what requirements for professional education are characteristic for the training of a teacher of a new formation; what role does professional training play in the professional development of HEI specialists (including pedagogical ones); what shortcomings in the training of masters of natural sciences occur at the present stage of development of higher education; what areas of modernization of vocational education in general and physical education, in particular, are identified by scientists.

The specifics of the professional activity of a pedagogical HEI specialist is often characterized by the fact that, in addition to traditional professional responsibilities that require the development of various competencies, masters of natural sciences often deal with other trivial and unusual situations that require them to be willing to model these situations and accept creative, independent decisions, based on the moral and psychological traits necessary for future educational and upbringing work with students, which should be developed in the process of self-education and upbringing within the university.

The study of psychological and pedagogical disciplines helps to form in masters of natural sciences the psychological and pedagogical readiness for professional activity and constant self-improvement. In modern psychological and pedagogical research, attention is paid to the professional training of future teachers in the works of O. Abdulina, A. Aleksiuk, I. Ziaziun, N. Kuzmina, N. Nychkalo, N. Talyzina, V. Yahupov, and others. Professional training of masters in the context of qualification requirements needs professional qualities, general pedagogical training, methodical training, and pedagogical proficiency. In our understanding, the term "training" will be used as a source of knowledge, skills, experience, etc., acquired in the process of learning, practical activities. The phrase "professional training" according to the "Economics Encyclopedic Dictionary" is a system of education that provides the necessary set of knowledge, skills, and abilities to acquire a certain qualification, to perform work in the relevant field. It is usually carried out in all out-of-school educational institutions (starting from vocational schools and ending with universities).

S. Batyshev, O. Novikov note that modern society puts before all types of educational institutions, and above all before the vocational school, the task of training graduates who can:

- navigate in life situations that change rapidly, independently acquire the necessary knowledge, apply them in practice to solve various problems that arise throughout life;

- independently think critically, see problems, and look for ways to solve them rationally, using modern technologies; be aware of where and how the knowledge they have acquired can be applied; be able to generate new ideas, think creatively;

- work competently with information (collect the facts necessary to solve a problem, analyze them, make the necessary generalizations, compare with similar or alternative options, establish statistical and logical patterns, draw reasoned conclusions, apply the experience to identify and solve new problems);

- be sociable, make contacts in different social groups, work together in different areas and different situations, to prevent the emergence or skillfully get out of any conflict situations;

- independently work on the development of their morality, intelligence, cultural level.

N. V. Kuzmina offers the following levels of professional activity of teachers:

1) – (minimum) – reproductive; the teacher can tell others what he knows; unproductive;

2) – (low) – adaptive; the teacher can adapt his message to the characteristics of the audience; low-productivity;

3) – (average) – locally-modeling; the teacher has learning strategies, knowledge, skills, abilities in a separate section of the course (i.e., to formulate a pedagogical goal, to be aware of the results, and choose the system and sequence of involvement of the masters in educational and cognitive activities); moderately productive;

4) – (high) – system-modeling, the teacher has strategies for forming the desired system of knowledge, skills; productive;

5) – (higher) – system-modeling activities and behavior of masters; activity of the teacher at a highly productive level is shown, first of all, in the ability to see the perspective, to formulate educational tasks competently, at a high scientific level, to predict the further educational activity, to choose optimum methods of an estimation of the decision of practical problems.

Important in this case is the so-called professional potential of the teacher, which reflects the systemic nature of pedagogical skills, and which is defined as a system of natural and acquired in the process of training qualities. The structure of the professional potential of the teacher consists of the following components: professional training, the creativity of the teacher, professionalism, pedagogical culture.

Among the requirements to the training of specialists, offered in pedagogical works, V. Fomkin recommends paying attention to professional, socio-psychological, personal, and creative. According to V. Shynkaruk, the improvement of education and professional training should take place in the following areas:

- the formation of attitude toward man as a goal of social progress, not a means;

- focus on the activation of human capital in higher education and vocational training, based on the concept of harmonious human development;

- reforming the system of higher education and training is strategic to ensure the quality of professionals;

- production, in the process of the training, of deep professional competence and social responsibility in solving the problems of scientific and technological progress, social and cultural development.

Based on the analysis of the above characteristics to the organization of the educational process, we see that the essence of the problem in the preparation of masters of natural sciences is to find the optimal structure for the use of forms and methods in the educational process. The solution to this problem today is beginning to be based not only on the use of traditional approaches in teaching but also based on the introduction of modern information technologies of teaching.

The preparation of masters of natural sciences for future professional activity in a pedagogical university is carried out not only during the study of disciplines of professional and practical training but also during the study of disciplines of fundamental and natural science training. In this regard, modern teachers must not only know psychological, pedagogical, and professional disciplines, but also the fundamental ones, which will help the students to master the techniques, modern pedagogical technologies and apply them in practice, while modeling and analyzing various pedagogical situations.

Under the educational and qualification characteristics of the areas of training, the requirements for the quality of educational and professional training of graduates of higher educational institutions are set. According to these requirements, per the fundamental and special training of future masters (field of knowledge 0401 "Natural Sciences"), they can perform the following types of professional activities: diagnostic, prognostic, constructive-organizational, educational, gnostic-research, analytical-evaluation, consulting-coordination. Among the production functions (labor, service) set of responsibilities performed by a specialist per the position and which are determined by job description or qualification characteristics, there are research, design, organizational, management, technological, control, forecasting, and technical. From the specified functions it is necessary to allocate the necessity of the organization of constant, continuous preparation of masters of natural sciences for the professional activity that demands a certain level of readiness of the expert for this activity. The term "readiness" in the philosophical dictionary means a person is armed with the necessary knowledge, skills, and abilities to successfully implement actions, providing the educational implementation of the action program in response to the appearance of a certain signal. Readiness is one of the characteristics of the potential state of the teacher's personality, which is manifested in the process of pedagogical activity. Readiness as a professional activity is the object of study of both educators and psychologists. Readiness for pedagogical activity, according to N. Kuzmina [118], consists of functions: constructive, organizational, and communicative.

M. Golovan introduces such a concept as "aspiration", which determines the solution of problems and tasks for training. The term "aspiration" in the Academic Explanatory Dictionary of the Ukrainian language is defined as "strong desire, inclination to accomplish something; wish". In our understanding, it is used as the individual's desire to obtain professional training.

Comparing the concepts of "readiness" and "ability", N. Podopryhora believes that the concept of "training" is not only result-oriented but also a process-oriented characteristic of

the development of the future specialist's readiness to implement various aspects of professional activity. That is why readiness as a characteristic of personal qualities of the master from the standpoint of evaluating his learning outcomes, is a broader concept than ability.

In S. Vyshniakova's dictionary, a professiogram is a document that reflects the conditions and substantial generalized characteristics of a certain profession, requirements (social, psychological, etc.) for a specialist, bearer of this profession, and definitions, based on these requirements necessary for this type of personality, that form the basis of professional suitability.

According to V. Yelahin, the professiogram should be considered as a document that concentrates the basic requirements for the educator's activity, a kind of passport that includes a set of qualities, pedagogical and professional special knowledge, and skills needed by the educator.

V. Slastonin includes to the model of the professiogram general political, social-psychological, personal, and ethical-pedagogical qualities which are shown in the direction of the person, so as requirements for psychological and pedagogical, special, and methodological training in the specialty.

It should be noted that the professiogram is an "open system". This means that because of the development of society, science, technology, culture, the structure, content, and functions of the teacher, the basic blocks of knowledge and skills will also change.

Among the components of professional competencies listed in the professiograms (teacher of natural sciences: physics, chemistry, biology), we highlight the components of subject competence in physics: to be able to carry out polytechnic education; to identify, establish and disclose interdisciplinary links, assess their cognitive value in the process of forming the scientific worldview, picture of the world and develop natural-scientific thinking. Thus, masters of natural sciences need to master the basic knowledge of the fundamental sciences to the extent sufficient for the development of general disciplines to successfully perform professional duties.

Under these conditions, the problem of improving the quality of training at all levels and in all forms of implementation becomes especially relevant. The solution to this problem is associated with the modernization of the content of vocational education, optimization of methods and technologies for organizing the educational process, as well as rethinking the goals and learning outcomes of future professionals. In their professional activity, they must solve not only educational problems of chemical or biological nature, which require

knowledge, usually of one discipline, but more complex, requiring synthesized knowledge, skills, and abilities in other natural sciences, including physics. It is possible to train such specialists only by equipping graduates with a set of knowledge of psychological and pedagogical, general scientific, general technical, and professional disciplines and experience of their application in future professional activity. One of the most important aspects of this problem is the improvement of methods of teaching physics to masters of natural sciences, considering methodological approaches.

Physics occupies an important place in the system of training masters of natural sciences, which provides fundamental, scientific, professional, and practical training for these specialties. This, in turn, allows masters of this profile to improve their knowledge, skills, and abilities in both scientific and professional training. Today's modernization of the physical education system is focused on the restructuring of content, the introduction of new forms and methods of teaching, aimed at the active use of technologies that teach independence and self-organization.

To achieve this goal required is the development of individual abilities, the formation of masters' ability to think independently, acquire and apply knowledge, carefully consider decisions, and clearly plan their actions, effectively cooperate in groups of different compositions and profiles, be open to new contacts and cultural connections. languages.

Comparing world trends with trends in the development of higher education in Ukraine, V. Serhiienko notes that in the period of globalization, competition, the rapid development of modern technologies, the current system of training future teachers can not satisfy Ukrainian society. That is why, as the scientist notes, one of the most important tasks of the modern education system is its transition to productive, problematic methods of teaching and education, the formation of a creative personality. The request of society for the training of a creative specialist, who is in constant search of effective and rational methods of teaching and education, reliably scientifically and methodically prepared, determines one of the main priorities of the higher pedagogical school. Within the limits of the specified problem at various levels of physical education (from the basic to higher school) it is necessary to shift accents from informative to the problem-activity type of the organization of the educational process.

According to V. Bakhrushyn, the modern educational system in Ukraine is at a difficult stage of functioning. This is due to the unsatisfactory condition of the physical facilities of higher educational institutions; low-quality textbooks and other educational publications; decline and disappearance of some science-intensive industries in general;

society's attitude to the basic sciences; issues of prestige or non-prestige of the profession and activities; deterioration of teachers' qualifications; the structure of change in the higher education system; lack of adequate funding, which leads to a decrease in the level of education; loss of links between higher education institutions and employers.

Yu. Pasichnyk and H. Shyshkin emphasize that to improve the quality of training of masters of natural sciences and ensure the country's entry into the European educational space, it is necessary to increase state funding on education, as well as improve the physical facilities of educational institutions.

M. Shut and L. Blahodarenko note that in the context of the above problems, physical education in pedagogical universities requires significant improvement. This requires solving such urgent problems as updating the content of higher physical education, improving its quality and priority, improving the natural and mathematical training of masters, modernizing the teaching staff, preparing curricula and programs that should significantly enhance the effective content. education and enrich the activity-practical orientation.

Considering the training of masters of natural sciences in pedagogical HEI, we should note that the main tasks in improving education are the successful assimilation by students of a set of generalized professional activities as the most important component of professional competence; basic, fundamental components of universal competencies that allow the graduate in the future to effectively adapt to changing conditions, constantly self-improve, successfully solve problem situations that provide him with a high level of demand and competitiveness in the professional labor market.

To improve the quality of training of masters of natural sciences it is necessary to implement a unified approach to teaching various disciplines, their compliance with modern society, structuring educational material, a unified conceptual approach to constructing the content of academic disciplines, and methodology of their study. The quality of professional training of masters of natural specialties increases significantly if the content of the physics course is focused on the formation of ideas about natural phenomena, objects of modern technology, and engineering. In the dissertation researches of V. Yelahina, N. Maiorova, and O. Petrova it is emphasized that the structure of the physics course of masters of natural specialties of pedagogical universities is influenced by new ideas and approaches, composition and logic of the course content, modern tendencies of teaching physics in higher school. The structure of the physics course is implemented in the curriculum. The curriculum through modules, content modules, sections, and topics distributes the entire system of knowledge and skills that masters must acquire while studying the course of physics. The

important structural elements of the program for these specialties are interdisciplinary links that promote the integration of knowledge and skills and their transfer to new conditions for the formation of scientific thinking and worldview.

Based on the above, R. Venhrenovych, V. Kramar, and M. Stasyk believe that the importance of developing new curricula should be to ensure the content and quality of education, including physics and mathematics, and knowledge transfer.

A new approach to the development of the course of physics allows the most productive consideration of the relationship of the disciplines of the natural cycle (physics, chemistry, biology). It is known that the weak or insufficient connection between these disciplines often leads to the fact that masters cannot approach the consideration of various phenomena and processes based on fundamental laws of nature, namely: if one of the laws studied within one discipline, it is necessary to apply to phenomena used within the context of another discipline. Introduction to the content of cross-cutting issues with interdisciplinary content allows acquainting masters not only with the application of fundamental laws in different conditions, but also to show the limits of application of these theories in natural sciences.

In our opinion, the construction of the content of the physics course for masters of natural sciences involves the selection of the main, fundamental, i.e., leading ideas, theories, laws, general concepts that directly affect the selection and placement of all educational material. Despite the reduction of academic hours dedicated to the study of physics it is necessary to carefully select educational material that has not only scientific or educational content but also a professional, developmental, and educational nature to understand physical theories and laws.

To improve the quality of training of masters of natural sciences in pedagogical universities, it is necessary to work harder on the selection of educational material. According to H. Bushok and B. Kolupaiev, from the point of view of psychology, a person has a desire for knowledge. Loss of interest in the study of the discipline occurs when the educational process violates the principle of holistic reflection of science – when attention is focused on the results of science, and the methodology of science and independent scientific activity is pushed into the background.

Ye. Petrova notes that during the preparation of masters of natural sciences, physics should have not only the worldview creation role but also one of mastering the disciplines of the professional segment, as masters develop the ability to build physical models of various

objects during the study of fundamental laws. These skills will be further used by masters of natural specialties in modeling various phenomena in professional activities.

It is known that the basis for studying the course of physics are general laws, ideas, and physical principles that require constant development in the system of physical education. The main ones are the laws of conservation in physics – total energy, momentum, angular momentum, electric charge, baryon and lepton numbers, the principle of relativity, conformity, symmetry, etc. The study of these principles is considered an important methodological problem. The solution to this problem should provide not only interdisciplinary nature but also fundamental, applied, and professional. The use of these principles in practice opens wide opportunities for the application of new approaches in the presentation of educational material. The study of physics, based on modern understanding is one of the main tasks of the physics course for masters of natural sciences.

It should be noted that in the professional training of masters of natural sciences, physical education occupies a prominent place, and the discipline “Physics” is one of the main disciplines of the natural sciences. According to theories and laws, physics was introduced as a mandatory basic discipline for masters of natural sciences.

Analysis of scientific, psychological, pedagogical, and methodological literature shows that the problem of teaching physics in the preparation of masters has not yet been studied, in many respects, and requires considerable attention. Most scientists working with masters of natural sciences in pedagogical specialties of HEI, emphasize the need to develop a model of the methodical system of teaching physics by masters of natural sciences based on the use of methodological approaches that will meet the requirements of modern specialists in both didactic and methodological terms. Taking these provisions into account will help to ensure proper training of masters of natural sciences.

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