Lutsenko Olena, Candidate of Biological Sciences, Associate Professor, Head of the Department of Theory and Methods of Teaching Natural Sciences, Glukhiv National Pedagogical University named after O. Dovzhenko, Glukhiv, Ukraine, https://orcid.org/0000-0003-3705-8743

METHODOLOGICAL AND THEORETICAL PRINCIPLES OF FORMING PROFESSIONAL COMPETENCE OF NATURAL SCIENCE TEACHERS

Abstract

The article examines the conditions of professional and pedagogical training of future teachers of natural sciences. The authors emphasize that the solution to the problem of theoretical and methodological prerequisites for the professional training of natural science teachers should be sought in the understanding of the categories "culture" and "methodology" and, as a result, in the awareness of the fact that, probably, not every activity requires a certain culture of its organization, as well as methodological justification.

Purpose - to determine the theoretical and methodological prerequisites for the professional training of natural science teachers.

Results. The Conceptual Foundations of the Development of Pedagogical Education emphasize the need to create a system of pedagogical education that is based on world and national heritage and established European traditions and ensures the training of pedagogical workers capable of carrying out professional activities in democratic conditions. Humanistic foundations are the basis for the implementation of educational policy as a priority function of the state for the purpose of development and self-realization of the individual, satisfaction of his educational and spiritual, and cultural needs, and the need to be competitive in the labor market.

Changing the orientation of the educational methodology - from the formation of the personality to strategies for the development of the personality and self-development - requires a differentiated, diversified, multi-level, basic, computerized, personalized, continuous, humane culturalization and humanization of the theory and practice of education, and is considered an absolute priority of the 21st century. These priorities are indicated in the main document adopted as part of the Bologna process.

Conclusion. The essence and content, the main trends and principles of the construction of the content and technologies of the professional training of the future teacher can be considered from the standpoint of various methodological guidelines, which for comprehensive research and comprehensive influence on the formation of the future teacher can be combined in several directions, namely: structurally systemic, personally oriented, professionally oriented, historical and cultural. To develop the methodological culture of the future teacher, it is necessary to find out the nature of the humanistic, competence, cultural, and methodological concepts of professional training, which were discussed in the material above.

The considered aspects of professional training are structured in curricula and programs into three cycles of discipline. Different options of professional and pedagogical training are modeled on established conceptual approaches to its structure and content based on a holistic and systematic understanding of the essence of this process.

Key words: prerequisites, preparation, teacher, professional, fundamentalization.

Problem statement. In modern scientific literature and educational periodicals, the issues of improving the system of professional training of future teachers are increasingly being raised, and the content of their professional and

pedagogical culture is being discussed. This indicates certain shifts in the awareness of the role and place of the teacher, and therefore, the rejection of a simplified consideration of professional and pedagogical activity and the system of professional training of teachers. We believe that the teacher is a determining figure in the educational process, the bearer of the content of education and pedagogical technologies of teaching and upbringing. He manages the educational and cognitive activities of students and implements the program of educating the student body, on scientifically sound principles, and provides appropriate conditions for the development, self-realization, and self-determination of students in various types of activity. Increased requirements for the professional activity and personality of the teacher determine the specifics of the organization of his professional and pedagogical training.

Analysis of recent research and publications. In modern socio-cultural conditions, professional and pedagogical training is designed to solve two complexes of interrelated tasks: first, to promote the social development of the future teacher's personality, his general educational, cultural, and ideological training; second, to ensure professional development in the chosen field of pedagogical activity (Valko, N.).

The development of the teacher's personality, mastering the relevant knowledge and abilities that allow him to make well-founded conclusions about the state and course of the pedagogical process and to act effectively, which is the goal, basis, and condition of effective professional activity. However, leading scientists who study the issue of improving the content of professional education (V. Bondar, S. Goncharenko, N. Hrytsay, N. Guz, I. Zyazyun, V. Kremen, V. Kuz, V. Lugovyi, O. Moroz, N. Nychkalo, V. Radul, O. Savchenko, S. Sysoeva, L. Khomych, etc.) quite rightly believe that in modern conditions, the formed image of professional and pedagogical culture no longer ensures the professional and career success of the teacher, his competitiveness, a high level of professionalism,

and pedagogical skills. As a result of understanding the content of the teacher's professional activity, which currently includes the functions of a teacher, educator, methodologist, and researcher of pedagogical reality, reaching the level of designing and constructing pedagogical systems, a new cultural phenomenon is distinguished - the methodological culture of the teacher. Despite significant achievements in this area, the concept of “methodological culture” has not yet been fully established in educational practice. For a long time, it was believed that this phenomenon can be considered only in the context of the professional culture of a scientist, researcher, or professional methodologist and that it affects the success of their main activity – the search for new knowledge. Attempts to determine the content and current composition of professional and pedagogical culture, which should cover all areas of a teacher’s activity and not be broken up into separate components, prompted scientists to formulate certain conclusions. First, professional and pedagogical culture is not a “mosaic” formation, but can be represented as an integrated unity of multiple cultures that lead to the formation of the personality of a future professional through the diversity of components of his self-determination in professional activity (Hramatyk, N.). Secondly, in the segmental structure of professional and pedagogical culture, there is a special formation that integrates the remaining components and serves as its core and guiding vector of development. Thirdly, culture, which assumes the function of a system-forming factor, is a separate axiological, acmeological, systemic, holistic, anthropological, culturological phenomenon and cannot be identified with either the scientific and philosophical worldview, or the intellectual culture of the teacher. However, the questions of the place of methodological culture in the metasystem of professional and pedagogical culture, as well as its specific functions, which primarily provide methodological activity uncharacteristic of educational practice, remain not yet finally determined.

So, the purpose of our study is to determine the theoretical and methodological prerequisites for the professional training of science teachers.

Presentation of the main material of the study.

The solution to the problem of the theoretical and methodological prerequisites for the professional training of a science teacher should be sought in understanding the categories of "culture" and "methodology" and, as a result, in realizing the fact that, probably, not every activity requires a certain culture of its organization, as well as methodological justification. Reproductive activity, a reflection of which can be the routine everyday work of a functional teacher at the level of once and for all mastered technologies, does not require methodological approaches. Another thing is productive activity aimed at obtaining an objectively new or subjectively new result in a situation of uncertainty of methods, techniques, and ways of organizing the educational process (Vasylchenko, L. V.). Recognizing the importance of methodological culture, a significant number of researchers of this problem at the same time consider it a characteristic of a teacher-researcher, who, in fact, produces new knowledge on the basis of a comprehensive methodological analysis. A system of methodological knowledge is enough for a teacher-practitioner to creatively comprehend pedagogical experience. However, today's pedagogical realities refute the thesis of a clear distinction between the functions of scientists, methodologists, and practitioners. In modern educational practice, a teacher's educational activity requires purposeful and professional research. S. Goncharenko, N. Gramatyk, Yu. Shapran and others determine that in the conditions of searching for new goals, the pedagogical content, to which practicing teachers are actively involved, and the methodological culture that is cultivated in it are of great importance. This not only increases the scientific and research level of teachers, but also strengthens all the leadership functions of teachers as translators of cultural experience in the educational process. The relevance of methodological culture for a teacher is explained by the modern rapid

development of both general scientific and thematic methods in combination with the processes of globalization and informatization. S. Goncharenko aptly calls this state the “accumulation” of various knowledge, methods, approaches, and directions (Goncharenko, S. U.). As a result, teachers often do not have the tools necessary to solve specific problems. They are the ones who need reflective analysis and reconstruction to obtain (create) a new scientific system with the help of which it is possible to perform tasks and achieve pedagogical goals (Ilchenko, V. R., Huz, K. Zh.). As a result, a methodological situation arises, for the solution of which the teacher needs to self-determine his scientific views, professional advantages and preferences, evaluate and generalize his own pedagogical experience and the experience of other teachers, and form a certain methodological position, which should be consistent with the professional and pedagogical position in general. No matter how thorough the knowledge a teacher has about the methods of scientific research of pedagogical reality, it turns out to be insufficient. Its products are certain programs, a system of logically connected principles or provisions, heuristic rules, prescriptions, etc. The use of scientific tools in educational practice allows for increasing the effectiveness of the teacher's activity and preventing work by the "trial and error" method.

It is important to theoretically generalize and focus attention on strategic ideas, the modern configuration of the principles of the teacher's methodological culture, to focus on specific pedagogical and research ones, which should contain a specific strategy for the development of the methodological culture of future teachers (Lypova, L., Valko, N.).

Recently, conceptual provisions have been developed based on the principles of the Constitution of Ukraine, the State Theory of Education Development, the laws "On Education" and "On Higher Education", the modernization of educational programs for the training of future teachers of biology and human health and natural sciences, the Concept "New Ukrainian

School", the UNESCO Global Action Program in the field of education for sustainable development (Partner Networds of the Global Action Program on Education for Sustainable Development), aimed at transforming the educational environment, developing the creative potential of teachers. The Conceptual Principles for the Development of Pedagogical Education emphasize the need to create a system of pedagogical education that is based on world and national heritage and established European traditions, and provides training for teachers capable of carrying out professional activities in a democratic environment. Humanistic foundations are the basis for the implementation of educational policy as a priority function of the state for the purpose of development and self-realization of the individual, satisfaction of his educational and spiritual, and cultural needs, and the need to be competitive in the labor market (7).

The change in the orientation of educational methodology – from the formation of the personality to the strategies of personality development and its self-development – requires differentiated, diversified, multi-level, basic, computerized, personalized, continuous, humane culturalization and humanization of the theory and practice of education, and is considered an absolute priority of the 21st century. These priorities are specified in the main document adopted within the framework of the Bologna Process (10, 11).

There is an opinion that teachers should be primarily specialists with a comprehensive mathematical and natural science education; however, some believe that the methodological component is more important, because it contributes to the effective organization of teaching and learning and the improvement of the teacher's working conditions. There is also an opinion that considers only the fundamentalization of aspects of branch sciences, without extending this requirement to other, especially humanitarian, disciplines.

In general, the process of fundamentalization, emphasizes L. Lypova, involves an increase in the volume and role of disciplines of the general scientific

cycle (not only logical-mathematical and natural-scientific knowledge, but also socio-psychological, philosophical, cultural-historical, and socio-political); strengthening the connections between the disciplines of the curriculum; restructuring the cycle of professional disciplines with increased attention to worldview and social problems; ensuring the formation of a methodological culture of a specialist in the process of education; studying special disciplines focused on the formation of skills in mastering the means and technology of information culture, etc. (Lypova, L).

So, if in the past discussions were conducted around two priorities of professional teacher training - subject-oriented or pedagogically oriented education - then today is characterized by the awareness of the need for humanitarian, cultural, and other concepts that would unite existing views. A. Stepaniuk singles out this trend from the analysis of foreign experience in teacher training and points to the expediency and relevance of disciplines related to culture and general education, since it is through them that a future teacher can comprehensively master the whole variety of forms of knowledge acquisition that belong to both his own and “foreign” cultural traditions. In this way, a new type of teacher will be formed, who is no longer a translator only of cultural heritage, but possesses various sources of knowledge that are available in different cultures (Stepaniuk, A. V.). The achievements of natural sciences, their impact on people's lives, the increase in the pace of scientific and technical and information and technological progress, could not help but affect the content of professional training of future teachers of natural disciplines.

There are many approaches to structuring the content of professional training for future teachers. However, under any conditions, upon its completion, a certain level of professional competence of a specialist must be achieved, which will allow him to successfully perform professional and pedagogical functions. In accordance with the Law of Ukraine “On Higher Education”, higher education

standards (educational standards) are being introduced, which ensure the functioning of a single educational space in the state. An education standard is understood as a system of basic parameters accepted as a state norm of education, which in turn reflects a social ideal and takes into account the capabilities of a real individual and the education system to achieve this ideal (11).

Fundamental training involves studying the theoretical foundations of general philosophical, general cultural, psychological, and pedagogical, and special knowledge in accordance with the latest achievements of science. In the modern context of fundamentalization of education, explains N. Hrytsai, the mastery of not only the methodology of science, but also the methodology of creative, research activity, cognition, and self-knowledge is of particular importance. Methodology, as the core of fundamental training, acquires the status of a personally significant theory of thinking, activity, subject-subject dialogue, which ensures systematicity, integrativity, integrity, and predictiveness of knowledge (Hrytsai, N. B).

Subject training is associated with the assimilation of the entire complex of scientific information from the main disciplines of the basic specialty of the future teacher. Psychological and pedagogical training is the process and result of the formation of the professional orientation of the future specialist through the study of the mandatory educational components of the psychological and pedagogical and methodological cycles in accordance with the chosen specialization, when students master the scientific foundations of pedagogical activity necessary for the development of pedagogical theory and analysis of pedagogical practice.

The main indicator of practical pedagogical training is the formed level of the teacher's personality with a systemic vision of the pedagogical process, possessing the foundations of pedagogical culture, components of pedagogical skill, which determine the future development of the individual style of his pedagogical activity (Vasylchenko, L. V.). The forms and terms of practice are

determined for each educational and qualification level, taking into account the specifics of the specialties, and their term is from 16% of the total time budget. The system of production (pedagogical) practice acquires a continuous and continuous character in the present conditions, ensuring the implementation by the student of the same leading functions - educational, developmental, and educational, as well as the construction of pedagogical interaction with the subjects of the educational process, which, in fact, is the basis of the teacher's activity.

Humanitarian training, N. Valko points out, is a set of forms, means, and methods of training and practice aimed at stimulating the cultural development of future specialists, their understanding of the importance of human values in the modern world. It is aimed at developing the humane culture of the future specialist, their understanding of the history of civilization, promoting spiritual needs and interests, improving communication and cultural standards, ultimately, at realizing their place in culture, developing cultural self-awareness (Valko, N.).

The above-mentioned main areas of training branch out into several interdependent, more partial in content and forms, such as: economic, mathematical, sociological, socio-psychological, pedagogical, managerial, legal, ecological, etc. Their scope and content are oriented towards the specialty and correlate with the needs of each specific branch of social production. Currently, the conceptual approach to the structure and content of professional training of future teachers is based on a holistic and systemic understanding of the essence of the educational process. On this basis, various options for professional and educational training are modeled.

Conclusion. The essence and content, the main trends and principles of building the content and technologies of professional training of a future teacher can be considered from the standpoint of various methodological guidelines, which, for comprehensive research and complex influence on the formation of a

future teacher, can be combined into several directions, namely: structural-systemic, personally oriented, professionally oriented, and historical-culturological. To develop the methodological culture of a future teacher, it is necessary to clarify the nature of the humanistic, competency-based, cultural, and methodological concepts of professional training, which were discussed in the material above. It is also determined that new models of professional training are currently based on the principles of differentiation, diversification, multi-level, fundamentalization, standardization, computerization, individualization, continuity, humanization, and humanitarianization. It distinguishes as separate, but quite significant components: general scientific, fundamental, subject, psychological and pedagogical, methodological, practical, scientific and pedagogical, information and technological, methodological, social and humanitarian, and other types of training. The considered aspects of professional training are structured in curricula and programs into three cycles of disciplines. Various options for professional and pedagogical training are modeled on the established conceptual approaches to its structure and content on the basis of a holistic and systematic understanding of the essence of this process.

References

1. Valko, N. (2019). Analiz ta perspektyvy pidhotovky maibutnikh uchyteliv intehrovanoho kursu «Pryrodnychi nauky» (Analysis and prospects of training future teachers of the integrated course "Natural Sciences"). Seriia: Pedahohichni nauky. Vyp. 2. Berdiansk: BDPU, S. 170–178 [in Ukraine].

2. Vasylchenko, L. V. (2020) Stan zaprovadzhennia intehrovanoho kursu «Pryrodnychi nauky» u profilnu shkolu zakladiv osvity Zaporizkoho rehionu. (The status of the introduction of the integrated course "Natural sciences" in the specialized school of educational institutions of the Zaporizhzhia region) Elektronnyi zbirnyk naukovykh prats ZOIPPO. № 2 (39). URL:

https://drive.google.com/file/d/1FjnSDtZh9L_3jm9Z5TSY1n1bxArGK4vp/view [in Ukraine].

3. Honcharenko, S. U. (2008) Fundamentalizatsiia profesiinoi osvity yak dydaktychnyi pryntsyp (Fundamentalization of professional education as a didactic principle) Teoriia i praktyka upravlinnia sotsialnymy systemamy: filosofiia, psykholohiia, pedahohika, sotsiolohiia № 2. S. 87–91 [in Ukraine].

4. Hramatyk, N. (2019) Profesiina pidhotovka maibutnoho vchytelia biolohii: bazovi teorii pryrodnycho-naukovoho dyskursu (Professional training of the future biology teacher: basic theories of natural science discourse) URL: http://mdu.edu.ua/wp-content/uploads/ped-visnik-66-2019-15.pdf [in Ukraine].

5. Hrytsai, N. B. (2016) Teoriia i praktyka metodychnoi pidhotovky maibutnikh uchyteliv biolohii (Theory and practice of methodical training of future biology teachers): monohrafiia. Rivne [in Ukraine].

6. Ilchenko, V. R., Huz, K. Zh. (2016) Tilky osvicheni vilni (Only the educated are free) Ukrainskyi pedahohichnyi zhurnal. № 3. S. 31–38. URL: http://nbuv.gov.ua/UJRN/ukrpj_2016_3_5 (data zvernennia: 16.04.2022) [in Ukraine].

7. Intehrovanyi kurs «Pryrodnychi nauky». URL: https://ele.zp.ua/sites/nature/ [in Ukraine].

8. Kolesnyk, M. O. (2020) Suchasnyi osvitnii prostir: nova paradyhma pryrodnychoi osvity (Modern educational space: a new paradigm of science education): monohrafiia. Chernihiv: Desna-Polihraf [in Ukraine].

9. Lypova, L. (2014) Model fundamentalizatsii zmistu pryrodnychoi osvity v zahalnoosvitnii shkoli (The model of fundamentalization of the content of science education in a secondary school). Dovidnyk dyrektora shkoly. №1–2. S. 39–47 [in Ukraine].

10. Metodychni rekomendatsii shchodo vykladannia pryrodnychykh nauk u 2019/2020 navchalnomu rotsi. URL:

https://osvitoria.media/metodychnirekomendatsiyi-shhodo-vykladannya-pryrodnychyh-nauk-u-2019-2020- navchalnomu-rotsi/ (data zvernennia: 16.04.2020).

11. Natsionalna doktryna rozvytku osvity Ukrainy. URL: http://zakon5.rada.gov.ua/laws/show/347/2002

12. Stepaniuk, A. V. (2018) Vykorystannia kontekstnoi tekhnolohii navchannia pry pidhotovtsi vchyteliv pryrodnychykh nauk (The use of contextual learning technology in the training of natural science teachers). Naukovyi visnyk Uzhhorodskoho universytetu. Seriia: «Pedahohika. Sotsialna robota». Vyp. 2 (43). S. 270–273 [in Ukraine].