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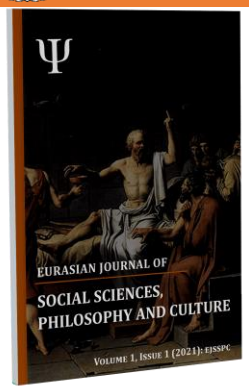

IMPROVING THE METHODOLOGY OF DEVELOPING THE ANALYTICAL THINKING OF FUTURE PHYSICS STUDENTS BASED ON THE DIALECTICAL APPROACH

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ABSTRACT

The article is devoted to the analysis of the problem of formation of the methodological component of professional training of future teachers of physics. The essence of the basic concepts of "methodological culture" and "methodological competence" of a physics teacher is clarified; the main components and pedagogical conditions are determined that contribute to the effective solution of the problem of the formation of methodological competence of students in the process of teaching theoretical physics.

INTRODUCTION

In the "Main Directions of Research in the Field of Pedagogical and Psychological Sciences", among the priorities of the professional training of modern specialists, the leading place is occupied by methodological training, which reflects the problem of "methodological and theoretical foundations for the fundamentalization of professional education" [1]. As a result, the strategic goal of the modern higher pedagogical school is the need to solve a fundamental problem - improving the quality of training of a specialist teacher, teacher-mentor, teacher-creator.

MATERIALS AND METHODS

Accordingly, an important component of the system of professional training of future teachers of the educational field "Natural science", in particular physics, is their preparation for creative professional activities: teaching the ability to learn, independently acquire knowledge, think creatively, "see" and analyze pedagogical phenomena and facts, predict results own actions. The solution of these issues is connected with the formation of their methodological culture, mastering the relevant knowledge and experience of independent creative educational and cognitive activity. It is the methodological culture of the teacher today is considered as: a prerequisite for the formation of his professionalism (V. Kraevsky); the basis of professional culture (A. Bondarevskaya); fundamentalization factor (S. Goncharenko), the main criterion for the quality of professional training (A. Lyashenko) [2].

RESULTS AND DISCUSSION

Methodological knowledge in teaching is not transferred as a set of ready-made knowledge, prescriptions or rules. The formation of a methodological culture of future physics

teachers requires purposeful and phased work, which should be implemented “from the first steps” of the system of their professional training in a pedagogical university. Despite the fact that the issues of the methodology of scientific knowledge are included in the standards of higher education, fixed in all modern courses of didactics and methodology, the analysis of periodicals, as well as the results of the survey of bachelors in physics during state exams, indicate an insufficient level of formation of methodological knowledge and the use of theoretical knowledge by them. methods of knowledge in practice. In most cases, students are not put in a situation of personal rethinking of the educational information that they learn during classroom lessons, and are often not ready to participate in such situations. Therefore, we get a subject teacher, and not a methodologist teacher, and even less a research teacher who can effectively design and organize the teaching and educational process in physics at school, creatively realize himself in accordance with his personal abilities and value orientations.

To the above, one more important circumstance should be added, connected with the need to resolve the main contradiction of modern higher education - the rapidly growing volume of scientific knowledge and the possibility of their qualitative assimilation. This shifts the emphasis in the formation of the goals of teaching fundamental, professionally oriented disciplines (primarily general and theoretical physics): the main thing is not the acquisition of a certain amount of knowledge by the student, but mastering the methods of obtaining them, the methodology of scientific knowledge, the style of scientific thinking. It is no coincidence that the leading Russian methodologists-physicists (P. Atamanchuk, L. Blagodarenko, A. Kaspersky, V. Sergienko, V. Sirotyuk, M. Shut, etc.) emphasize the need for a close connection between the methodology of studying the discipline and the methodology of science, since “the essence of learning is not only mastering the language, but also the method of thinking of science.” In this context, the problem arises of developing theoretical and methodological foundations for the formation of a methodological culture of future physics teachers as a factor of fundamentalization and one of the main criteria for the quality of their professional training [3].

An analysis of literary sources shows that in pedagogical theory and practice there are valuable ideas, approaches that form a whole range of scientific research in solving the problem under consideration: theoretical and practical aspects of the formation of a professional culture of a specialist (A. Bondarevskaya, L. Mikeshina, M. Skatkin, etc. .); pedagogical culture and mastery (I. Bekh, V. Grineva, I. Zyazyun and others); methodological culture of a physics teacher and some aspects of its formation (P. Atamanchuk, L. Blagodarenko, I. Bogdanov, S. Goncharenko, A. Ivanitsky, A. Lyashenko, M. Sadovoy, V. Sergienko, N. Sosnitskaya, V. Sirotyuk, M. Shut and others). Despite the significant interest in the formation of the methodological component of teacher training in pedagogical science, it should be noted that this problem remains one of the most complex and least developed. In modern didactics of physics, this problem has not been considered separately; it does not have a systematic and holistic solution both at the level of theory and in the practical plane of searching for appropriate conditions and technologies.

The formation of methodological knowledge of a future physics teacher begins with the formation of the concept of methodology. An analysis of scientific sources testifies to the

ambiguity of this concept. In a broad sense, methodology (Greek methodos, a way to achieve a goal, a path of research or knowledge; logos, science) is a doctrine of structure, logical organization, methods and means of activity. The complexity, versatility and interconnection of the phenomena of the surrounding reality necessitate the use of a set of methodological approaches in scientific knowledge that provide objective, reliable information, allowing you to create a complete picture of the object under study. Methodological principles include the following principles: the unity of the logical and historical, systemic and holistic, theoretical and empirical approaches, etc. The conscious and systematic use of the latter in scientific and educational knowledge forms the experience of the creative activity of the individual, his reflective skills, value orientations, that is, methodological culture [4].

The basis of the methodological culture of a physics teacher is methodological knowledge. It is their formation in the educational process of a particular discipline that is one of the most important didactic tasks. The search for ways to solve it begins with finding answers to the questions: what should be understood as methodological knowledge in general and a specific scientific, subject area in particular (in our case, methods of teaching theoretical physics), what are their relationship, structure and functions.

Methodological knowledge in science is a set of intellectual tools of the individual that orient, direct and organize his cognitive activity; it is in them that the practice of scientific research of the surrounding world is fixed. There are three levels of physical science methodology: philosophical, general scientific and specific. The basis of the first of them is dialectical materialism, which includes as basic principles such principles as objectivity, realism, consistency, logical structure, determinism, interconnection and interdependence, evolutionary development, etc.

The philosophical level of the methodology of modern physics is based on a system of generalized knowledge about matter and its movement, space and time, interaction and the following philosophical categories (single and general, whole and part, absolute and relative, quality and quantity, discreteness and continuity, revolution and evolution, unity and struggle of opposites, etc.), which, concretizing on physical examples, constitute a complex of epistemological, theoretical and cognitive tasks. This complex covers questions about: the role of practice as a source of knowledge and a criterion for their truth, the relationship between theory and experiment, the formation of scientific concepts, continuity in the development of physics, the relationship between absolute and relative truth, etc.

The general scientific level of the methodology of physics contains a system of methods, principles and means of natural science knowledge: methods of logical thinking (analysis, synthesis, induction, deduction, abstraction, generalization, analogy, comparison, etc.), methods for constructing empirical knowledge (observation, measurement, experiment), methods for constructing theoretical knowledge (idealization, formalization, modeling, thought experiment, hypothesis, mathematical methods, etc.).

The system of specific scientific methodological knowledge of students in teaching theoretical physics includes [5]:

– understanding of the structure and content of fundamental physical theories and their heuristic role in explaining and predicting patterns of natural phenomena and processes;

– awareness of the content of fundamental physical principles (atomism, conservation, relativity, causality, dualism, uncertainties, correspondence, complementarity, symmetry) as the basis for the unity of the laws of nature;
– awareness of the content and universality of fundamental physical interactions;
– awareness of the need to use the mathematical apparatus of modern science as a tool for understanding the nature of physical phenomena;
- knowledge of the most important aspects of the modern physical picture of the world and its evolution, as well as the characteristic features of the methodology of scientific knowledge (classical, non-classical or quantum-field, post-non-classical or evolutionary-synergetic stages / strategies of scientific thinking).

CONCLUSION

Thus, the formation of the methodological culture of a future physics teacher should be considered in the context of the development of his key professional competencies, which will allow him to rise to the highest level of professional training. In the teaching of theoretical physics, the latter causes a shift in emphasis from informational to methodological education, the transition from the translation of ready-made knowledge to the formation of a creative, scientific style of thinking of an individual. The problem of forming the methodological component of the professional training of future teachers of physics requires a comprehensive study, which, in our opinion, should be carried out in the unity of school and university methods, since the gap between them will lead to a decrease in the quality of the results obtained.

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