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## **PRINCIPLES FOR IMPLEMENTING THE CONCEPT OF CONTINUOUS EDUCATION AT THE STAGE OF SPECIALIZED TRAINING AND PROFESSIONAL EDUCATION**

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### **Abstract**

Currently, universities face the challenge of transitioning senior classes to specialized education. This problem is complex and requires extensive research. It is currently being widely discussed among educators, psychologists, and methodologists. In the concept of specialized education at the senior level of comprehensive school, the proposed profiles are merely outlined but not developed, and specialized education in the proposed form has not been researched. The issue of preparing future teachers for work in a specialized education environment remains unresolved. However, the success of the transition to specialized education largely depends on this. Groups with various focus areas have already been established, with pedagogical groups occupying a special place among them. The pedagogical profile guides senior students toward the teaching profession, which is widely practiced. Furthermore, the pedagogical profile facilitates the concept of continuous teacher training in the "specialized class - pedagogical university - specialized class" system, which has a cyclical nature. A number of higher education institutions have established teaching groups that teach pedagogy and psychology, but there is a complete lack of substantive connections between the subject-based chemistry curriculum and the chemistry teaching methods at the pedagogical university. General methodological training for future chemistry teachers at the pedagogical university is inadequate to prepare them for work in specialized groups, despite the perceived urgent need for such teachers. The social mandate for a transition to specialized education is not supported by the theoretical foundation and



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educational and methodological support needed to meet it. Hence, the need to create a system for preparing future chemistry teachers for work in classes with different profiles, which will ultimately entail the need to resolve these contradictions.

**The objective of the study was** to create a scientifically based system of continuous chemical and methodological training of students for work in specialized classes, including the step-by-step, consistent formation of methodological knowledge and skills at different stages of training during the acquisition of the teaching profession.

**Object of the study:** continuous professional and methodological training of future chemistry teachers in pedagogical classes and at the university.

**Subject of the research:** continuous chemical and methodological training of students of specialized classes and students of pedagogical universities for work in specialized classes.

**Research objectives:** To study modern approaches to the specialized education process and to analyze the development of the idea of specialized education in school chemistry education. To analyze the state of the problem of teaching chemistry in classes of different profiles and the preparedness of university graduates with chemical specialties, as well as practicing teachers, for such work. To develop a scientifically based theoretical concept of continuous chemical and methodological training of students in the system “specialized class - university - specialized class”. To determine methodological approaches to the design of the content of the school chemistry course for classes of different profiles.

**The results of the study:** the methodological training of future chemistry teachers for work in specialized groups requires a fundamental change in the system of this training in the direction of continuity, succession and integration of interaction between the pedagogical university and specialized pedagogical



groups. This can be achieved through: defining the characteristics of chemistry teaching to students of different profiles; propaedeutic chemistry-methodological training of students in pedagogical groups; chemistry-methodological orientation of chemistry disciplines in the junior years of the university; the creation of a methodological base in the main course "Chemistry Teaching Methods" to prepare students - future chemistry teachers for work in groups of different profiles; the development of a special methodological course to prepare students for work in different profiles as the final stage of comprehensive methodological training of future chemistry teachers at the university; the implementation of acquired skills by students during pedagogical practice, which closes the continuous cycle of chemistry-methodological training. The study consisted of the following stages: search and orientation, conceptual, constructive and modeling, experimental and research, and generalizing and corrective. At the search and orientation stage, in accordance with the goals and ideas of the study, the following was accomplished: modern world trends in higher education development were identified; Polish regulatory documents on higher education reform were analyzed and national trends in its development were determined; key scientific achievements in the field of inorganic chemistry that should be taken into account in the content of the university course were identified; historical and methodological analysis of the formation and development of chemical education in Poland and changes in the place and importance of inorganic chemistry courses in it were carried out; comparative analysis of the content of university courses in inorganic chemistry in Poland and other countries was conducted, their similarities and differences were identified; the state of the process of teaching inorganic chemistry students was identified and contradictions between the existing, traditionally established system of education and the new requirements for general chemical professional training of a chemistry student, to his personal qualities were revealed. Additionally, curricula for ascertaining and formative experiments were developed; local experimental studies of the assimilation of the basic concepts of general and inorganic chemistry were conducted; the level of knowledge of inorganic chemistry, and in particular, the chemistry of complex compounds, was determined among those



beginning to study this subject and among group graduates. To improve the reliability of the initial experimental data, a combination of various research methods was used: qualitative and quantitative analysis of responses, written assignments, and student exam results, interviews with teachers, discussions with teachers and students, comparison of the obtained data with those published in the literature, etc. The central part of the conceptual stage of the study was the development of a concept for modernizing the content and process of studying the inorganic chemistry course at the university. The theoretical foundations for constructing this course were developed based on the block-modular, historical-analytical, personal-activity, problem-based research, and axiological approaches, and their essence, structure, and functions were revealed. Requirements for developing knowledge, skills, and abilities were identified, and a methodology for assessing their acquisition was developed. Information and scientific research was continued by examining literary sources on the issues of teaching inorganic chemistry and the use of block-modular learning. At the constructive-modeling stage, a theoretical model of the methodological system was developed based on the concept, followed by a concretizing methodological system for teaching inorganic chemistry to students. Methods and means for updating and constructing the course content were determined, individual blocks of study, as well as the types and levels of student cognitive activity, were designed. A system of blocks, modules, and modular units was developed, which became the basis for the original inorganic chemistry teaching program at Polish universities. Didactic tools for teachers and educational materials for students were developed, ensuring the presentation and assimilation of the main blocks and modules of the course studied using the experimental methodology. The programs, methods, and teaching tools developed by us have been implemented in pedagogical practice, and a study of their effectiveness throughout each training cycle has been conducted. During the experimental research phase, a study was conducted to assess the effectiveness of the modernization of the structure and content of the original teaching method. The methodology for studying inorganic chemistry was refined, and criteria for assessing its effectiveness were defined. Data was processed, and the results were



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systematized and summarized using statistical methods. The impact of the original methodology on students' personal development, their interest in learning the subject, their ability to comprehensively apply and transfer acquired knowledge to different situations, and their willingness to realize their creative potential, especially in research, was determined.

At the generalizing and corrective stage of the study, a system of integrated methodological, organizational, managerial and material support of the educational process was created. The research results were summarized, the concept and theoretical foundations of modernizing the content and process of teaching inorganic chemistry at universities were clarified. The scientific novelty of the study lies in the fact that for the first time in Polish chemical education, the task of substantiating and organizing block-modular study of chemical disciplines was set and solved and its prospects for modernizing university education were proven, for this purpose: a methodological and theoretical foundations for modernizing inorganic chemistry teaching at Polish universities were developed; on the basis of a specially developed multi-level methodology, including the leading ones: systems, historical-analytical, block-modular, personal-activity, problem-research and axiological approaches, a theoretical model of block-modular teaching of inorganic chemistry and a methodological system of student teaching that implements it were created; The content of the inorganic chemistry course blocks and modules has been scientifically substantiated and structured, reflecting the most important areas of chemical science. A new-generation inorganic chemistry course has been developed, implementing a substantial revision of the course's content, the most important of which is the chemistry of coordination compounds. A set of traditional and innovative diagnostic methods has been proposed to assess the effectiveness of developing students' knowledge and skills, as well as the level of development of research abilities.

**The conclusion is** to define current global and national trends in the development of chemical education and teaching inorganic chemistry; to create theoretical and methodological foundations for modernizing the course of inorganic chemistry, to identify its patterns; to introduce and provide scientific substantiation for new principles of constructing the course of inorganic chemistry; to determine the





conditions for the full implementation of its educational opportunities, reflecting the role and features of inorganic chemistry in the system of university training of a specialist, as well as the achievements of the theory and practice of its teaching; to develop a methodological system for teaching inorganic chemistry that ensures the adequacy of the structure and content of the subject to the problem-based research nature of the student's educational and cognitive activity, and also contributes to the deepening of generalization, systematization and fundamentalization of knowledge and skills, increasing the explanatory and prognostic capabilities of the course in the cognitive activity of students; to create a new, block-modular structure of the course of inorganic chemistry based on the intra-subject integration of its content and the implementation of the links of this course with the content of chemistry education in secondary school and other subjects studied by students at the university; determining the conditions for: developing students' cognitive and research motives and needs in the study of inorganic chemistry, students' understanding of its role in their own professional development, developing cognitive abilities and independence, ensuring productive educational activities for students in mastering the systemic concepts of inorganic chemistry .

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