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DEVELOPMENT OF PROFESSIONAL COMPETENCIES OF FUTURE TEACHERS OF NATURAL SCIENCES

Introduction

The system of higher education of Ukraine has embarked upon the path of reform and provides for the introduction of a competence-based approach to the process of its modernization. The National Strategy for the Development of Education in Ukraine identifies radical changes aimed at improving the quality and competitiveness of education in the new economic and socio-cultural conditions, accelerating Ukraine's integration into the international educational space. This is due to the current trend of many developed countries to introduce a competence approach into pedagogical practice in general and the introduction of competencies as a target orientation of education in particular.

Competence approach is considered to be one of the important conceptual principles that defines the modern methodology of updating the content of education. Education should become an innovative environment capable of training highly qualified competent professionals competitive on the labor market, who focuses on related areas, is ready for continuous professional growth, social and professional mobility. The introduction of competence-based education should promote the social adaptation of young people, their ability to be responsible for their own lives, and the awareness of their purpose, meaning and direction in life.

Theoretical rationale

The concept of "competence approach" emerged in the 60s of the twentieth century in the United States and was included in vocational education programs in the United States in the 70s, and in vocational training programs in the European Union in the 80s (Leyko, 2013). In Ukraine, the competence approach was introduced in the late 1990s. In many educational systems, the competence approach is interpreted as a new approach that affects not only the very structure of knowledge, but also the quality of education in general.

Competence-oriented education should promote the comprehensive acquisition of knowledge, social adaptation of young people, who shall become responsible for their own lives, aware of their purpose, meaning and direction in life (Hrudinin, 2015).

In the post-Soviet countries, the development of theoretical and methodological foundations for the implementation of the competence approach was carried out by such scientists as I.V. Rodigina, G.O. Freiman, V.O. Bolotov, O.I. Pometun, S.E. Shishov, O.V. Ovcharuk and others. The main goal of the Ukrainian education system is to create conditions for the development and self-realization of each individual, ensuring high-quality education, which is possible thanks to the implementation of a competence-based approach. The traditional education system focused on the acquisition of knowledge, skills and abilities with the main focus on the knowledge itself whereas the competence approach shifts the emphasis from the process of accumulation of the required knowledge, skills and abilities to the development of the ability to act and creatively apply the acquired knowledge and experience to solve professional, socially and personally significant tasks. That is, the competence-based approach focuses on an effective and integrated combination of knowledge, abilities and attitudes for the fruitful performance of the required activities, the ability to flexible adaptation to changes in the content and conditions of professional activity.

The analysis of psychological and pedagogical resources on the problem of the competence approach convincingly proves that there is no single understanding of the concept of "competence approach". There is no generally accepted definition of "competence". Most researchers interpret the concept of "competence" as an integrative property of personality, which contains not only a set of knowledge, skills and abilities, but also developed professional personal qualities, certain ways of thinking that allow a person to solve professional and life problems (Ovcharuk, 2004). Competence is a consequence of individual self-development, self-organization of an individual and generalization of their activity and personal experience.

In psychological and pedagogical resources, the defining categories of the competence approach are based on the concepts of "competence" and "competency". "Competence" means knowledge, skills or range of issues which a person should be aware of, and "competency" is defined as personal qualities of a person who is able to possess certain competencies. Thus, competence in a particular field is a combination of relevant knowledge and abilities of the individual, which allows to act competently and effectively in it and effectively perform tasks.

The pedagogical resources use the concept of "educational competencies", which are complex generalized ways of activity that are mastered by the individual during training. Scientists note that general educational competencies are not needed for all activities in which people participate, but only

for those that relate to the main educational areas and subjects. Such competencies determine the object-action component of general education and should ensure the comprehensive achievement of its goals. For the purpose of updating the content of education, the concept of "educational competence" is central, as it has an integrative nature, combines knowledge, practical and intellectual components of education.

The system of competencies in education has a hierarchical structure and includes integrated and general competencies that are necessary for any type of professional activity, and professional or subject competencies that are determinative only for a particular specialty. The formation of professional competence is relevant, because it is during training that the foundations for professionalism are laid, subject-oriented and special knowledge, skills and abilities to apply certain theories, tools and methods in professional activities are developed. Subject-oriented competence allows an expert to successfully perform various types of professional activities, it synthesizes a wide range of knowledge and practical skills, reflects the quality of professional training. At the same time, subject-oriented competence is considered to be an integrative quality, an ability that cannot be limited only by the presence of a certain amount of knowledge, skills and abilities. For the most part, it involves such personal qualities that provide an opportunity to find and select the necessary knowledge, and find ways to act in a given situation. According to G.A. Larionova, professional competence is a systemic concept, the range of powers in the field of activity, the range of issues which an individual is knowledgeable about, experience, the totality of which reflects the status and qualifications, as well as individual characteristics that enable certain activities (Larionova, 2005). When using the competence-based approach, future experts must have professional competencies that will provide them with the opportunity after the end of the training period to take their rightful place in the modern labor market. The prospects of the competence approach is that it ensures that university graduates are ready for and willing to engage in activities in various fields.

Results and their analysis

The professional competence of teachers of natural sciences is an integrative, multilevel notion. As noted in many works of the Ukrainian researchers, the semantic aspect of the concept of competence includes the following components: value-motivational (readiness to demonstrate competence); cognitive (knowledge possession); activity (ways to perform tasks); axiological (value attitude to professional activity and personal development). These components do not exist in isolation from each other, they are closely interconnected.

In psychological and pedagogical resources, it is argued that the basis for personality development, its professional development is the development of the

motivational sphere (Thomas, 1984). Motivation is a type of activity that motivates a person to act for the purpose of achieving personal goals or goals of the organization. The motives influence the activities and behavior of future teachers of natural sciences, they are manifested in the mind as an object, as a goal to which their behavior is directed at. The value-motivational component is characterized by the emotionally positive attitude of the individual, as a subject of professional activity, to the profession and is reflected in the internal motivation to implement pedagogical activities. It reflects the readiness to develop professional competence, the desire to study special knowledge in this field and the development of the necessary practical skills to competently carry out these activities in the future. This component is a kind of indicator that allows you to determine the level of attitude of future teachers to the acquisition of new knowledge, to professional and personal development and performs a regulatory function in the development of professional competence. The components of the motivational component are professional interests, professional needs, professional values, attitude to a specific profession. The driving forces of students' activity, which form the motivational sphere of educational activity are interests, beliefs, ideals, values.

Motivational characteristics are divided into two main groups: substantive and dynamic. The substantive aspect of motivation is a system of motives, which provides for their complex hierarchy, manifestations of diverse needs of people. This aspect of motivation in the process of developing professional skills has the following components: the content of motivation, the relationship between motives, the hierarchy of motives, the needs that underlie the motives and determine the behavior of the individual during training. The development of the substantive aspect of motivation is determined by social and psychological contacts of an individual with the environment, society, as well as the organization of activities. The substantive aspect of motivation is relatively independent of its dynamic aspect and, at the same time, is in a complex relationship with it. The dynamic aspect of motivation is based on the peculiarities of the nervous system (strength, balance, mobility, dynamics of nervous processes, the level of general activity of the nervous system). This determines such dynamic characteristics of motivation as strength, stability of motivation.

Motivation is defined as a set of psychological reasons that explain human behavior, its onset, focus and activity. In psychological and pedagogical resources there are external and internal sources of motivation (Aismontas, 2002). The internal sources of educational motivation include cognitive needs, which are due to interest in acquiring knowledge, curiosity, the desire to develop cognitive abilities, enjoyment of intellectual activity. External sources of learning motivation are determined by the desire for self-affirmation, a sense of prestige and authority among peers, approval by important people, a sense of duty. Learning activities are characterized by a complex structure, system, focus,

dynamism, stability and are associated with the level of intellectual development and the nature of learning activities.

The professional motivation of future teachers is a set of factors that determine their lasting interest in the future profession, the setting for professional development and planning its strategy. It consists of the ability to lead personal activity, which is aimed at mastering the chosen profession, achieving the appropriate level of pedagogical skills and the desire for professional growth in the future. The development of professional motivation during studies at the university is a system of conscious hierarchically arranged internal motivations for educational and professional activity.

According to Chadenkova O.O. motives for educational activities depend on the intellectual and personal characteristics of students, as well as on the professional orientation of the university (Chadenkova, 2002). The motivational sphere of the personality is constantly changing: with the emergence of new needs, old motives are rethought, some of them begin to dominate whereas others lose significance.

To verify this statement, we conducted a survey among students of Zhytomyr Ivan Franko State University in their first year of studies pursuing Bachelor's degree and majoring in 013 Primary Education (future primary school teachers) and students in their first year pursuing Master's degree and majoring in 014 Secondary education (Biology and Chemistry) (future teachers of Biology, Science and Chemistry). Students were asked to choose from the list of motives that are most important to them, motives for the attractiveness of the teacher's profession. The results of their answers are provided in Table.1.

Table. 1. Motivation factors and values of students

№	Factors	Motivation index, %	
		Students in the 1 st year of study (Bachelors)	Students in the 1 st year of study (Masters)
1.	Acquisition of knowledge	5,4	16,1
2.	Mastering profession	3,2	28,6
3.	Self-development	2,8	11,2
4.	Creative aspect of professional activity	4,1	8,9
5.	The social significance of the teacher's work	11,5	7,8
6.	Love for children	9,2	8,1
7.	The prestige of a teacher	15,4	6,4
8.	Salary	8,1	3,2
9.	Communication with peers	11,1	4,1
10.	Diploma on higher education	29,2	5,6

Source: designed by the author.

The results of the survey show that the structure of motivation for Bachelor's degree students is dominated by external motives: social prestige,

material prosperity and communicative motive. In fact, intrinsic motivation is underdeveloped. For students pursuing Master's degree, the main motives are related to professional self-realization, which indicates a conscious attitude to vocational training and the desire to ensure the success of future professional activities. The dominance of professional motives in undergraduate students can be explained by the fact that the development of professional competence is based on knowledge, skills, abilities that they acquired while they were working for their Bachelor's degree, and they already have developed value and motivational components of competence. Therefore, their previous level of professional competence is the basis for the development of the next, which they are more aware and aimed at forming a stable professional and cognitive interests in teaching, the desire to form professionally important qualities.

Motivation, during the process of choosing a profession, is crucial for the process of professional self-determination. The choice of profession can be conscious only if it is deeply motivated, when future teachers adequately assess their own psycho-physiological capabilities and the content of the chosen profession, aware of its social significance. Strong motivation of the student is expressed in their acceptance of the goals and objectives of learning, both personally significant and necessary. The motivational space of professional realization of the future specialist is, first of all, the professional orientation of the individual, which is necessary to achieve a high level of formation of the foundations of professionalism. The needs for self-improvement and professional development direct the individual to master the profession of teacher. Thus, professional and personal motivation is formed under the influence of external and internal factors and includes professional and personal motives, interests, needs, the formation of which is a clear guide, focus and internal impetus for training.

The cognitive component of competence involves the formation of knowledge, skills, attitudes and values of students. It determines the impact of educational information on the development of the professional worldview of future science teachers, their moral and ethical views, beliefs, values of their professional activities. The development of the teacher's professionalism focuses on the development of such an integral personal characteristic, which serves as an indicator of professional development, characterizes the student's readiness for future professional activity. This happens in stages by acquiring knowledge, skills and abilities while studying professional and psychological-pedagogical disciplines. Because knowledge is the source of human mental development, it determines the worldview and attitude to reality.

The training of future teachers of Natural Sciences at Zhytomyr Ivan Franko State University is carried out at the second (Master's) level of higher education under the educational-professional program Secondary Education (Biology and Chemistry). During the first 4 years, i.e., the Bachelor's degree, students study in the educational-professional program "Biology", gaining

professional knowledge that can be further implemented in professional activities in the field of biology. The subject natural competencies formed in the process of studying natural sciences are an important basis for future teachers of natural sciences.

When pursuing Master's degree, pedagogical training is realized by studying of such obligatory components: "Theory and Methods of Pedagogical Activity", "Psychology of Pedagogical Activity", "Fundamentals of Natural Science with its Teaching Method", "School Course of Biology", "Fundamentals of Health Study and its Teaching Method", "Theory and Methods of Teaching Chemistry" and others. The purpose of the educational-professional program is to provide theoretical and practical training of university students to solve specialized problems in the field of secondary education, which involves the implementation of professional tasks of theories and methods of innovative nature in Biology and Chemistry. During their studies, students master the methods of teaching natural sciences, get acquainted with the theory and methods of organizing the teaching process, conducting educational work with students in secondary schools, acquire skills to use teaching forms, methods and tools of, monitoring and evaluating learning outcomes, use of knowledge in the development of special training courses.

The educational and professional program is based on modern scientific knowledge about the educational goals and values of natural sciences, traditional and innovative approaches to the solution and application in the educational process of secondary schools. Implementation of the educational-professional program allows students to develop professional competencies of teachers and focus on trends in psychology, pedagogy, the requirements of modern training in the field of natural sciences. The active inclusion of undergraduates in the educational process is facilitated by the possibility of access to educational information and the results of educational activities through the Internet. This allows to develop a set of organizational and methodological tools for indirect management of the process of mastering pedagogical competencies through the development of professionally significant personality traits of undergraduates in the process of meeting their educational information needs. As a result of pedagogical training, the master must have the following pedagogical competencies: know the tools of pedagogical analysis and design, apply knowledge about the essence of educational processes in professional and pedagogical activities, use modern educational and developmental pedagogical technologies.

The course of pedagogical training of Masters is realized through a system of lectures, laboratory classes, pedagogical practice of students. The lectures present basic theoretical information based on the results of psychological and pedagogical research, best practices of teachers. In laboratory classes, students learn to perform methodical tasks, analyze the content of school textbooks and

programs, work with methodical literature, use it creatively, acquire the ability to compile notes and conduct lessons. In the process of pedagogical practice, students have the opportunity to some extent to understand the pedagogical phenomena and facts, patterns and principles of teaching and education, to master professional skills, practical experience. Pedagogical practice is an organic component of a single educational process, psychological, pedagogical and methodological training of future teachers, linking the theoretical learning of a student in high school with his future independent work at school. Therefore, during the practice on the basis of knowledge, skills and abilities obtained at the university, they use modern methods and forms of organization of the educational process in secondary schools, learn to make independent decisions during specific work in real conditions for professional activity.

The main idea of the competence approach is the realization of the activity nature of the content of education, as a result of which students transform from an object into a subject of study, develop themselves as a person. The activity component of professional training of future teachers of natural sciences provides mastering of professional and pedagogical abilities and skills providing effective pedagogical activity. It is manifested in the process of performing various types of cognitive activities by students, in the process of their active participation in laboratory classes, during pedagogical practice, writing scientific papers.

The modern approaches to the organization of the educational process from the standpoint of the competence approach actualize the need for systematic, methodologically verified work on the development of students' competencies focusing on independent student work. Today, the system of education and training is aimed at developing an active subject of activity, capable of self-education and independent acquisition of knowledge for personal development and self-improvement. This is due to the decrease in the curriculum hours devoted to classroom work and the increase in time for independent work of students. Students' independence is reflected in their ability to think independently, the ability to navigate in a new situation to find a problem in the task and offer a new, non-standard solution. The basis of independent work is independent cognition, in the process of which students perform their educational tasks that most fully realize their personal needs. This requires them to show cognitive activity and independence as a quality of personality that combines the willingness, ability and desire to master the necessary cognitive mechanisms. On the one hand, independent work is considered to be a pedagogical means of organizing and managing the student's independent activity in the educational process, on the other hand, it is a specific form of educational and scientific knowledge.

In modern conditions of informatization of society information technologies occupy an important place when it comes to organization of independent work, i.e., information technologies provide access to sources of information, provide opportunities for creativity, acquisition and consolidation of

skills, allow to implement new forms and methods of teaching. Access to the Internet provides access to electronic textbooks, reference books, scientific articles, electronic teaching and methodological resources, posted on university websites, and allows you to expand the creative potential of students if they can work creatively with the information obtained. The application of information technologies in the organization of independent work of students helps not only to intensify their work, but also lays the foundations for their further continuous self-education, forms the ability to analyze, synthesize and summarize information. The competence process of organizing the training of future science teachers with the use of information and communication technologies allows to make classes more interesting through the use of multimedia presentations, effectively solve the problem of clarity, expand the possibilities of visualization of biology material, making it more understandable and accessible.

The important factors in the development of professional readiness of future teachers of natural sciences for pedagogical activities are creativity, professional creative thinking, pedagogical skills, pedagogical reflection, creative behavior, love for children, the desire for continuous self-improvement. In this regard, the axiological approach is extremely important, which is based on the idea of the priority of universal values and self-worth of each individual and determines the prospects for further improvement of education and optimal use of pedagogical resources in accordance with modern society. The axiological approach is applied in the course of development of learning ability, desire to change lives for the better, interests and intrinsic motivation, the ability to make their own choices and set their own goals, the ability to determine their own roles in society, social and civic skills and abilities. The axiological approach to professional training involves the formation of a system of value orientations, a hierarchy of individual preferences, a motivational program of activities (Burchak, 2011).

Conclusions.

The developed professional competencies of a university graduate determine their readiness to use the acquired fundamental knowledge, skills and abilities, as well as ways of solving practical and theoretical problems that arise in professional activity and life and can guarantee them the necessary competitiveness in the European labor market. The very processes of development of a competent individual should be provided on the basis of the principle of continuing education.

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Abstract

The article discusses the peculiarities of development of professional competencies of future teachers of Natural Sciences. The concept of "competence approach" is explained. Some aspects of value-based and motivational, cognitive, activity-based and axiological components of professional competence are analyzed.

Keywords: professional competence, competence approach, motivation, learning activities.