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THE SCIENTIFIC AND THEORETICAL FOUNDATIONS FOR DEVELOPING THE PROFESSIONAL COMPETENCE OF FUTURE SPECIALISTS IN INFORMATION TECHNOLOGY WITHIN THE MODERN EDUCATIONAL SYSTEM

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Abstract:
This scientific article focuses on the measures implemented to enhance the effectiveness of vocational training and retraining systems within the information technology sector, with particular emphasis on ensuring the availability of qualified IT professionals for government agencies and network organizations. The development of professional competence in future information technology specialists is essential due to the significant role this field plays in modern society, influencing both the education system and the labor market.

Keywords: Artificial intelligence, information technology, database, cyber security, innovation, network technologies, professional skills, programming.

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Introduction

The new education concept adopted by international organizations such as UNESCO and UNICEF, as well as by developed countries, is focused on the development of education systems worldwide and ensuring quality education for a sustainable future by 2030. The concept recognizes education as "The main driving force of development and a vital endeavor for achieving sustainable development goals." In achieving the Sustainable Development Goals (SDGs) through education, the concept highlights "Education, Technology, and Innovation" as key areas, emphasizing the effective use of modern technologies in education, increasing digital literacy, and fostering innovation by teaching how

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to work with new technologies. This calls for the preparation of qualified professionals in higher education and the development of students' high-level skills and competencies. Given the rapid, continuous advancement of modern pedagogical and information technologies, there is a need to place significant focus on training future information technology specialists and to continuously improve the education system to nurture well-rounded, capable professionals.

Materials and Methods

The necessity of developing the professional competence of future information technology specialists is related to the significant role this field plays in society, influencing both human life, the education system, and the labor market. As evidence of this, the measures being taken to increase the efficiency of vocational training and retraining systems in the information technology sector are particularly emphasized in the successful implementation of the "Digital Uzbekistan – 2030" strategy, with a focus on ensuring that government bodies and sector organizations are supplied with qualified IT specialists.

This situation highlights the importance of preparing professionally competent specialists in the field of information technologies as a crucial component of the nation's development. The current era demands the effective resolution of the issue of shaping and enhancing the professional competence of information technology specialists during the educational process. Therefore, there is a growing need to conduct research in leading scientific research and educational institutions of the Republic to further develop the professional competence of information technology specialists and to purposefully and efficiently apply the achievements in education practice.

A future information technology (IT) specialist is an individual engaged in modern technologies, programming, network construction, data storage, and processing, with the goal of managing and developing information systems and technologies. This specialization encompasses a wide range of fields, including some of the most relevant specializations in the sector, such as:

1. **Information Systems and Technologies** – Specialists working in scientific research and pedagogical activities, organizational management, project development, and manufacturing with information technology expertise.

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2. **Programming and Software Development** – Developing programs, websites, mobile applications, or software for computer systems. Software Developer.
3. **Databases** – Working with systems essential for storing, processing, and analyzing large volumes of data. Database Administrator.
4. **Cybersecurity** – Protecting data and systems from cyber-attacks and developing security policies. Cybersecurity Specialist.
5. **Network Technologies** – Creating, managing, and optimizing network infrastructure, as well as organizing internet and corporate networks. Network and Infrastructure Engineer.
6. **Artificial Intelligence and Machine Learning** – Developing algorithms to make systems intelligent and enable decision-making through data analysis. AI/ML Specialist.

In our research, we primarily focus on the development of professional competence among IT specialists in higher education, specifically those pursuing a degree in Information Systems and Technologies (across networks and sectors). The **Information Systems and Technologies (across networks and sectors)** educational program is a field of study in science and technology that examines the application of computer technologies across various branches of science and the integration of information technologies into practical activities in different sectors. It involves studying the future potential of the field, developing professional skills, and focusing on general secondary and vocational education, as well as preparing individuals for leadership roles. This program encompasses a comprehensive set of tools, methods, and techniques for human activity. The professional activities of bachelors in this field include the following:

- The application of information technologies and programming;
- The use of modern mathematical and computational methods;
- Studying real objects and processes through modern mathematical methods, particularly mathematical modeling techniques;
- Analyzing processes, especially information exchange, occurring in complex objects;
- The widespread use of mathematical methods and computer technologies in all areas of science and production;
- Methods for information protection;

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- Designing automation of work processes in experimental-design organizations, production, and educational laboratories;
- Pedagogy of professional education and teaching technologies;
- Didactic tools for teaching;
- Electronic tools for education;
- Pedagogical activities in the system of secondary specialized and vocational education. [1]

In the context of modern socio-economic development and the demands placed on higher education systems, many studies have viewed the competence-based approach as a new stage in changing the content and methods of education. From this perspective, numerous studies have interpreted competence as a set of interrelated personal qualities necessary for productive and creative activity, and competence itself is understood as the possession of the required qualifications enabling an individual to solve specific problems within a particular field. [2]

The terms “competence” and “competency” were initially used in daily life and later discussed in literature, as explained in explanatory dictionaries. For example, the *Brief Dictionary of Foreign Words* defines competence (from Latin *competens, competentis* – suitable, capable) as “understanding and knowledge of a specific field; knowing one's rights based on one's knowledge or authority, being able to make decisions or perform tasks; expressing an opinion on a particular matter.” [3]

The *Uzbek National Encyclopedia* defines “competence” (from Latin *compleo* – to achieve, to be suitable, to be worthy) as “knowledge and experience in a particular field.” [4]

According to I.A. Zimnyaya, the concept of "competency" is explained as a unity of knowledge, skills, and abilities that ensure an individual’s successful performance in a specific area of activity. Competency encompasses the ability to effectively apply one's knowledge, as well as the opportunities and capabilities necessary to solve practical tasks. [5] In our view, the scholar emphasizes the importance of developing key competencies in the educational process and assessing their outcomes.

Scholars such as A.V. Khutorsky, Yu.G. Tatur, and I.G. Galyamina have conducted in-depth research on the concept of competence in education. They consider competence as one of the central concepts in education and professional activity. These scholars interpret competence broadly, stating that it encompasses

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not only knowledge but also skills, personal qualities, and practical experience. Therefore, the studies of these scholars demonstrate that competence is a complex and multifaceted concept.

In Sh.S.Sharipov's scientific research, it is emphasized that "creativity, encompassing all aspects of both the teacher's and student's activities, ensures the effective organization of the educational process, which in turn guarantees the quality of education and the achievement of professional competence in the specialists being trained."

Several studies have focused specifically on the professional competence of teachers and its distinctive features. Notable research in this area includes studies conducted by A.K.Markova and B.Nazarova.

In his research, we examined A.K. Markova's set of knowledge, skills, and personal qualities necessary for successful activity in the educational process.

According to Markova, a teacher's professional competence includes not only advanced professional knowledge and skills but also the ability to organize the pedagogical process effectively, as well as the personal qualities and striving for professional development. [6]

In N.A. Muslimov's doctoral dissertation, competence is defined as the acquisition of the knowledge, skills, and qualifications necessary for the execution of professional activities that have personal and social significance, and the ability to apply these in professional practice. Furthermore, Muslimov's research addresses the importance of providing methodological support in the professional preparation of teachers, including the creation of electronic educational resources and methodological foundations. [183, 185]

The issue of approaching pedagogical professional competence continues to be a subject of scientific debate and discussion among scholars and experts worldwide. It is evident that Russian scholars are particularly focused on competence issues in comparison to their counterparts in the United States and European countries. In the third chapter of the textbook *Pedagogy* by V. Slastenin, I. Isayev, and others, titled "The Teacher's Professional Competence," the authors provide insights into the concept and skills associated with this competence. They emphasize that the pedagogical competence system, both practical and theoretical, shapes and governs the teacher's professional competence. The development of an individual requires competence, which manifests as the teacher's ability to demonstrate both theoretical and practical preparedness in

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their professional skills. The qualification of a teacher in any given field is measured by the standards of the pedagogical competence model. [7]

According to V.A. Bolotov and V.V. Serikov, the competency-based approach emphasizes not the student's knowledgeability but their ability to solve problems, considering this capability as the most fundamental and essential skill. [8]

In the scientific works of Ye.V. Bondarevskaya and S.V. Kulnevich, it is argued that the elements of competency acquired by students should be directed exclusively toward the primary goal, which is the implementation of pedagogical activities, and must be deemed necessary for this purpose. [9]

In the article “Competency-Based Approach to Organizing Student Education in a Pedagogical University,” published in issue 3 of the Russian journal *Fundamental Research* in 2012 by V.S. Elegina and S.M. Poxlebaev, it is stated that under competency-oriented educational conditions, students achieve creative outcomes through their activities. Simultaneously, they master the methods, strategies, approaches, and techniques necessary for achieving success. A creative result produced by the student is considered a joint creative achievement of both the student and the teacher. The aim of assessing students’ acquisition is to determine the effectiveness of the provided education. This involves, firstly, assessing the level of theoretical knowledge acquired in school and, secondly, evaluating the formation of competencies, which accelerates successful performance during practical activities. [10]

Results

Modern education, which demands profound reforms and modernization, inevitably brings the issue of the competency-based approach to the forefront. This necessitates the preparation of future teachers who are professionally competent. The primary goal of education is to develop in students socially essential qualities and competencies, including self-awareness as individuals, continuous improvement of their knowledge, self-regulation, and increasing activity levels.

It is evident from the above discussion that debates regarding the professional competencies of specialists in the field are closely tied to their roles in society. Understanding the essential universal competency elements in the field of education and training remains one of the most pressing issues in contemporary pedagogy. In addressing the core competency question, opinions vary widely

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regarding the application of global pedagogical practices versus defining competency criteria based on the norms of traditional Uzbek pedagogy, leaving many unresolved issues.

An analysis of the scientific and theoretical literature on the development of professional competencies for future specialists in information technology reveals the following:

- Numerous renowned researchers worldwide are conducting studies in the field of information technology. Each has achieved significant scientific results in specific areas, contributing to the advancement of the field. However, these researchers often focus on theoretical aspects and may not sufficiently address practical challenges and real-world problems encountered in the application of technologies.
- Due to the rapid pace of innovation in the field of information technology, the technologies and approaches used in dissertations can quickly become outdated.
- If research provides only general recommendations without offering specific methodological approaches for integrating technologies into the educational process, it complicates the practical application of the research in education.
- The professional preparedness of educators teaching information technology to future specialists is equally crucial. Without adequate analysis and preparation in this area, successfully integrating technologies into teaching becomes increasingly difficult.

Conclusion

Every experienced educator knows that students' attention can only be captured by presenting new and yet-unknown learning materials. However, these materials must be connected to knowledge that is already familiar and deeply understood by the students. This is not merely a tactical approach but also attention can only be drawn to new information when it is linked to what is already well-known to the individual.

The connection between the individual's prior experiences and the new information reflects a broader relationship, encompassing the individual's sensory connections, interests, and the specific orientation defined by the process of their holistic development. [11]

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In discussing the topic of "Developing Professional Competencies of Future Specialists in Information Technology," attention is directed not only to the scientific research conducted in the pedagogical systems of the United States, France, European countries, and Russia but also to the scientific and practical studies within the education system of the Republic of Uzbekistan. The goal is to analyze these diverse approaches and draw meaningful insights from them.

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