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CONDITIONS

FOR THE DEVELOPMENT OF ICT SKILLS IN HIGHER EDUCATION PEDAGOGY STUDENTS

CONDICIONES PARA EL DESARROLLO DE HABILIDADES DE TIC EN ESTUDIANTES DE PEDAGOGÍA DE LA EDUCACIÓN SUPERIOR

Andrii Hedzyk ^{1*}

E-mail: Hedzyk@gmail.com

ORCID: <https://orcid.org/0000-0003-4516-356X>

Iryna Astremska ²

E-mail: Astremska@gmail.com

ORCID: <https://orcid.org/0000-0002-9746-3356>

Andrii Hedzyk ¹

E-mail: Hedzyk.A@gmail.com

ORCID: <https://orcid.org/0000-0002-2330-4395>

Tetiana Kovalova ³

E-mail: Kovalova@gmail.com

ORCID: <https://orcid.org/0000-0002-6551-4139>

Svitlana Zaskalieta ⁴

E-mail: Zaskalieta@gmail.com

ORCID: <https://orcid.org/0000-0001-5384-5806>

¹ Pavlo Tychyna Uman State Pedagogical University, Ukraine.

² Petro Mohyla Black Sea National University, Ukraine.

³ Sumy State University, Ukraine.

⁴ Sukhomlynskyi Mykolaiv National University, Ukraine.

* Author for correspondence

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ABSTRACT

The article defines the conditions for digitalization of education in the aspect of the problem of developing ICT competence of students. To clarify the structure and essence of ICT competence of pedagogical college students, to identify the levels, criteria and indicators of its formation. Interdisciplinary connections between computer science and professional training disciplines have been identified as the basis for constructing an interdisciplinary course, the content of which is aimed at developing the ICT competence of students. To develop a structural-functional model for the formation of ICT competence of students during their studies at a pedagogical college. Pedagogical conditions for the formation of ICT competence of students during their training at a pedagogical college have been created based on the implementation of the developed structural-functional model for the formation of ICT competence of students and proven their effectiveness.

Keywords: ICT competence, Pedagogical conditions, Information environment, Digitalization, Communications.

RESUMEN

El artículo define las condiciones para la digitalización de la educación en el aspecto del problema del desarrollo de la competencia en TIC de los estudiantes. Esclarecer la estructura y esencia de la competencia TIC de los estudiantes universitarios de pedagogía, identificar los niveles, criterios e indicadores de su formación. Las conexiones interdisciplinarias entre la informática y las disciplinas de formación profesional se han identificado como base para la construcción de un curso interdisciplinario, cuyo contenido está dirigido a desarrollar la competencia en TIC de los estudiantes. Desarrollar un modelo estructural-funcional para la formación de la competencia TIC de los estudiantes durante sus

estudios en una facultad de pedagogía. Las condiciones pedagógicas para la formación de la competencia en TIC de los estudiantes durante sus estudios en una facultad de pedagogía, se han creado sobre la base de la implementación del modelo estructural-funcional desarrollado para la formación de la competencia en TIC de los estudiantes y ha demostrado su eficacia.

Palabras clave: Competencia TIC, Condiciones pedagógicas, Entorno de la información, Digitalización, Comunicaciones.

INTRODUCTION

The new generation of students lives in a digital environment that is formed by digital technologies, including educationally significant digital technologies: telecommunication technologies, big data, distributed registry systems, artificial intelligence, robotics components, wireless communication technologies, virtual and augmented reality technologies, cloud technologies, electronic identification and authentication technologies, digital technologies for specialized educational purposes, Internet of Things (Lisborg et al., 2021). Trends in the digital transformation of the sphere of vocational education require a high level of ICT competence from the teacher for the successful implementation of professional activities, because it is teachers who are called upon to further prepare the younger generation for life and activity in a modern digital society. The relevance and significance of ICT competence of modern teachers, including digital literacy (Iasechko et al., 2022; Markauskaite et al., 2023; Mykolaiko et al., 2024).

Development of education and culture in the conditions of globalization and European integration requires the renewal of the paradigm of training specialists based on the preservation of traditions and best practices the national system of education and culture, as well as achieving its compliance with the progress of the information society and ensuring the quality of training of specialists in the projection of the growth rate of scientific and technical progress, constant increasing the amount of information that a specialist must master (Utsilmak et al., 2022).

The analysis of normative documents in the field of education and culture and psycho-pedagogical works of Ukrainian and foreign researchers made it possible to describe the state of study of the problem of formation of information and communication competence (ICT competence) of future specialists in the field of higher education.

So, in particular, the state standards of education of the specialties of the field were considered and the lists of general, special (professional) competences and program

learning outcomes were drawn up. It was found that the most widespread and frequent used are: the ability (skills) to use information and communication technologies and the ability to search, process and analyze information from various sources. As a result of the comparative analysis, it is proposed to standardize the approach to the formation of ICT competence of future specialists by optimizing the formulation of ICT competence itself, and corresponding program learning outcomes.

The importance of the ability to plan and implement research and projects involving information and communication technologies, as well as the ability to present the results of one's scientific research and projects, has been established for both the first (bachelor's) and second (master's) levels of higher education.

The prospect of a scientific analysis of the process of forming the ICT competence of future specialists in higher education institutions is strengthened by the presence at the current stage of their digital and information and communication development of a number of contradictions, in particular between:

- the rapid development of the information society and insufficient preparation of future specialists

- performance of professional duties in the conditions of informatization;

- the need to increase the level of digital literacy of future specialists and the level of involvement of ICT, necessary for performance of their professional tasks;

- standardization of the formation of ICT competence of future specialists and improper development of the methodology of its formation, educational and methodological and material and technical support.

Therefore, today ICT competence is one of the leading competencies in teaching activities at all levels of continuing education. This is also relevant for the training of mid-level specialists, including future teachers of educational organizations.

The relevance of the problem of developing ICT competence of students of a pedagogical college during their training is confirmed by: analysis of the results of the ascertaining experiment, which showed an insufficient level of knowledge and skills of students in the field of computer science and ICT; high assessment of the importance of ICT competence of a modern teacher and the need for its formation in future teachers, expressed by employers and teachers.

MATERIALS AND METHODS

The study of the conceptual apparatus, structure and content, composition and technology of formation of ICT competence is reflected in scientific works: Tapscott (2008), explores how "Next Generation" uses technology for learning, communication and development. Prensky (2010); and Turkle (2011), looks at the influx of digital technologies into mutually exclusive and special developments. Mills (2016), the book takes a theoretical view of digital literacy, discussing a variety of approaches to understanding how people consume and consume digital content. Thomas & Brown (2011), the authors look at how the rise of digital technologies and open-source information is creating new opportunities for advancement. Warschauer (2004), the book focuses on the role of technology in changing social dynamics, through the increased availability of lighting and information. Prensky (2001); and Lankshear & Knobel (2008), the authors discuss the concept of digital literacy in the context of current social and cultural practices. Jenkins (2009), explores how digital culture is shaping new kinds of literacies that are necessary for effective interactions in the modern world.

At the same time, there is still a need to clarify a number of aspects at the methodological, theoretical, methodological and technological levels for the formation of information and communication competence.

A study of the literature showed that the issues of developing ICT competence of students of a pedagogical college, taking into account interdisciplinary integration in the context of digitalization of education, have not been studied (Casas, 2020).

Analysis of research, scientific and pedagogical literature, study of the practice of developing ICT competence of students of a pedagogical college (hereinafter referred to as students of a pedagogical college), the results of the ascertaining experiment allow us to formulate the following contradictions:

- between the growing influence of digitalization on the development of education as a whole, which generates the need to improve the quality of the educational process, and the insufficient development of ICT competence of students to work in the conditions of digitalization of education;
- between the need to develop ICT competence of future teachers during their training in the education system in the conditions of digitalization of education in accordance with the requirements of modern standards and the impossibility of ensuring adequate formation of ICT competence

of pedagogical college students as future teachers using existing models and methods;

- between the need of educational organizations for teachers with a high level of developed ICT competence, ensuring the successful implementation of teaching activities, and the existing level of ICT competence of students, which is insufficient for the successful implementation of future professional activities.

The identified contradictions determined the choice of the research problem, which is to determine and substantiate the features of the formation of ICT competence of future teachers, taking into account interdisciplinary integration in the learning process in the context of digitalization of education.

Object of study: the formation of ICT competence of students of a pedagogical college in the process of their professional training.

Subject of research: content and organization of the process of developing ICT competence of students of a pedagogical college, taking into account interdisciplinary integration in the context of digitalization of education.

Purpose of the study: theoretical justification, development and testing of a structural-functional model for the formation of ICT competence of students at a pedagogical college, taking into account interdisciplinary integration in the context of digitalization of education.

The research hypothesis is an assumption that the process of developing ICT competence of students at a pedagogical college will be effective if:

- theoretically substantiated, developed and practically implemented a structural-functional model for the formation of ICT competence of pedagogical college students, taking into account interdisciplinary integration.

To solve the problems, the following research methods were used: theoretical (analysis of scientific, psychological, pedagogical, methodological literature, dissertation research, regulatory documents; modeling); empirical (pedagogical experiment; observation, method of expert assessments, analysis of the products of students' activities; diagnostic methods (questionnaire survey, testing); statistical (grouping, tabular and diagrammatic interpretation of data, comparative analysis of experimental data).

RESULTS AND DISCUSSION

Today, many scientists note that the modern world has moved to a new level of technology development, called "digitalization," which is a priority direction in the modernization of education, replacing the process of

informatization. The productive use of digital technologies in education, the inclusion of students in independent search, selection of information, participation in project activities forms 21st century competencies in future specialists, including ICT competencies. Analysis of regulatory documents, research in the field of digitalization of the economy and education made it possible to identify the conditions for digitalization of education: digital generation of students; creation of a legislative framework for the digitalization of education; resource support for the digitalization of education, including the digital educational environment of the educational organization; training human resources for digital education with ICT competence; use of digital pedagogical technologies and educationally significant digital technologies (European Commission, 2019).

The levels of development of ICT competence of future teachers have been determined: reproductive, productive, creative. The reproductive level is characterized by: reproduction of previously acquired knowledge and skills in the field of computer science and ICT for use in typical situations; the ability to apply existing knowledge in the field of computer science and ICT, etc. The productive level is characterized by: insufficient manifestation of the need for knowledge and mastery of skills in the field of ICT; the ability to apply learned information in non-standard situations and when solving non-standard problems, including practical, applied ones with the advisory support of a teacher, etc. The creative level is characterized by: the conscious need of the future teacher to master ICT and use them in professional activities; the ability to independently apply existing knowledge in the field of computer science and ICT when solving non-standard problems in IOS. Criteria and indicators of the development of ICT competence of pedagogical college students are identified, which determine the levels of their implementation.

Structural-functional model of formation ICT competence of students includes theoretical, target, content-activity, organizational-technological and evaluation-effective blocks. The theoretical block is based on the theoretical foundations for the formation of ICT competence of pedagogical college students - approaches (system-activity, personal, integrative) and principles (fundamental, scientific, systematic, interdisciplinary integration). The basis of the target block is an integrated goal based on social order (education based on modern standards), the formation of ICT competence of students. The content-activity block includes components of ICT competence (motivational-value, general user, general pedagogical and subject-pedagogical) and stages of its formation (motivational, actualizing, basic, generalizing). The basis of the

organizational and technological block is the pedagogical conditions for the formation of ICT competence of pedagogical college students, active and interactive methods, forms of training, digital pedagogical, IT and educationally significant digital technologies, didactic teaching aids, incl. digital.

To effectively develop students' ICT competence, it is necessary to take into account interdisciplinary integration and the conditions for digitalization of education. Interdisciplinary integration as the highest form of integration of educational content is the basis for selecting content aimed at developing ICT competence of students. The conditions for digitalization of education include: the digital generation of students; creation of a legislative framework for the digitalization of education; resource support for the digitalization of education, including the digital educational environment of the educational organization; training human resources for digital education with ICT competence, including digital literacy; digital pedagogical technologies and educationally significant digital technologies.

The model for the formation of ICT competence of students is a structural and functional complex education, including: a theoretical block containing approaches (system-activity, personal, integrative) and principles (fundamental, scientific, systematic, interdisciplinary integration); target block, reflecting an integrated goal (formation of ICT competence of a future teacher), based on social order - education based on modern standards; content-activity block, including components (motivational-value, general user, general pedagogical, subject-pedagogical) and stages of formation of ICT competence (I stage - motivational, II stage - updating, III stage - basic, IV - generalizing); organizational and technological block, the basis of which is the pedagogical conditions for the formation of ICT competence of students; active and interactive forms and methods of teaching, IT and digital technologies, didactic teaching aids, incl. digital, ensuring the formation of ICT competence of future teachers; an evaluative-resultative block reflecting the levels of development of the ICT competence of the future teacher (reproductive, productive, creative) and the result – the developed ICT competence of the future teachers (Gardner & Davis, 2013).

The implementation of the structural-functional model for the formation of ICT competence of future teachers presupposes a number of pedagogical conditions that contribute to the holistic formation of ICT competence of students studying in the conditions of digitalization of education: interdisciplinary integration as the basis for constructing the ICT competence, the content of which is

aimed at the formation of ICT competence; including information, didactic, technological components as the basis for the formation of ICT competence; integration of formal, non-formal and informal education to ensure the integrity of acquired knowledge, skills, and operational experience as the basis for the formation of ICT competence of future teachers; creation and use of a set of tasks as special means of developing ICT competence of future teachers.

When implementing a structural-functional model for the formation of ICT competence of future teachers, the following are preferable: active and interactive forms and methods of teaching; digital pedagogical technologies (blended learning, mobile learning, augmented reality technology, distance educational technologies, gamification, electronic (online) learning, etc.); educationally significant digital technologies (artificial intelligence, robotics components, wireless communication technologies, virtual and augmented reality technologies, etc.), based on the use of technical means and specialized interactive equipment (PCs, laptops, tablets, robotic kits, electronic flipcharts, interactive sandbox, interactive cubes, etc.).

It is advisable to diagnose the level of formation of the components of ICT competence of students at the motivational, actualizing, basic and generalizing stages as part of the study, during teaching practice, and the implementation of projects within the framework of the activities of the pedagogical cluster "ICT in Education".

Scientific novelty of the research results:

1. The conditions for digitalization of education that contribute to the formation of ICT competence of students have been identified and justified (digital generation of students; creation of a legislative framework for digitalization of education; resource support for digitalization of education, including the digital educational environment of an educational organization; training of human resources for digital education with ICT competence; the use of digital pedagogical technologies and educationally significant digital technologies).
2. The definition of the concept "ICT competence of students and components (general user, general pedagogical, subject-pedagogical components) has been clarified; the introduction of a motivational and value component has been justified. The levels (reproductive, productive, creative), criteria and indicators of the development of ICT competence of students are determined.
3. A structural-functional model for the formation of ICT competence of students has been developed, the basis of which is an interdisciplinary course, the content is structured taking into account the interdisciplinary connections

of computer science with the disciplines of professional training and is aimed at developing the ICT competence of students. Auxiliary models have been developed (model of an interdisciplinary course; models of complexes as special didactic means of developing ICT competence of students).

4. Pedagogical conditions for the effectiveness of the formation of ICT competence of pedagogical college students have been created and justified: interdisciplinary integration as the basis for constructing an interdisciplinary course; use of an integrated information and educational environment; integration of formal, non-formal and informal education; creation and use of sets of tasks.

5. The stages of formation of ICT competence of pedagogical college students are determined (motivational, actualizing, basic, generalizing).

CONCLUSIONS

Based on the analysis of regulatory documents, dissertations on the research problem, modern standards, a conclusion was made about the need and possibility of developing ICT competence of students of a pedagogical college, taking into account interdisciplinary integration in the context of digitalization of education.

The conditions for the digitalization of education are identified and justified, contributing to the formation of ICT competence of students of a pedagogical college (digital generation of students; creation of a legislative framework for the digitalization of education; resource support for the digitalization of education, including the digital educational environment of the educational organization; training of human resources for digital education, proficient in ICT-competence, including digital literacy; the use of digital pedagogical technologies and educationally significant digital technologies).

The definition and components of ICT competence of future preschool teachers have been clarified, and the introduction of a motivational and value component has been justified. ICT competence of future preschool teachers has a four-component structure: motivational-value, general user, general pedagogical, subject-pedagogical components. The levels (reproductive, productive, creative), criteria and indicators for the formation of ICT competence of students are determined, the content of these levels (reproductive, productive, creative) is revealed accordingly.

The theoretical significance of the research results lies in expanding scientific knowledge about the features of the formation of ICT competence of students, taking into account interdisciplinary integration in the context of

digitalization of education; in substantiating the feasibility of developing ICT competence of students when studying the IDC, the content of which is aimed at developing ICT competence; in making a contribution to the development of the problem of interdisciplinary connections, in particular in identifying interdisciplinary connections between computer science and professional training disciplines based on the concentrations of the conceptual apparatus of computer science; in revealing the principles of forming the components of ICT competence of future teachers in the context of digitalization of education; in the development and content filling of the criteria base, which includes criteria, indicators and levels of development of ICT competence of future teachers.

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