SYSTEM OF PROFESSIONAL-DIGITAL COMPETENCIES OF A TEACHER OF A HIGHER PEDAGOGICAL EDUCATIONAL INSTITUTION

Oleksandr Kucheryaviy

The article is devoted to the problem of substantiation of the integral target orientation of preparation of future teachers of institutions of higher pedagogical education for professional activity in the conditions of digitalization of society: systems of their professional-digital competences. The main conceptual idea is put forward: professional-digital competencies of a teacher of a higher pedagogical educational institution are in isomorphic dependence on his/her professional functions and form a holistic system - a reference model of the target landmark of the digitalized educational process in graduate and postgraduate studies. The integral-functional dimension describes the procedure for establishing a holistic set of updated teacher functions in the digital educational environment of a pedagogical university. The set of the following criteria for their search is outlined: 1) the specifics of the functional content of the types of teaching activities, taking into account the process of digitization of higher education; 2) the subject of the teacher's relations with future teachers and public life; 3) the nature of the relevant links. According to all criteria in their unity, three core professionally defined functions are defined: heuristic-digital, managerial-digital and self-development-digital. To these are added purely instrumental general professional - executive-digital, technical-digital and the function of compliance with digital security.

The differences between the concepts of "professional-digital" and "digital" competence are emphasized. The concept of the system of professional-digital competencies of a teacher of a higher pedagogical educational institution as a holistic and interconnected set of their components, adequate to his/her certain professional functions in the digital environment, is formulated. The following relevant system of competencies is defined: heuristic-digital aspect (competencies in the areas of pedagogical innovations, digital content of personal and professional development, in particular, worldview and existential orientation, etc.); managerial and digital aspect (competence of the teacher of diagnostic and prognostic, motivational, design, organizational, stimulating and control functional and managerial nature); self-development-digital aspect (important for personal, professional and professional-cultural development of the teacher's competence); aspect of digital culture (digital competencies, highlighted in the literature, important for information retrieval, reception, processing and output, use of basic and application software, solving technical problems, personal data protection, copyright, etc.)

Keywords: digitalization, competence, professional-digital competence, system of professional-digital competencies of a teacher

How to cite:

© The Author(s) 2021
This is an open access article under the Creative Commons CC BY license hydrate

1. Introduction
In the context of the struggle of the Ukrainian people against the Russian invaders for their freedom, the state strategy for digitalization of all social life, education and science, in particular, is especially valuable for the country's future. The urgency and priority of digitalization of modern education and science is discussed in the Laws of Ukraine "On Digital Agenda of Ukraine", "On Ratification of the Agreement between Ukraine and the European Union on Ukraine's participation in the European Union Framework Program for Research and Innovation" Horizon 2020", Development Concept Digital Economy and Society of Ukraine for 2018–2020", the state target program" Science in Universities", many other documents. The quality of digitalization of state development is derived from the digital culture of teachers, the formation of which in students in higher pedagogical education requires a radical rethinking and updating of the scientific base of the educational process in theoretical, methodical and methodological dimensions. Prominent among them is the problem of clearly defining the targets of professional training of future teachers of pedagogical universities to perform professional functions in the context of digitalization of public life. The urgency of this problem is primarily due to the focus of its results on resolving the contradictions between the social order of higher pedagogical school for a graduate as its potential teacher with a high level of professional-digital competencies and his/her real ability to perform professional functions in Ukrainian society as informational.
2. Literary review

The chosen problem field of scientific research is in accordance with those areas of research of the Institute of Digitalization of Education of the National Academy of Pedagogical Sciences of Ukraine, which directly relate to the nature and features of the use of leading information technologies in higher education. It is primarily about cloud technologies in education, which the director of this research institution V. Bykov pays great attention to [1]. The core component of scientific and conceptual foundations of digitalization of higher pedagogical education should be considered a set of ideas by M. Zhaldak on the positive impact of its informatization on the humanization of the educational process [2], the need and specifics of building a holistic system of teacher training for use in professional activities [3]. Directly relevant to the solution of the chosen problem should be considered:

1) provisions on the nature and design and development of information and educational environment in the modern university, reflected in the monograph of L. Panchenko [4];
2) theoretical and methodological bases of designing and application of the digital educational environment of scientific communication of masters-researchers, revealed in O. Kuzminskaya's dissertation [5];
3) theoretical and methodological principles of informatization of teaching computer science disciplines in higher educational institutions, determined by S. Semerikov [6];
4) theoretical and methodological principles of design and use of the computer-based learning environment of an institution of postgraduate pedagogical education, developed by K. Kolos [7].

Determining the targets of formation and development of professionalism of a teacher of higher pedagogical school in the context of European integration depends on taking into account the components of the image of a teacher of the European Union, which was very successfully presented by B. Chererdetska [8]. The solution of this problem is significantly influenced by generalizations of scientists' ideas about Soft Skills [9] and reflected in N. Lazarenko's monograph results of analysis of their development experience in certain areas in the system of teacher training (context of its integration into the EU) [10]. The results of the analysis show that the main research of various aspects of the formulated problem is based on the competence approach to it. Therefore, we choose this methodological regulation as a system-forming one. It is established, that special attention of Ukrainian scientists is paid only to the formation of certain types of professional competencies of future teachers of higher education institutions in the master's program, and not their system: in particular, research [11]; social [12]; methodical [13]; monitoring, etc. An exception is research [14].

As for digital competence (especially of citizens and professionals), this concept has become the focus of attention not only of a large number of scientists and specialists in various fields of social production, but also government officials, whose statements speak of "digitalization of the economy", "state in smartphone", "digital development of the state", etc. It is especially important for us, that the special article by O. Spirin is devoted to the essence, composition and place of information and communication-information competencies of a professional teacher (computer science teacher) in the system of his/her professional and specialized competencies [15]. However, both digital and professional-digital competence of a teacher of higher pedagogical school are not yet the subject of productive and systematic scientific research.

3. Research aim and tasks

The aim of the article: based on the definition of the essence of the phenomenon "professional-digital competence of a teacher of a higher pedagogical educational institution" to build a system of his/her respective competencies in the measurement of basic professional functions.

To achieve this goal, the following tasks were set: 1. To substantiate the composition of the whole set of functions of a teacher of an institution of higher pedagogical education in the conditions of its digitalization.
2. To characterize the essence and value-semantic difference of the concepts of professional-digital competence of a teacher of a higher pedagogical educational institution and his/her digital competence.
3. To define the concept of the system of professional-digital competencies of a teacher of higher pedagogical school.
4. To specify the structural components of the system of professional-digital competencies of a teacher of a higher pedagogical educational institution in terms of their adequacy to his/her main functions.

4. Research methods

The core of the methodological platform for solving the problem of establishing a holistic set of target guidelines for professional training of teachers of higher pedagogical education in the context of digitalization of society are the following approaches:

– integral-functional (worked primarily to ensure the quality of the complete set of professional-digital functions of the teacher);
– competence (in the role of system-forming was aimed at determining the composition of professional-digital competencies of the teacher of a certain functional orientation);
– systemic (the study has become a regulation of the search for unity of integration and differentiation of targets of digitalized training of future teachers of higher education with the dominant tendency to combine them into a multilevel system as a whole set of interconnected components);
– personal-activity (contributed to the personal-activity orientation of the formulations of specific professional-digital competencies). The following methods were used in the process of scientific research:

– a set of general scientific and logical theoretical methods of cognition (induction, deduction, analysis, synthesis, abstraction, concretization, generalization), used to study the applied literature sources, formulate goals and objectives of research, disclose its content, essence of basic definitions and conclusions;
– functional analysis of a teacher of higher pedagogical school (to determine his/her professional-digital functions in terms of digitalization of public life);
– comparative-categorical method (to compare the value-semantic essence of the concepts of "professional-digital competence" and "digital competence" of the teacher’s personality;
– system-structural method (used to build a system of professional-digital competencies of a teacher of a higher pedagogical educational institution based on system analysis as a selection of components of this system phenomenon and structural-functional connections;
– observational method (observation, survey, testing, self-assessment) as a way to identify the knowledge of future teachers about the core professional-digital competencies, levels of mastery.

5. Research results
The principle of integrity requires, first of all, ensuring the high quality of the professional functions of the teacher of future teachers and their adequate professional-digital competencies. An integral property of the relevant functions - due to the nature of teaching. The main criteria for their selection are as follows: the specifics of the functional content of the types of teacher activities, taking into account the process of digitalization of higher education; the subject and nature of the teacher's connections in the digital environment with future teachers and social life; conditions for the implementation of functions.

In the dimension of the first criterion, the analysis of needs of pedagogical universities in qualitative updating by means of their digitalization, purposes, content and technologies of personal-professional and professional-cultural development of undergraduate and postgraduate students, typical tasks, solved by the teacher as an educator and supervisor in this process, is carried out.

The subject of his/her connections with students and social life – heuristic activities in the digitalization of the educational environment and the country as a whole, various aspects of management of digitalized professional training of students (diagnostic, motivational, design, organizational, stimulating and control), personal and professional self-development based on self-education and self-upruring digital means.

The nature of the teacher's connections in the digital and educational environment is mainly information-communication, which requires from him/her at least digital literacy, and at most – digital culture.

Heuristic-digital, managerial-digital, self-development-digital, executive-digital, technical-digital and digital security function should be considered as the main functions of a teacher of higher pedagogical school in the aspect of core tasks of advanced progress and digitalization of the state, in particular, its educational space.

Solving the chosen problem in the competence dimension (essence, structure, criteria and other characteristics of the concepts of competency and competence – the subject of consideration of such Ukrainian scientists as N. Bibik, O. Gura, I. Yermakov, L. Sokhan, O. Savchenko, O. Ovcharuk, etc.), first of all, T. Fedirchyk’s understanding of the phenomenon of professional competence of a higher school teacher, will be called the starting point. In her interpretation, "professional and pedagogical competence of the teacher is a theoretical and practical readiness to carry out scientific and pedagogical activities, which involves mastering professional (subject or special pedagogical), psychological, pedagogical and methodological competencies" [16].

Issues in the social and scientific discourse on the structure and value-content basis of the category "professional-digital competence of an individual" are not yet resolved, in particular, professional-digital competence of a teacher of higher pedagogical school in its broadest sense. There is a lot of talk about purely digital competencies: citizens of Ukraine, pupils, students, representatives of various professions. However, in the field of holistic vision of professionalization, the digital competence of any specialist cannot be reduced to professional-digital: the latter is related to all his/her professional functions, personal and professional qualities and properties significant for their performance, and digital as a component of professional-digital is a means of effective disclosure of his/her professional competence potential in the implementation of specific functions. In this sense, it should be called a unique tool for optimizing professional activities. A holistic set of professional or professional-digital competencies is an integral characteristic of the personality of a specialist, which is directly focused on the specific subject of his/her work. It is not about purely digital competence, which has a universal applied "face": it has the potential to ensure the effectiveness of the interaction of an individual with any subject area of his/her professional – and not only – actions.

A look at the phenomenon of professional-digital competence of a teacher of higher pedagogical school from a systemic standpoint allows us to immediately distinguish two of its interrelated structural components: professional and digital. The function of the first is to be the bearer of professional values isomorphic to the specific subject of work of this specialist. The function of the second is to serve as an effective means of improving the quality of public relations and educational-developmental interaction of the teacher with students in the traditional classroom, mixed and remote forms of organization of the educational process.

The system of professional-digital competencies of a teacher of a higher pedagogical educational institution as a subject of providing in the conditions of informatization of society personal, professional and professional-cultural development of future teachers is a reference model of the target of improving the quality of his/her professional activity. Different functional affiliation in measuring the needs of national cultural creation, the advanced progress of Ukrainian education, its integration into the European educational space.

The considerations based on the results of the analysis of the relevant problem field formed the basis of the following version of the system of professional-digital competencies of a teacher of higher pedagogical education.

Heuristic-digital function:
– ability to create pedagogical innovations (new models, programs, technologies, etc.) based on the results
of scientific work based on their own theoretical and methodological training and digital literacy;

- readiness to build an individual author's pedagogical system of professional training of future master teachers in the digital educational environment;

- ability to creative development of digital content of classes at the organization of problem, modular-developmental, interactive and other developmental types of training in an institution of higher pedagogical education;

- readiness to create digital content adequate to the goals and objectives of professional and cultural development of future masters in pedagogy during the semester and academic year;

- ability to develop digital content with the function of affirming the dignity of a teacher-patriot of higher pedagogical school, related to the existential essence of human culture;

- system skills to create digital content relevant to the disclosure and implementation of the holistic – educational, developmental and upbringing – potential of a particular educational topic and the entire educational module;

- integral ability to improve and subordinate the digital content, created on a heuristic basis to the needs of realization of meta-goals of development of unity of national and professional-pedagogical consciousness and self-consciousness in students in classes;

- readiness to creatively develop digital content, important for the formation of the noetic picture of the world in future teachers of higher pedagogical school, the desire for creativity, manifestation of the unity of intuitive and analytical thinking in them in a variety of activities, the ability to career growth from the student body.

**Management-digital function**  (list of competencies adequate to its diagnostic, motivational, design, organizational, incentive and control components):

- integral practical readiness to diagnose with reliance on the possibilities of digital space the levels of mastery of the values of the content of pedagogical education by future specialists of general secondary and higher school;

- ability to implement diagnostics of intellectual, emotional-volitional and communicative capabilities of future teachers in the self-organization of professional creativity and professional-pedagogical creativity by digital means;

- ability to determine the features of the worldview of future professionals on the platform of a set of different methods and tools, taking into account digital;

- ability to perform the diagnostic-digital function in the field of establishing levels of development of national consciousness in students;

- integral ability to form and develop students' interest in mastering pedagogical professionalism and professional-pedagogical culture on a digital basis;

- competence in creating conditions with the use of digital technology for the formation of future teachers' meaningful motives for self-preparation for creative self-realization as specialists by self-educational, self-upbringing and professional-creative developmental tools;

- ability to perform the motivational function based on digital technologies in terms of orientation of future teachers to increase social and civic activity throughout life as patriots of Ukraine;
other activities of future bachelors and masters of pedagogical education.

**Self-development-digital function:**
- ability to digitize the processes of personal and professional self-diagnosis and self-forecasting in order to build a strategy and tactics for further self-development as a holistic process;
- readiness to digitally provide ways to enhance personal self-development in professional and public environments;
- ability to self-organize personal career growth as professional and professional-cultural development during life with the use of digital means.

Implementation of purely digital competencies by the teacher, as well as other specialists, in the types of activity is subordinated first of all to their executive-digital, technical-digital functions and functions of observation of digital security. Their full set is reflected in the Digital Competence Framework for Citizens of Ukraine, published by the Ministry of Digital Transformation of Ukraine (based on the relevant Framework for EU citizens). In the dimension of these functions, the following occupy a prominent place in its proposed system of digital competencies:
- ability to quality use of basic software of the educational process;
- ability to use computer and mobile devices;
- ability to search, view, critically evaluate and filter information and digital content;
- basic skills in programming;
- competence in the implementation of cloud technologies in practice as a model of optimal network access to computing resources (added by the author as important for the teacher);
- technical readiness for various types of communication and cooperation with the help of digital technologies;
- ability to follow the instructions on compliance with network etiquette;
- readiness to solve technical problems;
- knowledge of the best models of information security at the personal level;
- competence in the protection of information assets in the digital environment;
- ability to solve life problems on a digital basis.

We see prospects for further research in determining the patterns and principles of mastering the professional-digital competencies of a teacher of higher pedagogical education. The limits of the study are the delineation of the system of relevant general competencies: in particular, special subject competencies were not defined.

**6. Conclusions**

1. The composition of the whole set of functions of a teacher of higher pedagogical education in terms of its digitalization (heuristic-digital, managerial-digital, self-development-digital and purely digital) is, on the one hand, due to the nature of his/her professional and pedagogical activities, which provide unity of all aspects. On the other hand, is derived from the results of its analysis according to the following criteria: concrete specifics of the functional content of the main professional actions of the subjects of the organization of the educational process; the subject and nature of their connections with future teachers and social institutions; features of external and internal conditions of realization of functions. The main types of certain orientation of the functions are as follows: for ensuring the continuity of professional development and holistic development of students (indicators of orientation – unity and universality, system orientation, specificity); for personal, professional and professional-cultural development of the teacher.

The hierarchy of functions presupposes the existence of a leading function of a creative nature (heuristic-digital) and (managerial-digital and self-development-digital), consistently focused on it as basic, and instrumental – executive-digital, technical-digital and digital security functions.

2. Professional-digital competence of a teacher of a higher pedagogical educational institution is such a systematic characteristic of his/her professionalism, special emergent properties of which contribute to the quality of his/her performance of a certain professional function based on digital technology, but not reduced to the sum of properties of its professional and digital components, directly related to pedagogical labor subject. The difference between the concepts of "professional-digital" and "digital" (digital is primarily such a flexible element of professional-digital, which has the universal property to improve the quality of person’s interaction not only with specific but also with any subject area of activity) teacher’s competence requires their use depending on the purpose and meaning of a particular statement in the competence dimension.

3. The concept of the system of professional-digital competencies of a teacher of higher pedagogical school, highlighted in the article, allows to indicate the following main essential characteristics:

1) approval of the structural type of the relevant system of competencies – composition (these are integrated heuristic-digital, managerial-digital, self-development-digital and digital structural components), the presence of internal connections between components;

2) focus on personal and professional development of future teachers;

3) cultural orientation (it is a question of assistance of realization of needs in national cultural creation and European integration and needs of the teacher in development of professional and pedagogical culture);

4) compliance with the requirements of the reference model of the target of quality professional activity of the teacher in the digital educational environment.

4. Defining specific professional-digital teaching competencies of different functional backgrounds is a process of finding elements of their system, which allows to comprehensively cover all the specific diversity of the teacher's relationship with future teachers or society within the direction and implementation of a particular function. The correlation of the functions of the teacher with the competencies is fixed in the formula: the functions are a kind of "key" for the selection or formulation of professional-digital competencies significant for their implementation. Differentiation of competencies in their specific subsystem is the result of multifaceted functions of the teacher (for
example, the managerial-digital function has such aspects as diagnostic-prognostic, motivational, design, organizational, stimulating and control).

General conclusion: mastering the system of professional-digital competencies by teachers and future teachers of higher pedagogical school at the personal level is an effective means of its reform and revival of Ukraine in general after the war. Implementation of this priority area of higher pedagogical and postgraduate pedagogical education requires updating its goals and content in the professional-digital dimension, development of programs for digitalization of the educational process and its clear focus on personal, professional and professional-cultural development of its content.

Conflicts of interest
The authors declare that they have no conflicts of interest.

References

Received date 07.02.2022
Accepted date 17.03.2022
Published date 31.03.2022

Oleksandr Kucheryaviv, Doctor of Pedagogical Sciences, Professor, Leading Researcher, Department of Theory and Practice of Pedagogical Education, Ivan Zyazyun Institute of Pedagogical and Adult Education of National Academy of Educational Sciences of Ukraine, M. Berlinskoho str., 9, Kyiv, Ukraine, 04060
E-mail: oleksandr.kuch@ukr.net