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Professional Training of Future Academic Staff and Digitalization of Education: Analysis of Mutual Influences

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Abstract: Today's modern society is developing quite dynamically due to the use of the latest technologies and their implementation in quotidian life. The same trends are characteristic for the development of higher education and all participants involved in this process. The purpose of the article is to analyze the mutual influence of the professional training of future scientific and pedagogical

workers and the trends of education digitization. Particularly, the importance of acquiring digital competence was established – the importance of this process was confirmed by the use of content analysis of the literature: search engines found 60 most concerning articles for the years 2015–2023. In the results, materials of empirical and theoretical content were elaborated. It should be noted that students in Ukraine are not enough competent in the use of digital technologies, but some of them have not completely realized the essence of the responsibility and academic integrity regarding the use of various sources. The results also show that there are a number of difficulties (for example, lack of motivation and knowledge about digital competencies) in the professional training of future scientific and pedagogical workers using digital technologies. The conclusions summarize that digital skills will become especially relevant in the future, so the training of teachers and scientists should pay great attention not only to the use of digital technologies and resources in teaching, but also theoretical counseling, the formation of students' ability to critically perceive the digital content. Therefore, the system of professional training of future scientific and pedagogical workers should focus on the formation of digital literacy, critical thinking, and information competence of students. At the same time, the mutual influence on the digitalization of education is possible. Thanks to the cooperation with employers, teachers will change the content of training in accordance with the current requirements of the labor market, so digital training mechanisms will also need an improvement.

Keywords: scientific and pedagogical workers, digital technologies, digitalization of education, distance education.

Introduction

In today's information society the digital technologies development changes the educational process, ways, forms, and methods of teaching. The digital dimension touches the transformation of educational organization because the latter plays an important role in familiarizing participants in the educational process with the target application of digital technologies and tools in the digital society. This, in turn, requires adequate digital literacy. The digital competence influences the transformation of educational institutions taking into account the basic conditions of the information society. It also allows being successful in the new information world, managing information, making strict and quick decisions, acquiring important and relevant competencies and skills. Accordingly, professional training of scientific and pedagogical staff is impossible without taking into account digital trends.

The education's digitalization key aspects have been studied by many scholars. Aldhafeeri and Alotaibi (2022) revealed the effectiveness of using digital technology in the training of modern students. Stoika (2022) studied the peculiarities of digital transformation in education. The researcher analyzed all the measures taken by the Hungarian government in the field of digital transformation as well as factors for the further development of digital learning. Yoleri and Nur Anadolu (2022) characterized the level and digital literacy skills of undergraduate students who study in different departments according to the article, type of department, and daily use of the Internet. Bader et al. (2022) explored the digitalization of the education of the future through the lens of risk analysis and the choice of mechanisms to overcome the barriers of large-scale digitalization of the field. At the same time, Peruzzo and Allan (2022) characterized the main aspects of education digitalization against the background of the spread of the pandemic Covid-19, also described the threats and drawbacks of digital e-learning implementation. Tytova and Mereniuk (2022) explored the importance of digital literacy for future teachers in the realities of large-scale military aggression. Zhang and Aslan (2021) highlighted key

aspects, features of using AI technology in education. Yee Chung et al. (2021) analyzed the problem of using AI in modern digital and automated education. Safonov et al. (2022) characterized the digital transformation of education, the key challenges to its implementation. Nevertheless, the issue of the mutual influence of digitalization and education is still important for investigating, so the problem of analyzing the professional training of future educators and scientists with the involvement of digital technologies requires more reflection.

Research Problem

In terms of education digitalization problems this process is considered to have a one-way direction: the use of modern techniques seemed in order to influence the organization of the educational process. At the same time, the other vector is important - how scientific and pedagogical workers themselves are able to influence the development of digital technologies because the latter should correspond to the interests of society and be a reliable support in the use. For this reason, the problems of influencing the knowledge and competencies acquired during the training are also relevant, because they must meet the current challenges and evolve according to the needs of modernity.

Research Focus

The study focuses on the acquisition and use of digital competence through the prism of analysis of the most promising skills that will definitely be in demand in the next few years (established based on studies of labor market specialists). Certain new learning objectives open up opportunities for the use of computer technology to increase the quality of education, the formation of educational impact. Obviously, it is impossible to form future scientific and pedagogical workers without taking into account these specifics and further detailed research.

The solution of many topical difficulties depends on the mechanisms of functioning and improvement of methodological systems aimed primarily at the development of digital and information competence. Consequently, attention is also drawn to this aspect of the training of applicants for higher education, who in the future will be able to independently and effectively engage in scientific and educational activities. A particular attention will be paid to the need of introducing specific courses in responsibility for the information used and disciplines that address the review and acquisition of academic virtue skills. General skills development (e.g., critical thinking) through the digitalization of the educational process is also important.

Research Aim and Research Questions

The article aims to analyze the mutual influence of future scientific and pedagogical staff professional training and the trends of digitalization of education. In addition, the degree of mastering digital literacy of students and prospects for the development of training of future scientific and pedagogical workers are considered.

Research Methodology

General Background

This article refers to theoretical and empirical research as it was implemented in several stages: theoretical and empirical. The theoretical analysis of the problem is presented in the first part of the paper. At the same time, in order to determine the level of digital competence of future scientific and pedagogical workers a special survey was conducted on the online platform The theoretical part of the

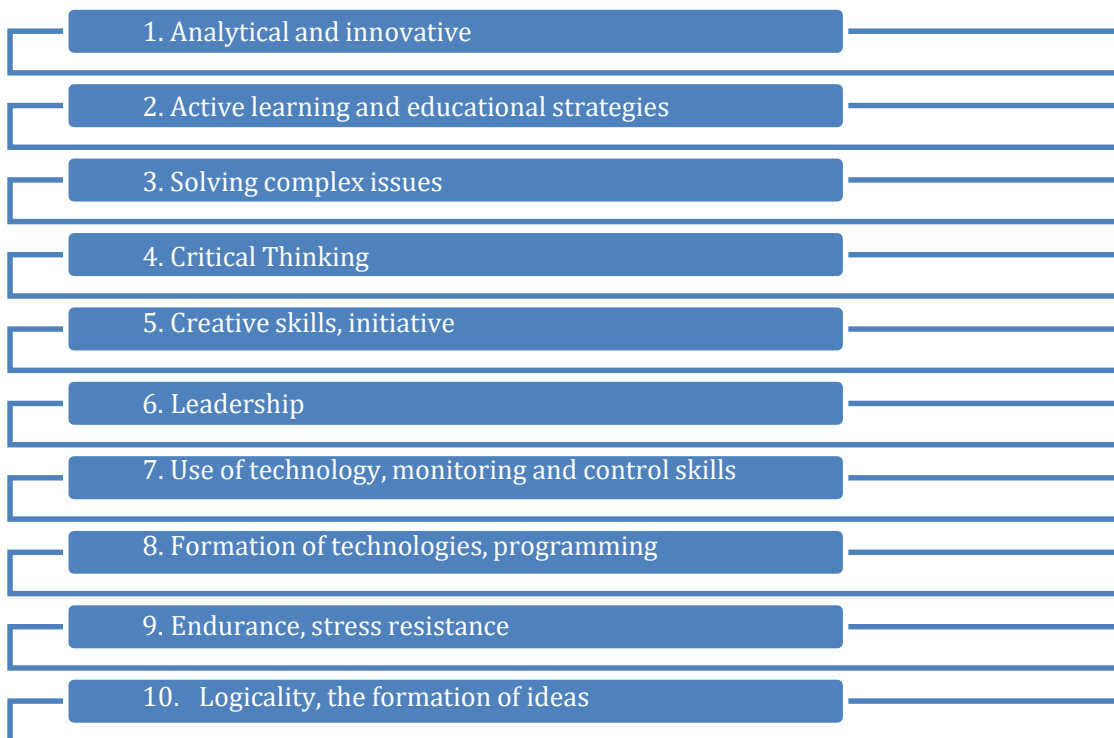
study is formed on the base of general scientific methods use: analysis, synthesis. Based on deduction it was possible to move from general (accepted in science) statements to the formation of own conclusions and hypotheses about the problem of professional training of future scientific and pedagogical worker on the background of digitalization of educational and scientific spheres. Through the use of the dialectical method, the phenomenon of students' professional training was considered as constantly changing and actively developing.

Research Results

The traditional system of education and science is undergoing significant changes in all periods of the educational and scientific process. The total process of digital technologies and innovations implementation in higher education among the various factors of improving the quality of obtaining education focuses on improving the comprehensive professional training of specialists and ensuring the demand for professionals in the modern labor market (Andros, 2022). At the same time, current education aims to provide the future specialist with key learning services and to adapt the pedagogical conditions in order to form an independent development of an individual capable of responding to a variety of global changes, digital as well (Baber, 2020). The process of active improvement of digital technologies, the introduction, and formation of various strategies and concepts of sustainable development, the use of digital communication tools in teaching contribute to the transformation of the digital environment of the educational and scientific sphere (Peruzzo & Allan, 2022). Consequently, the widespread use of digital technologies in the training system of the future scientific and pedagogical employee contributes to the formation of digital competence, now relevant and particularly in demand in the labor market (Turczynski, 2022). The World Economic Forum in Davos formed a rating of the most demanded skills, among which digital competence occupies a prominent place (See Figure 1).

Figure 1

Top 10 Most In-Demand Skills for the Next 5 Years



Source: adapted from Turczynski (2022).

Consequently, digital competence will be important for a long time: digital skills, monitoring, and control, technology creation, etc. are relevant. - these are things that the professional of the future must know (Kuzminska et al., 2019). Experts note that in the future even greater digitalization of all social institutions of humanity is expected, so the professional training of the future scientific and pedagogical employee should be based on the formation of digital and information competence (Turczynski, 2022).

An important element of digitalization is the appeal to various computer technologies, which influence the compliance with the criteria of collecting, processing, obtaining, and providing information using digital computer systems (Kuzminska et al., 2019). The basis of innovative computer technologies are three technological solutions that are currently used: the ability to store information on digital and physical media, the becoming and further development of communications, and automatic procedures for processing information using computers. Practically, computer technology is used in software and hardware complexes, which are formed from personal computers and the necessary set of peripheral devices connected to local and global computing networks and equipped with the necessary software (de Figueiredo et al., 2020). The use of the mentioned parts allows increasing the ability of scientific research and educational processes, which are the basis for their improvement (Safonov et al., 2022). The possibility of using computers allows the formation of new technological generations. Primarily it allows the increasing of education quality, form updated ways of educational influences, successfully interact with computational tools, and improve the information competence of teachers and students. For this reason, the following pedagogical goals of the use of digital resources in the training system of future scientific and pedagogical workers are highlighted:

1.The intensification of all levels of the educational process. It is important to note the prospects of non-formal education. Due to society's digitalization it begins to play an important role in learning. The turn to digital platforms (e.g., Promoteus), will provide opportunities for digital self-learning and mastery of digital and information literacy. This opens up new opportunities for self-education and blended learning, where some of the material can be learned in higher education classes and some during additional and asynchronous work with educational platforms on the Internet. Although this potential is not fully exploited, it may be revealed in the future. Teachers can additionally influence this process: they can offer interesting and new formats of classes, so that digital platforms will undergo changes according to the chosen effective methodology.

2.The applicant's personality development: the formation of critical thinking, digital literacy, information competence, culture of digital communication (Andros, 2022).

3.Students' preparing for a comfortable life in the realities of the global information society.

At this stage, an important role is played by communication technologies: telephone communications, television, mainly used in the management of the learning process in distance learning systems (Stoika, 2022). The learning is concentrated on the obtaining of the learning informatization goals based on a set of functional and interrelated pedagogical, informational, methodological, psychophysiological, and ergonomic methods and features of the application. One example of the modern successful implementation of computer technology in modern educational institutions was the use of unlimited possibilities of the Internet in higher education institutions, analysis, and storage of comprehensive information, its transportation to all interested users (Yoleri & Nur Anadolu, 2022). The Internet quickly adapted for scientific, social, informative advertising work, but also - in education. At the same time, the first stages of the introduction of the Internet in educational environments revealed not only considerable opportunities for their development but also established difficulties that require

a prompt response and quality response in educational institutions (Rossikhina et al., 2019). First of all, it is a large cost of organizing digital education when compared to the capabilities of traditional technologies, which is associated with the need to address a considerable amount of technical and software (Stoika, 2022). An additional requirement is adequate training and preparation of teaching and learning materials. Note that as a result of using the latest digital technologies, future academic educators will not only be able to receive, find, research, process, interpret information, but also will be equipped with modern means of communication, affecting the formation of e-learning using the system of modular oriented principle (Bader et al., 2022).

The management of educational and scientific institutions with the help of digital, computer technologies implements the control of many processes, however, and the learning process, teachers use them in the preparation, organization, and conduct of lectures and seminars, students - directly in learning activities (Rossikhina et al., 2019). Current research discusses the main benefits of using digital technologies in the education for years (Aldhafeeri & Alotaibi, 2022; Bader et al., 2022). In general, they increase the effectiveness of learning through such factors as increasing the amount of useful information with the generalization of research and development; easier and faster search, storage, interpretation, transfer, and presentation of educational information materials; the ability to analyze a large volume of learning information; the ability to implement various tasks not previously solved in the traditional system; selection of topics and obtain results that are inaccessible by other means. The use of digital educational resources provides new opportunities for the quality of education improvement. At the same time, their use in the field of education allows teachers to qualitatively transform the content, tools, methods, and organizational forms of the process of professional training of future scientific and pedagogical workers.

Discussion

The professional training of future education specialists will generally require significant changes in the system of its organization. Such processes are associated not only with total digitalization but also with the Russian-Ukrainian war. Therefore, an experienced and competent use of various digital platforms will require the formation and provision of higher education institutions with quality products (Tytova & Mereniuk, 2022). One believes that this will affect the assessment to a variety of educational materials, current scientific developments, and research, the world's distance science libraries, etc.

According to Bader et al. (2022), the main directions of the modern process of educational digitalization consist in the creation of educational resources in order to support the interactive content, the creation, and implementation of digital, innovative computerized ways and methods of organizing the education. It also consists in the introduction of appropriate facilities, in the use of information and communication technologies at all levels of the educational process. Consequently, it is predictable that through the use of modern information and communication technologies in professional training, future teachers and scientists will be able to actively compete with other professionals and become more in demand in the labor market.

However, the analysis of modern scientific research demonstrates that there are a number of problems to be solved on the way to full-scale digitalization of education (Aldhafeeri & Alotaibi, 2022; Peruzzo & Allan, 2022; Safonov et al., 2022).

There are a number of difficulties in the system of professional training of future scientific and pedagogical workers using digital opportunities for the full digitalization of this process. First of all, it is

the lack of awareness of teachers and educators, their lack of motivation can be traced to an absence of knowledge and relevant digital competencies, which can be caused by subjective and personal factors (Rossikhina et al., 2019). There are also barriers that impede educators' professional development during the digital mastery process. Such barriers refer to individual human metastructures (Bader et al., 2022, p. 28). The study of these aspects will contribute to the awareness of the non-linearity of professional teacher training to work in a digital environment. There are also didactic barriers to the digitalization of the educational space: they are observed where teachers use shotgun methods of work organization, which cannot realize the full digital potential of education. Administrative barriers also play a notable role, such as outdated regulatory frameworks that remain unadapted to the widespread use of digital education. According to Bader et al. (2022), due to the fact that there are now many different educational Internet resources, a separate barrier is the security factor. Obviously, at present, many modern educational platforms do not have protection against various hacker threats and attacks. The implementation of the indicated problems will contribute to an even greater connection between digital technologies and the training process of a future scientific and pedagogical employee.

The resolution of many existing difficulties and contradictions is seen in the development and improvement of the methodological system aimed primarily at the development of digital and information competence of higher education students. This should also be realized through comprehensive training in computer technology. Separately, in order to increase the level of digital competence, we propose to introduce into the training system of future scientific and pedagogical workers special courses of responsibility for the information used and disciplines aimed at studying the phenomenon of academic virtue. Such steps will contribute not only to the formation of digital communication skills but also to the formation of responsibility and critical thinking in students.

At the same time, one should note that teachers and higher education are also able to influence digitalization. First, they can develop specialized training courses, which impose special requirements for digital platforms and methods of information transfer. Accordingly, IT product developers, responding to the demands of the academic teaching market, should make changes to their products and thus steer the direction of digitalization in the direction needed by the academic teaching staff.

Another way to influence the development of digitalization of education is the continuous improvement of digital competence and information literacy of scientific and pedagogical personnel. This can be realized through their participation in professional development courses, and internships with appropriate credits for listening to disciplines with appropriate digital learning.

Also, in the process of professional training, there should be close cooperation between teachers and employers (representatives of universities, research institutes, industries, businesses). Through such cooperation, it is possible to respond to the challenges of the time, i.e., to update the knowledge, skills, and abilities demanded in the labor market, including those in the field of digital technology. Stakeholder initiatives can become a driver of change when, out of the mass of digital material, the emphasis is placed on the most effective learning models. This will force the developers of educational content and technology to restructure their services, applications, etc. Note that elements of such stakeholder influence are already tangible: a mechanism for accreditation of educational programs has been launched, where the obligatory point is the celebration of cooperation with employers and the provision of a detailed package of documents to prove it. Although today there are cases when many educational institutions imitate such a process or put it formally from a bureaucratic point of view, the idea of establishing a dialogue with future employers is relevant and objective is beginning to be recognized as a necessary element for the successful completion of education. Accordingly, the tool to

influence the digitalization of learning (its content and forms) will have more influence and efficiency in the future.

Conclusions and Implications

The total society's digitalization has a great impact on the education. It is undergoing digital transformation at all levels and spectra. Therefore, the system of professional training of future scientific and pedagogical workers should focus on the formation of digital literacy, critical thinking, and information competence. Acquiring these skills, future scientific-pedagogical workers will be able to compete professionally in the labor market. In addition, in view of labor market trends, digital skills will become especially relevant in the future, so the training of teachers and scientists should be of great importance not only concerning the use of digital technologies and resources in teaching, but also in the theoretical counseling, in the formation of students' ability to critically perceive digital content and understand new innovative technologies.

The results of the study demonstrated that Ukrainian students do understand the use of digital technologies, but most were not fully aware of the importance of responsibility for the use of certain materials and academic virtue. In the professional training of future teachers and scientists, it is suggested introducing special courses on digital literacy and academic virtue, which will generally affect the correction of the above-mentioned trend.

The interaction between the educational industry and digitalization has demonstrated that there are several barriers to the total digital transformation of the sphere that require a solution to the professional training of education and science specialists. In particular, a significant drawback is the lack of awareness of teachers and educators, their lack of motivation can be traced to a lack of knowledge and relevant digital competencies. Also, as it was found, there are didactic, administrative, safe barriers to digitalization. Solving the identified problems will also contribute to an even closer digitalization of the educational sector, and thus will affect the professional training of specialists of the future. Teachers and academics can also influence the development of digitalization, particularly by improving their digital skills through participation in professional development courses and internships. Teachers can influence the digitalization of the educational process by developing specialized training courses using innovative technologies. The prospect of cooperation with employers as an effective mechanism to influence the content and forms of digital learning is noted. Stakeholders' requirements for training applicants and close cooperation with the teachers of educational programs will allow to transform the essence of academic disciplines and to adjust digital teaching methods accordingly. This will make it possible to adjust the forms of digitalization of education. Although this mechanism still needs further improvement, it will improve the way higher education institutions train their graduates.

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