

DIGITAL TECHNOLOGIES AS A DRIVER OF PROFESSIONAL DEVELOPMENT OF TEACHERS OF VOCATIONAL EDUCATION ESTABLISHMENTS

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ABSTRACT

The article reveals the state of VET teachers' readiness for using digital technologies in the process of education; highlights the results of search and implementation of new ideas, innovative models and alternative forms of professional teachers' training in the system of postgraduate education. The need to use digital technologies during the quarantine period of the COVID-19 pandemic has accelerated the development of digital competence of teachers of professional VET. The transition to online education in the system of postgraduate education has become a driver for development of professionalism of scientific and pedagogical workers. The authors applied theoretical and empirical methods to research and generalization of the results of the analysis of the state of use of digital technologies in the professional development of teachers. The need of teachers for additional knowledge and skills in the application of digital technologies in professional development, as well as the need for the level of teaching in trainings, which involves the development of teachers' skills to teach remotely. Master new software and applications quickly and efficiently, exchange experiences during open classes, scientific and practical conferences and seminars, master classes. The essence of the concept "the readiness of teachers to use digital technologies in professional development" as a holistic personal concept was defined based on motives, subjective qualities, acquired professionally significant knowledge, skills, abilities, methods of activity, gained experience by means of ensuring the use of such technologies in professional development. The authors have reflected the results of a pedagogical experiment in order to improve the process of professional development of teachers of VET in terms of forming their readiness for the use of digital technologies, which provided: updating the content, methods and technologies of training, use of modern digital teaching aids, use of knowledge in practice by listeners. It was also found out, that after training in experimental groups, the number

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of students with high and medium levels of development of all its components increased significantly, while with low - decreased. In order to confirm the reliability of the obtained results, a statistical method – Pearson's criterion - was applied, and for their visualization was decided to apply infographics.

Keywords: digital technologies, teachers' readiness, digital competencies, postgraduate education, professional development of teachers.

INTRODUCTION

It is quite obvious that the modern world is already living in conditions of rapid changes, the speed of which will only increase in the nearest future. Recently, the term "liquid world" has even appeared in scientific circles, i.e., the world that does not have any "frozen forms", which (alike to liquid) is in constant motion and permanently changes its form depending on the circumstances those are appearing during our life. One of the drivers of these changes is Industry 4.0. In the age of digitalization, education is becoming the most important investment for the sustainable development of the world and the new concepts of continuing education are gaining relevance. They are reflected in a number of documents adopted at the international level. For example, in the Memorandum of a Lifelong Learning of the European Union the emphasis is on the interaction between all the types of learning - formal, non-formal and informal, which provides the opportunities for human development throughout the life (A Memorandum on Lifelong Learning commission staff working paper, 2000, p). The Incheon Declaration "On Education 2030: Ensuring Comprehensive Inclusive and Equitable Quality Education and Lifelong Learning" (2015) addresses the need to provide equal and expanded access to all levels of education, from primary vocational to scientific higher edu-

cation. This document emphasizes the importance of applying flexible learning trajectories, recognition, certification and accreditation of knowledge, skills, abilities and competencies acquired through non-formal and informal education. Thus, considerable attention is paid to creating conditions for adults to master functional skills at the appropriate level and lifelong learning.

In Chapter VII of the Article 59 of the Law of Ukraine "On Education": "Professional development of pedagogical and scientific-pedagogical staff involves continuous self-education, participation in training programs and any other types and forms of professional growth" (On education: Law of Ukraine, 2017) the attention is also paid to the professional development of pedagogical staff. Conditions for the professional development of teachers should be provided by the heads of educational establishments. It should be emphasized that the Resolution of the Cabinet of Ministers of Ukraine on "Some issues of professional development of pedagogical and scientific-pedagogical staff" from 21.08.2019 №800 provides for the different types of professional development, which allows them to choose and build an individual trajectory of professional development of each teacher (Some Issues of Professional Development of Pedagogical and Scientific-Pedagogical Employees: Resolution of the Cabinet of Ministers of Ukraine, 2019).

Today we can observe the dynamic changes in the process of professional development, which are becoming mainly practice-oriented and based on the application of experience in teaching, their research activities as well as solving problems of decision-making in conditions of uncertainty. At the same time, the system of postgraduate pedagogical education must respond effectively to the new challenges and formulate adequate responses in the form of timely

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changes. The modern orientation of society to overcome the consumer culture, the formation of innovative specialists as Individuals, Citizens and Professionals, directs the professional development of teachers to the formation of subjectivity, awareness and improvement of individual style and the implementation of the author's approach to teaching. However, it should be noted that the transformation of approaches to the professional development of teachers in particular vocational education, is quite slow. Nevertheless, the traditional forms of education still prevail - collective (advanced training courses) and group (cycle and subject commissions, seminars, round tables, trainings, etc.). Until now, there is still an opinion that the educational space created in this way is effective for improving professional and social competencies, and understanding the course of educational processes, the use of different technologies should come from outside in the process of formal learning. But the situation around the world has changed. Significant adjustments in the activities of all pedagogical teams were made by the COVID-19 pandemic, which became on the one hand "a real stress test for education systems, and on the other - an incentive for the development of its alternatives (Petrenko, L., Romanova, G. & Oleshko, P., 2021, p.243) ". In order to find the new ideas, innovative models and alternative forms, methods and ways of organizing professional training of teachers in the system of postgraduate education, we turned to scientific achievements, which are reflected in open sources.

The purpose of the article is to identify and substantiate the possibilities of digital technologies in the transformation of teachers' professional development of vocational education.

THEORETICAL BACKGROUND

Today in the domestic system of postgraduate education the following general tendencies of professional development of pedagogical workers can be outlined: differentiation of educational content in accordance with individual educational needs, involvement of students in the process of determining the content of their course learning, application of the interactive teaching methods, dialogization of the educational process, its construction on the basis of critical analysis of practice, development of creative and moral sphere of personality, direction of educational process on training during the course period, strengthening of attention to use of computer equipment and modern means of communication and stimulation of self-education. At this stage of reforming of the educational systems both in Ukraine and in scientific circles of different countries, a wide discussion took place on the use of digital technologies in the professional development of teachers, their impact on the organization of professional development and the introduction of a personalized approach.

First of all, we consider being necessary to determine the essence of the definition of "professional development of teachers". According to the analysis of scientific works, we will consider that this is a "process (activity) aimed at developing of the professional competence of the specialist, which is provided by the constant transformation of his or her professional thinking system, regulated by social requirements and individual needs, closely related to real life and lifelong learning using various forms and methods of open education, including the use of information technology and electronic educational resources that allow bringing the educational process to the level of active social creativity" (Petrenko, L., Romanova, G. & Oleshko, P., p. 245). Based on the content of the abovementioned concept, in the Central Institute of Postgraduate Education SIHE "University of Education Management", research and teaching staff of the Department of Vocational and Higher Education developed and implemented educational and professional training program in the field of "Pedagogical, research and teaching staff and heads of educational establishments" areas of knowledge: 01 "Education". It focuses on the training of teachers, including vocational education establishments for ensuring the modernization and renewal of the structure, forms and content of vocational education and training of staff of a new format, who will master the complex professional competencies, various forms of integration of professions along with the renewing of the content of training.

Of course, a special place in this process belongs to the system of postgraduate pedagogical education, because its purpose is actually to improve the skills of teachers by being a tool for restructuring the educational sector and, consequently, social change at a qualitatively new level. We believe that in the system of postgraduate education, taking into account the specifics of the contingent of students, it is possible to create an innovation and development environment in which, based on practical experience, it is possible to initiate their professional and personal development and to help the students to design their own strategy of effective professional activity (Serheieva, L., Kupryievych, V., 2020).

In order to realize the purpose of this study, we considered the traditional approaches to the professional development of teachers in the system of postgraduate education, those were covered in the scientific works of the following scientists: Ja. Belmaz (2008), N. Sehedá (2011), L. Shevchuk (2001), M. Andros (2018), T. Baryshnikova (2008), N. Morozova (2010), S. Fomenko (2011), L. Sierykh & L. Verzunova (2008), N. Panova (2009), O. Vakulina (2008), H. Ihnatieva (2007). Based on the analysis of these publications, it was found out that the modern models of professional development of teachers reflect the current needs of society, features of pedagogical activities, individual trajectories of professional self-improvement of teachers, focus on interaction between stakeholders, project principles of educational process management (Petrenko, L., Romanova, G. & Oleshko, P.).

This issue is also widely discussed in the research space of foreign scientists: P.-An. Ullmo, Y. Mor, M. Delgado (2015); Jan H. van Driel, Douwe Beijaard, Nico Verloop (2001); John Harland & Kay Kinder (2014). For example, the role of school principals in supporting the continuing professional development of educators has been studied by Michael Stevenson, John G. Hedberg, Kerry-Ann O'Sullivan & Cathie Howe (2016). They focused on the contextual factors those are influencing school principals' choice of the best model for continuing professional development. According to the results of the study, they found out that the school principals' perception of the structure and ways in supporting the continuous professional development of teachers is constantly changing. Their attention was drawn to two key circumstances: firstly, the principals use mostly non-formal vocational training technologies, and secondly, they find in various social networks the ideas of popular scientists in the field of education on the use of modern technological tools (Stevenson, M., Hedberg, J.G., O'Sullivan, K.-A. & Howe, C., 2016).

Gavin T. L. Brown (2004) raises the issue of professional learning communities for the development of research competence of teachers in agencies and by conducting rounds with the participation of scientists. Teachers' Agencies focus on the model of activity, represented by Carey Philpott & Catriona Oates. It reveals the role of sociocultural factors in personality development (Philpott, C. & Oates, C., 2017). In the review article by Anja Swennen & Tony Bates (2010), research materials on teachers' professional development are grouped into five clusters. The authors emphasize on the importance of the education of "teacher's teachers" and note that this category of teachers requires much more attention concerning the issue of their professionalism.

One of the aspects of the study, conducted by Emily Howell, Sarah Hunt-Barron, Rebecca Kaminski & Rachel Sanders (2017) is dedicated not only to the influence of the teacher on the formation of certain skills among students (learning to write), but also the positive effects of students on the professional development of research and teaching staff.

In the context of this study, the particular scientific interest to us is represented within the scientific papers, those reflecting the results of the use of digital technologies in the professional development of teachers. After all, in the conditions of change of the labor market, the risks, carried by the world fourth industrial revolution as well as formation of STEM-education ecosystem are actualized. L. Grynevych, N. Morse, V. Vember and M. Boyko (2021) have already mentioned about it in their scientific works. This also requires transformation of professional development of teachers of vocational education. Professional development of teachers in the process of implementing of blended learning is the subject of research conducted by O. Shcherbyna (Scherybna, O.A., 2021).

Analysis of publications of scientists in domestic and foreign scientific journals allowed us to identify different points of view on the place of learning technologies in the methodological system. For example, L. Chernykh (1995, p.18) believes that the learning technology is a subsystem of the methodological system, which includes methods, tools and forms of learning and answers the question "How to teach?". The importance of introducing information and communication technologies in the educational process of higher education establishments is outlined by Elena H. Fedorenko, Vladyslav Ye. Velychko, Andrii V. Stopkin, Alona V. Chorna and Vladimir N. Soloviev (2018). They view the informatization of education as "a modern resource that provides answers to questions of interest to both teachers and students. Having the skills to use information resources is the main way to improve their professional skills" (2018). Thus, in the domestic education system, research is aimed at developing innovative models of professional development of teachers in the context of digitalization of the economy.

Based on the study of standards of pedagogical education in France, the United States and Australia, scientists S. Semerikov, I. Teplytskyi, V. Soloviev, V. Hamaniuk, N. Ponomareva, O. Kolgatin, L. Kolgatina, T. Byelyavtseva, S. Amelina & R. Tarasenko (2021, p. 15) identified the components and indicators of "common digital competences, such as the ability to: assess, implement and use ICT-based learning platforms; apply e-learning in social media; teacher design for e-learning; assess, implement and evaluate e-assessment; apply ICT-related knowledge; implement enhanced learning practices; analysis of production implementations and e-learning systems"

(Semerikov, S.O., et al, 2021). During the study, they found out that the development of these competencies in the European educational space is seen as a component of functional literacy of the staff demand in which in the labor market is extremely high. Thus, in terms of innovations in the field of information and communication technologies (educational resources, social networks, mobile technologies, Internet of Things, artificial intelligence, virtual and augmented reality, big data, programming, ethics and privacy protection, should be considered through the content of the training (UNESCO ICT Competency Framework for Teachers, 2018). That is why there is a great need for continuous professional development of teachers, in particular the continuous improvement of digital competencies, which will expand the opportunities for the use of digital technologies in the training of competitive professionals.

Thus, the new philosophy of the postgraduate pedagogical education necessitates its new organization on the basis of implementing the ideas of the open education, which allows to meet the challenges of the information society and respond to the transformation of the educational demand for the high quality training under the different or even adverse conditions. These ideas encourage a significant reformatting of postgraduate pedagogical education, the transition to open educational systems that operate on the basis of network technologies, decentralization and democratization of education, open formation of the structure and scope of educational and professional training.

METHOD

The following general scientific methods were used in the process of study: analysis of pedagogical, psychological, methodological literature, the results of which determined the essence of the concept “readiness of teachers to use digital technologies in professional development”; synthesis as a process of practical and mental reunification of the whole from the parts (for example, individual components of different models of professional development of teachers in a set of elements adapted to specific conditions), comparison, systematization and generalization of the most common obstacles while applying the digital technologies, survey results; comparative analysis to study the work of foreign and domestic scientists, legislative support for the introduction of distance learning, etc. This study also used a set of specific scientific methods, i.e.: interpretation – in order to define the basic concepts of the study such as “the readiness of teachers to apply the digital learning technologies” and “E-portfolio”. The prospects for the further research were determined by using prognostic analysis. Empirical methods were used in the structure of this pedagogical research: questionnaires of students by using Google form; informal conversation, which provided an opportunity to identify problems in the work of teachers of vocational education related to the use of digital technologies on non-rigidly standardized issues. To study the effectiveness of the described and implemented guidelines for the use of digital technologies in professional development of teachers of vocational education establishments, the method of pedagogical experiment was applied. In order to confirm the reliability of the results, the statistical method – Pearson’s criterion, and – infographics – for their visualization – were applied.

RESULTS AND DISCUSSION

The study of the current state of use of digital technologies in professional development involved 165 teachers of vocational education, who during 2020th-2021st were trained at the University of Education Management on the working curricula of the Department of Vocational and Higher Education. At the beginning of the training, students were offered a questionnaire containing 17 questions, of which 11 were closed and 6 were open.

The results show that the vast majority of respondents (92%) feel the need for additional knowledge and skills concerning the application of digital technologies in professional development, in particular, they note the relevance of distance learning, social platforms and increasing digital competence in general. In order to improve the relevant competencies, teachers undergo refresher courses, internships, participate in activities in order to share experience, attend seminars, webinars, workshops, exhibitions and are engaged in self-education.

The participants of the study emphasize that, in addition to the planned training courses, they study throughout the year, even during the holidays and online courses, educational platforms “Vseosvita”, EdEra, Prometheus, “Na Urok”, “Metodychnyi Portal”, “Academy of Digital Development (Akademiya Tsyfrovoho Rozvytku)”, exchange their experience and provide the consultations with proficient colleagues during visits to educational exhibitions. Among the main sources of information on training opportunities, respondents identify: Facebook,

methodical offices, educational and methodical centers of vocational education, websites of higher education establishments, newsletters from the Institutes of Postgraduate Pedagogical Education, the Directorate of Vocational Education of the Ministry of Education and Science of Ukraine, National Academy of Pedagogical Sciences of Ukraine and personal subscriptions to the other newsletters. Thus, digital technologies are gaining leading importance in the professional development of teachers.

The results of the participants' assessment of their competence in working with computers, software, electronic resources and cloud technologies show that 40% of respondents (66 people) assess themselves as confident users, 34.5% (57 people) - consider themselves to the group of advanced users, 16.4% (27 people) - consider themselves to be experts, and 9.1% (15 people) - beginners (Fig. 1).

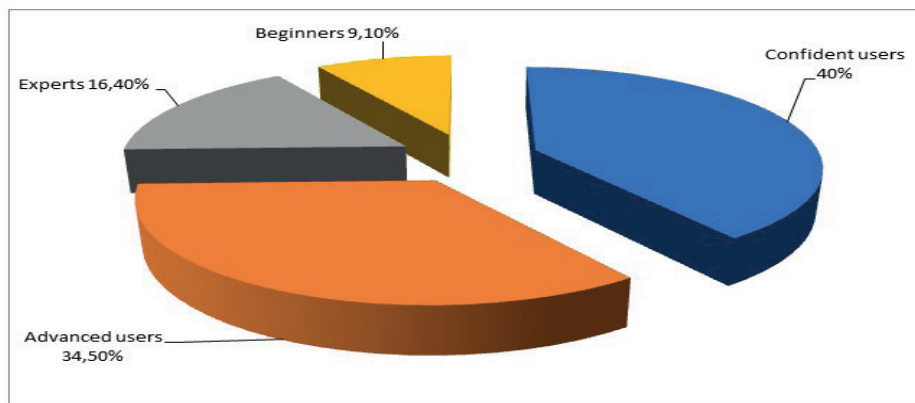


Fig. 1. *Self-assessment of digital competence performed by teachers of VEE*

The obtained data confirm that the groups of students, who are undergoing advanced training at the University of Education Management, are mostly heterogeneous if we talk about the skills in digital literacy and competence. Accordingly, the methods and technologies of teaching students need to provide an individual approach as well as various methods and forms of presentation of educational material.

Among the motives of professional self-development in the context of digitalization, respondents single out the desire to be competent, the requirements of professional activity, the desire to develop as a person, the need to keep up with the times, love for the profession, career growth, dreams and new achievements. In general, the striving for the self-improvement, their internal motives prevail over external ones. In planning further education, teachers prefer modern practice-oriented methods and forms, including trainings, webinars, workshops, distance learning courses.

The results of the survey show that all respondents use digital technologies in the educational process, which was influenced in particular by force majeure related to the COVID-19 pandemic. The Internet provides a large number of services that allow you to create and edit quizzes, crossword puzzles, presentations, publications, videos and teaching aids. These services are actively used in the learning process, which allows you to activate it, make the lesson interesting, and accordingly increase the level of student achievement. At the same time, if Internet resources are unconditionally popular in education, then only about a third of respondents (55 people) indicate their use for educational activities.

With the development of modern technologies, the employees of vocational education establishments with pedagogical education have more and more opportunities to create didactic teaching aids. That is an urgent need today and an integral part for ensuring the unity of the educational process as well as an effective way of presenting educational material. According to the results of the questionnaire, 81% of respondents (134 people) have methods of creating their own electronic didactic materials, 19% do not have them (31 people) (Fig. 2).

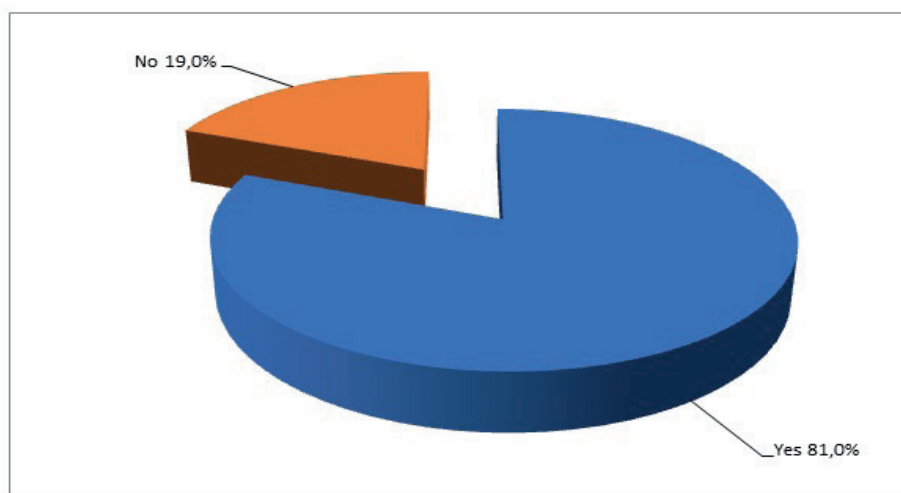


Fig. 2. Acquisition of the VEE pedagogical employees of the electronic didactic materials' creating methods.

If the majority of research participants are able to independently develop modern didactic support, then the creation of video content turned out to be a problem area for a significant number of them. In today's web space, there are a plenty of online services for creating videos. These services provide the user with a wide range of tools: the effects of transitions between images, panning, adding background music as well as animated text or voice comments. Among the surveyed pedagogical employees of vocational educational establishments, 44.8% (74 people) have the skills to create video fragments and 55.2% (91 people) do not have such skills.

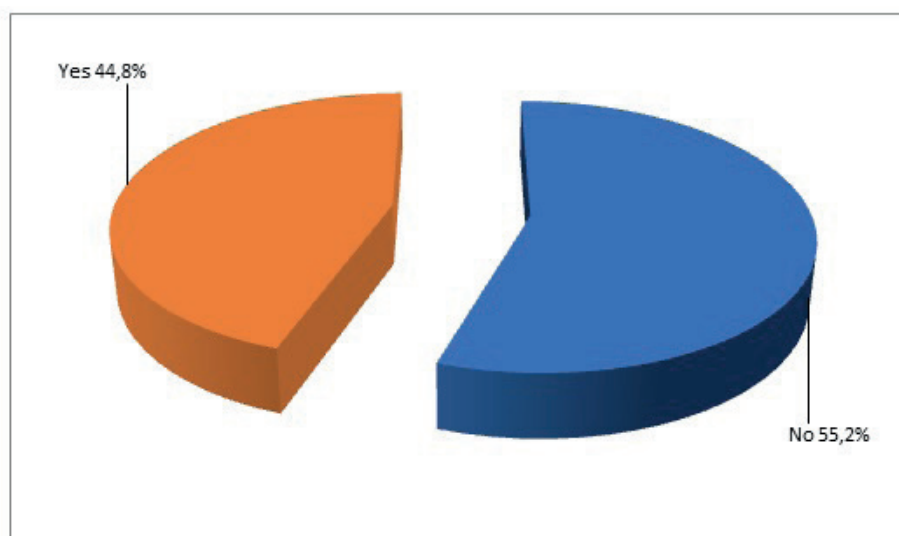


Fig. 3. Development of skills in the creation of video materials in teachers of VEE.

Today, support for distance learning through social networks and services, TV and video conferences, forums and blogs, websites, virtual rooms, etc. needs special attention. Among the popular distance learning platforms, respondents name: "Zoom", Google Classroom, Google Meet, "Vseosvita", Moodle, "BigBlueButton", Microsoft 365, "Testpad", "Prometheus", "Na Urok", "Ivan Ivanov", "Webex", Skype, Microsoft Times, "Ilearn", Classtime, "LABA", Teems, Google Hangout, "MOSA". The participants of the study mainly use social networks and e-mail for supporting the distance learning. At the same time, it is noteworthy that only 12% of respondents (20 people) have such a powerful resource for feedback from students as their own blog (website).

Among the most important reasons that prevent the use of digital technology, study participants named the following:

- overload, lack of time;
- insufficient psychological readiness (internal barriers, resistance);
- lack of uninterrupted access to the Internet;
- Insufficient computer and software in the workplace;

- complexity of training.

According to the results of observations of teachers' activities during the distance learning in advanced training courses (students' speeches, student-teacher dialogue, group work, conversations), it should be noted the interest within the educational environment "G Suite for Education", which represents a number of services from Google. Their complex is defined depending on the set goal, allows productive organization of the educational process both online and offline. The advantages of digital services G Suite for Education include the following:

- the establishment of collective joint educational activities by means of digital tools;
- monitoring learning outcomes; discussion in a group or chat concerning the different approaches towards performing some certain tasks;
- organization of interaction and exchange of information; application of distance learning based on Google Class;
- conducting online conferences, testing, exchange of correspondence, etc.

Educators emphasize on the convenience of using such digital services as: Google Calendar, Google Forms, Google Spreadsheets, Google Docs, Blogger, Google sites in event planning, scheduling classes, providing scientific and methodological support for the organization of educational and methodological work in the team, educational process management and so on (Gushchyna, N., Kondratova, L. & Kasian, S., 2021, p.39.).

Teachers of vocational education establishments widely use the full potential of Google Classroom as a unique program specifically designed to achieve educational goals. The authors (Sultanova, L., Tsiuniak, O., Milto, L., Zheludenko, M., Lyktei, L., Petrenko, L. & Uchitel A., 2021) note that this free web service "performs the functions of methodological, software, technical, informational and organizational environment". This mobile application is multifunctional and quite easy to use. It allows users to "take photos and attach them to tasks, share files from other applications and have offline access to information. The teacher can control the progress of each student and after evaluating his work - to return it with certain comments" (Google Classroom. Free Encyclopedia).

In order to increase the readiness of teachers of vocational education establishments to use digital training technologies during quarantine, the set of special conditions were created in order to meet their professional needs and the implementation of personal trajectories. In this context, new challenges have arisen for teachers of vocational and higher education: the development of skills of teaching remotely; quickly and efficiently master new software, new applications (bbb2, Jitsi Meet, Office 365) as a means of teaching students to organize the educational process at the distance, acting as curators-tutors. Quarantine training has intensified the exchange of experience between teachers: open classes are held systematically along with the mutual attendance of classes online. Among the modern progressive trends is the completing by teachers of the department of advanced training at the university, which is also can be considered as the implementation of the corporate model of continuing education. Members of the department in the course of their activities directly implement the principle of teacher self-development "teaching and learning", systematically conducting intra-departmental scientific and practical seminars. The generalization of own experience of educational, methodical and scientific activity and also acquaintance with achievements of colleagues, is promoted by activity of teachers on filling with educational materials of personal web-offices on a platform of the Ukrainian Open University of Postgraduate Education.

Due to the development of digital technologies, the modern process of professional development of teachers of vocational education has powerful tools, in particular - in terms of implementing productive learning as a technological embodiment of human-centered approach based on partnership between teachers and students.

For pedagogical employees of vocational education establishments who take advanced training courses at the Central Institute of Postgraduate Education of the University of Education Management, special courses have been developed and implemented, i.e.: special courses "Educational web quests: from idea to practice", "implementation of social networks in pedagogical practice", topics "Creating of educational web quests", "Cyber hunting and multimedia album as types of Internet projects", "Electronic portfolio as a tool for educational projects", etc.

A few examples should be considered in this case: thus, the method of intelligence maps (also called concept or mental maps, mind maps), which can be created using the services www.mindmeister.com/ru, <http://mind42.com>, is effective for generating ideas and encouraging creativity. www.mindomo.com. By visualizing the thought processes, this method allows you to perform a logical search, systematize knowledge, establish connections and relationships between these phenomena. The infographic diagram provides a holistic visual coverage of the situation as a whole, and at the same time, keeping in mind a large amount of information. At the heart of this

technique is the principle of “radiant thinking”, which refers to the associative mental processes that unfold around the central object. This shows the infinite variety of possible associations and the inexhaustibility of the brain. This method of recording allows the memory card to grow and supplement indefinitely (Homeniuk, D.V., Kulalayeva, N.V., Romanov, L.A., Romanova, H.M. & Tkachuk, A.E., 2017).

A useful tool for project activities is an online board (interactive cloud board), which allows for effective group interaction. Such a board can be created owing to the services <http://linoit.com>, <http://dreamsboard.ru>, <http://mooscle.ru>, <http://padlet.com>. You can attach various images, videos, stickers, text notes, links related to one topic; organize sharing to discuss ideas and suggestions.

Confirmation of the effectiveness of project management, along with the results obtained can be a project folder (portfolio), which contains complete information about the project from the start and until the finish. All performers take part in its filling. The E-portfolio allows to organize the work of the participants clearly and to determine the personal contribution and achievements of each one, objectively assess the progress of the project, as well as provide the necessary information for further projects. The structure of the portfolio can be varied and, as a rule, it includes a project passport, records of all ideas, hypotheses of solutions (in particular, in the form of a project map), all information on the project topic (diagnostic methods, questionnaires, answer sheets, etc.), research results analytical materials, graphs, diagrams, tables), reports on the discussions, “brainstorming”, meetings of project teams, sketches, drawings, materials for the presentation, etc.

During the training of students, such Internet technology project as “Cyber Hunt” is used and mastered. It is an online activity that focuses on gathering information from websites in order to answer the questions on specific topics. In particular, the following main types of Cyber Hunt are used:

- a simple task in which the teacher develops a series of questions and provides students with hypertext links to the URL for search activities;

- a more complex task designed for increasing and improve Internet search skills, when students use search engines to find answers to questions asked by the teacher.

Web quests are an example of effective integration of design and digital technologies. Their use is a manifestation of gamification, which is the use in the learning process of game practices and mechanisms for involving learners in solving educational, cognitive and informative problems (Romanov, L., 2015). To work out the algorithm of work by means of this technology, students must pass the educational and methodical web-quest “Golden Apple”, which is presented in the form of a site and is located at <http://q-golden-apple.blogspot.com>. After passing the web-quest, the technological aspects of its development are worked out, in particular, creating a blog and filling it with the necessary information.

The issue of informatization and digitalization of vocational education is an important aspect of consideration during workshops and scientific-practical conferences, provided by the advanced training programs for the relevant categories of students. During such events, students make presentations, virtual tours, reports, which are discussed by leading experts in the digital industry.

The orientation of pedagogical workers of vocational education establishments on the use of digital technologies in professional development and pedagogical activity was widely reflected in the content of their dissertations, which was systematically aimed at supervisors - teachers of vocational and higher education. In particular, various aspects of digitalization are reflected in 88% of works defended by this category of students in 2021. Among them - the organization of information activities in vocational education, STEM-learning technology, development and implementation of distance learning elements in vocational education, the use of modern information and digital technologies in the educational process, etc.

In the course of the experimental research, the levels of readiness of pedagogical workers of vocational education establishments in using digital technologies in professional development at the entrance and final stages of advanced training courses were compared. The result of which are the aforementioned methodological aspects, those have been already implemented.

The readiness of teachers to use digital technologies in professional development means a holistic personal education based on motives, subjective qualities, acquiring of the professionally significant knowledge, skills, abilities, types of activities, experience, which in its turn, ensures the implementation of such technologies in professional development.

The study of readiness was carried out according to the following previously developed criteria and indicators: motivational (desire, intrinsic motivation to use digital technologies in professional self-improvement), subjective (activity to master digital technologies, proactive to professional self-improvement; innovative proper-

ties, focus on interaction, reflection) cognitive (understanding of the essence and specifics of digital technologies, knowledge of the procedures for their application) and activity (skills and abilities for the use of digital technologies).

- On the basis of criteria and indicators, the following levels of readiness of pedagogical employees of vocational education establishments to application of digital technologies are defined:
- low (weak desire to use digital technologies in professional development, avoiding of new, unwillingness to improve; low level of activity in mastering digital technologies, low level of proactivity in professional self-improvement, weak expression of most innovative properties, low focus on interaction, low level of reflection; superficial understanding of the essence of digital technologies, inability to fully explain the procedures for the use of digital technologies, low level of knowledge about the peculiarities of the use of digital technologies; insufficient development of skills and abilities for the use of digital technologies);
- average (indifferent attitude to the use of digital technologies in professional development, dependence on external incentives in order to master digital technologies, average level of formation of needs for professional self-development; average level of activity in mastering digital technologies, proactivity in professional self-improvement, development of innovative properties; average level of focus on group interaction, average level of reflection, the ability to explain the essence, describe digital technologies and procedures for their use at the reproductive level, the average level of development of skills concerning the application of digital technologies);
- high (conscious persistent aspiration to use digital technologies, intrinsic motivation to use them, high desire for professional self-development; high level of activity in mastering digital technologies, high level of proactivity in professional self-improvement, high, stable expression of innovative attributes, high level of focus on interaction, high level of reflection, actual understanding of the essence of digital technologies, their ability to describe in detail and explain the procedures of application, awareness of the peculiarities of the use of digital technologies, the formation of a set of skills for the use of digital technologies).

During the study of the readiness of pedagogical workers of vocational education establishments to implement the digital technologies in professional development, took part 165 pedagogical employees, 81 of them in the control group and 84 in the experimental group. A pseudo-parallel experiment was conducted, as the number of respondents is not enough to form an experimental and control group (students of the control group were trained in 2020nd, and experimental - in 2021st)

At the initial stage of training, fundamental differences in the development of readiness for the use of digital technologies in students of experimental (EG) and control (CG) groups were not detected (Table 1).

Table 1. Comparison of the students' of control and experimental groups distribution according to the levels of development of components of readiness for the implementation of digital technologies at the initial and final stages of the ADC

Components	Stage	Distribution of students by levels of formation of components of readiness for application of innovative production technologies												Criteri- on ²
		CG						EG						
		L		A		H		L		A		H		
		n	%	n	%	n	%	n	%	n	%	n	%	
Motivational and personal	Before	10	11,9	41	48,8	33	39,3	9	10,7	39	47,9	33	41,4	0,048
	After	9	10,7	35	41,7	40	47,6	4	5,4	23	27,8	54	66,8	6,439
Subjective	Before	3	3,6	50	59,5	31	36,9	3	3,6	47	58,6	31	37,8	0,038
	After	3	3,6	47	55,9	34	40,5	0	0,0	32	39,5	49	60,5	8,507
Cognitive	Before	33	39,3	41	48,8	10	11,9	33	40,2	36	44,8	12	15,0	0,452
	After	30	35,7	43	51,2	11	13,1	20	24,9	29	36,3	32	38,8	14,928
Activity	Before	36	42,9	37	44,0	11	13,1	36	44,3	34	42,5	11	13,2	0,072
	After	34	40,5	36	42,9	14	16,6	23	27,7	28	34,8	30	37,5	8,889
Average value	Before	21	25,0	42	50,0	21	25,0	20	24,8	39	48,5	22	26,7	0,104
	After	19	22,6	40	47,6	25	29,8	12	14,5	28	34,5	41	51,0	7,525

The results show that after experimental training in EG, in contrast to CG, significantly increased the number of students with high and average levels of development of all its components, at the same time, the low one decreased. In the control group, the changes that have occurred were less significant. The most pronounced positive dynamics in the EG is observed in relation to the levels of formation of the activity component.

In general, in EG the number of listeners with a high level of readiness increased by 24.3% (in CG by 4.8%), the number of listeners with a low level decreased by 10.3% (in CG by 2.4%) (Fig. 4).

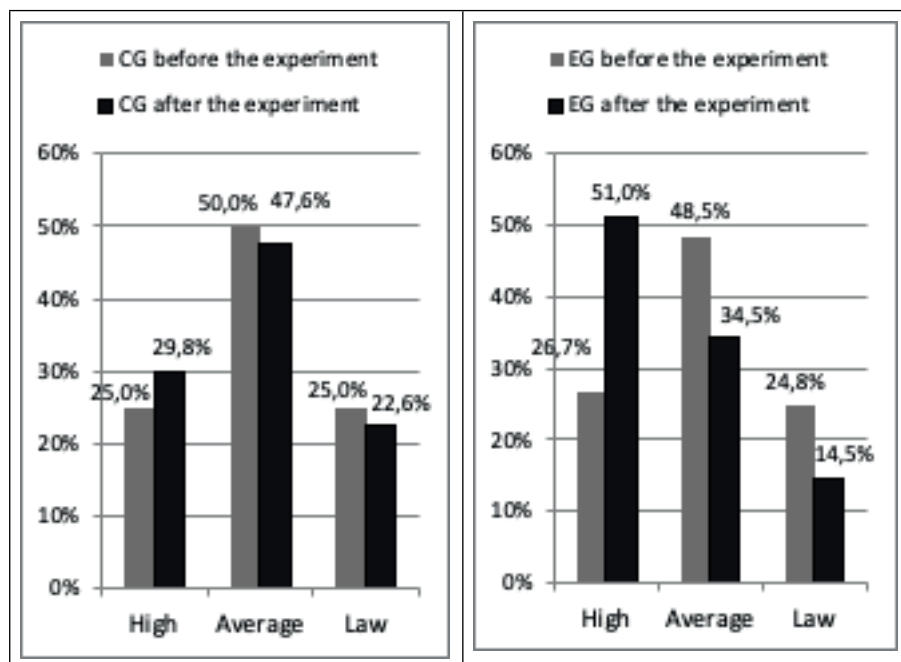


Fig. 4. Dynamics of Readiness of CG and EG Students for the use of digital technologies in their professional development

The reliability of the obtained results is proved by the statistical criterion χ^2 according to Pearson. The obtained empirical values of the criterion χ^2 were compared with the corresponding theoretical value of this criterion, equal to 5.99 - at $m-1 = 2$ degrees of freedom on the probability of permissible error ≤ 0.05 . It was determined

that according to the distribution of students of the control and experimental groups and according to the levels of development of the components of readiness for the use of digital technologies in professional development before and after the experiment there are quite significant differences. If before the experiment the differences in the distribution of students in the control and experimental groups were not significant (the empirical value of the criterion χ^2 was less than the theoretical value), then after the experiment differences in this distribution for all components of readiness are statistically significant (empirical value of the criterion χ^2 was greater than the theoretical value).

Thus, the results of the study confirmed the effectiveness of the introduction of advanced training courses for teachers of vocational education complex of methodological measures and developments in the use of digital technologies for professional development.

CONCLUSION

Summarizing the results of the analysis of the implementation of digital technologies in professional development of teachers shows that the vast majority of respondents feel the need for additional knowledge and skills in the use of digital technologies in professional development. They emphasize on the relevance of distance learning, social platforms and digital competence. Among the difficulties were determined the following ones: overload, lack of time, lack of psychological readiness, problems with uninterrupted access to the Internet, insufficient computer and software in the workplace and the complexity of preparation for classes. It is noteworthy that Internet resources are used by all participants in the study, while only about a third of respondents indicate their use for educational activities. It was also determined that most of the participants in the process of study are able to develop modern didactic materials, while the creation of video content was a problem area for many of them.

Improving the readiness of teachers of vocational education in the process of digital technologies implementation requires an appropriate level of teaching courses. It involves the development in teachers the ability to teach remotely, quickly and efficiently and master new software and applications, share experiences during open classes, online attendance - modes, scientific and practical conferences and seminars, workshops. The generalization of own experience of educational-methodical and scientific activity, and also acquaintance with achievements of colleagues, is promoted by activity of teachers on filling with educational materials of personal web-offices on a platform of the Ukrainian open university of postgraduate education.

Improving the process of professional development of teachers of vocational education in terms of forming their readiness to use digital technologies involved updating the content, methods and technologies of training, the use the modern digital teaching aids, students use the knowledge obtained in practice. It is determined that after training in experimental groups, the number of students with high and average levels of development of all its components has significantly increased, while with low - decreased.

Thus, the transition to distance and blended learning in quarantine conditions for the COVID-19 pandemic stimulated the development of digital competence of teachers, served as a driver of mastery and implementation of innovative technologies, contributed to the diversification of forms of vocational training in postgraduate pedagogical education.

The further prospects for the study are seen in surveying organizational and pedagogical conditions for self-development of teachers of the vocational education system in the between-course period.

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