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DEVELOPING DIGITAL COMPETENCY IN FUTURE MASTERS OF VOCATIONAL TRAINING

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Abstract.

Relevance: the use of modern digital technologies is a prerequisite for the development of more effective approaches to learning and the improvement of teaching methods, which saves time and faster to achieve this goal. The high educational potential of modern digital technologies and the pace of their development, development and modernization of software determine the requirement for the improvement of training of masters of industrial training. In these circumstances, it is important for graduates of pre-professional higher education to have the knowledge, skills and experience to solve educational tasks, above all, digital tools.

Aim: to substantiate and experimentally test the levels of digital competence development of future masters of industrial training.

Methods: theoretical (analysis, synthesis, generalization); empirical (testing); statistical (results processing, charting).

Results: the role of digital competence in the professional activity of masters of industrial training is analyzed in the article and the main aspects that digital competence in the general understanding in the educational process should provide. The levels of development of digital competence are distinguished: technical, social, informational and epistemological. In order to determine the levels of digital competence of future masters of industrial training, a study was conducted among the students of the final groups of the Professional-pedagogical specialty college of Hlukhiv NPU named after O. Dovzhenko with further analysis and presentation of the obtained results. In the experiment study, a technique was used to establish digital competence levels based on the respondents' frequency of use of various digital technologies. The obtained results reveal some problems in the formation and development of levels of digital competence in the preparation of future masters of industrial training. Namely, it has been demonstrated that the four levels of digital competence under study are not equally developed and need further adjustment. Thus, the social level was dominant in a large number of study participants. The analysis of each level separately revealed some patterns in their formation during the educational process and during the ordinary daily operations of the respondents.

Conclusions: frequent use of a variety of digital technologies is an important overall indicator of the development of digital competence, provided that procedural knowledge is transferred, which is supported by the purposeful use of digital devices. According to the results of the experimental research, some differences in the levels of development of digital competence were revealed in the respondents. Thus, in 47% of respondents there is a developed social level, in 24% of respondents – the technical level, and in 17% – the information level. The smallest number of respondents (12%) has an epistemological level of digital competence.

Keywords: *masters of industrial training, levels of development, digital competence, digitization, digital technology.*

Introduction. The concept of digital competence arose simultaneously with the development of digital technologies that determine the constant emergence of new activities in society. Therefore, the relevance of its development is constantly growing. Today, most European researches studies focus more on identifying access to and consumption of digital resources than on the developing of digital competence. Using and managing basic digital tools or online platforms is only the first step to "advanced" digital skills to work. The development of digital competence should be seen as a continuation of the development of instrumental skills to more productive, communicative, critical and strategic (Henseruk, 2019).

Although the using of computers, mobile devices and the Internet is constantly growing in all segments of the population, this does not certainly mean that they develop skills that can be useful in various aspects of the activity. Studies have shown that great amounts of digital devices contribute to the development of digital skills only at the operational level. Higher cognitive ability to critical search and selection of information is not the result of greater consumption. Users can simply stay on the same level and use only certain programs and services. Therefore, increased usage of digital technologies can not be considered as a key indicator of digital competence (van Deursen, 2010).

Examining this model of key competences which is approved by the European Parliament and the Council of the European Union, digital competence is included in it. According to this document, "digital competence is the confident, critical and responsible use and interaction with digital technologies for learning, professional activities (work) and participation in society" (ANNEX to the Proposal for a Council Recommendationon Key Competences for Lifelong Learning, 2018).

Ukraine has set out to create a digital state (or state in a smartphone). This is recognized as the need to form the digital economy and society, and digital technologies are seen as one of the key elements of such development.

One of the priorities of this developed is the digitalization of educational, which involves, above all, the intensification of the learning process, the implementation of ideas of adaptive and developmental learning, improving forms and methods of organizing the educational process, creating an education system focused on modern digital technologies (Bykov, 2019).

The priority tasks for the development of vocational education in the context of digitalization should include not only the resource content of the educational environment with modern digital teaching forms, but also the preparation of teachers for their effective use. Taking into consideration the high educational potential of modern digital technologies and the pace of their development, due to the continuous development and modification of software, the education of such professionals needs constant improvement today. Under such conditions, it is very important for the master of industrial training to determine the level of his knowledge, skills and experience that he needs to perform educational tasks using digital technologies. This lets, in its turn, outline the individual educational trajectory to increase their own digital competence of professionals.

Sources. The theoretical analysis of the researched problem was carried out on the basis of scientific works of native and foreign researchers. Modern trends of the development of the informative society are considered in the studies of V. Bykov, M. Leshchenko, N. Morse, L. Finally, Fr. Spirina et al.

I. Gavrysh, R. Gurevych, I. Vorotnikova, O. Dubaseniuk, K. Durai-Navakova, O. Kovalenko, V. Kovalchuk, L. Kondrashova, M. Kulakova, O. Romanovsky, L. Romanyshyna, L. Khomych, J. Tsekhmister and others studied the conceptual principles of professional training of specialists.

Interpretation of the essence of the concepts "digital competence", "digital technologies", definition of their structure, features are found in many works of our native scientists. In the researches of N. Soroko, O. Spirina the issues of digital literacy and information and communication competence of a person are scientifically substantiated.

Our native and foreign scientists worked on the problem of introduction of digital technologies in educational process: V. Bykov, M. Byrka, I. Vorotnikova, A. Ershov, M. Zhaldak, V. Kovalchuk, V. Kukharenko, V. Lapinsky, M. Leshchenko, P. Matyushko, V. Monakhov, N. Morse, I. Novik, A. Poplavsky, V. Rozumovsky, O. Spivakovsky, O. Spirin and others.

Foreign researchers: J. Anderson, S. Brookfield, M. Fengchun, P. Normak, H. P?ldoja, M. Simonson, O. Abramova, I. Zakharova, E. Polat, B. Yarmakhov pointed out the importance of implementing computer technologies in modern education, the possibility of using distance learning, various network technologies and Web-services, features of implementation of modern models of computer and e-learning.

The results of researches by these scientists show that only a competent in digital technologies specialist who is ready to use them can organize a productive educational environment. Namely, such effective professional activity is possible with a combination of modern digital and pedagogical technologies.

The article aim is to substantiate and experimentally check the levels of the development of digital competence of future masters of industrial training.

Methods: theoretical (study and analysis of psychological and pedagogical, scientific and methodological literature to identify the role of digital competence in the professional activities of masters of industrial training; emphasizing the main aspects that digital competence should provide in the general sense in the educational process; identifying levels of digital competence of future masters of industrial training); empirical (testing of graduates – future masters of industrial training in order to determine their levels of digital competence); statistical (processing of the received test results and construction of diagrams).

Results and discussion. The digital society dictates its requirements for professional training. The graduate must not only acquire the skills needed to enter a more technological and competitive labor market, but also constantly improve these skills and acquire new ones, learning throughout life. To do this, he must be well-versed in the vast information space, be able to find solutions independently (Nasution et al., 2018).

It is the digital competence of the graduate that can ensure his ability to self-education and professional development in the context of digitalization.

The concept of digital competence appeared in 2013 for the first time and after a significant update it describes 21 learning outcomes in 5 areas:

1) information and information literacy, content management;

2) communication, cooperation and participation in public life;

3) creation of digital content;

4) data security and protection;

5) solving tasks (Kovalchuk and Sheludko, 2019).

The definition of digital competence in 2018 in the European Framework of Key Competences outlines these five areas, while maintaining the basic format of knowledge, skills and abilities.

Digital competence involves the ability to use digital technologies to support creativity, active citizenship and social integration, collaboration with other people to achieve personal, social or commercial goals (Havrilova and Topolnyk, 2017).

However, today this definition must be flexible enough to be relevant in today's and future society first of all. This is primarily due to the large number of social media resources and the emergence of technologies such as artificial intellect, robotics, virtual and augmented reality.

A necessary condition for the preparation of a graduate capable of using digital technologies in professional activities there, are qualified teachers who are motivated to work, self-improvement and productive use of digital technologies in the educational process.

The modern learning process involves the use of computer information environment as a universal tool in the acquisition of knowledge and professional skills (Kovalchuk and Fedotenko, 2018).

Most modern teachers find it very convenient to use digital technologies in their professional activities, but this does not mean that all teachers and graduates of educational establishments are well possessed in them and can use them in their professional activities. As digital technologies have been becoming a part of our daily lives and are embedded in the educational space, it is crucial that our educational community is competent and is willing to use them. In this sense, digital competence means the confident and critical use of the full range of digital technologies for information, communication and basic problem solving in all aspects of life (Lynch, 2019).

It is easy to assume that most people use digital technologies comfortably, but unfortunately this is not true. In fact, the Pew Research Center conducted a study that assessed respondents who were divided into five sections based on their readiness to use digital technology: "unprepared", "traditional students", "forced", "cautious clickers" and "digitally ready". According to their estimates, most people doubt their readiness when it comes to using digital tools, and only 17% are fully prepared to use them (Horrigan, 2016).

Our study was conducted on the basis of the Professional and Pedagogical Professional College of Hlukhiv National Pedagogical University named after Oleksander Dovzhenko among 68 respondents (future masters of industrial training).

As a tool to study the levels of development of digital competence of future masters of industrial training, we used electronic tests. They were developed based on the Digital Competency Profiler (EILab) proposed by the University of Ontario's Institute of Technology (EILab) (Digital Competency Profiler, 2018). The test aims to understand how and at what level graduates of the Vocational College will be able to use a variety of digital technologies, including mobile technologies, both in everyday life and in future professional activities. At the end of the survey, a graph of the profile of the distribution of levels of digital competence was created for each respondent. This profile helps to identify gaps in the development of digital competence that can be

removed through appropriate advice, further education or experience.

The main advantage of choosing this approach is that the indicators for measuring the levels of development of digital competence are formulated on the basis of an analysis of the objective needs of modern society. At the time of the research, this methodology is considered the most appropriate and practice-oriented.

Based on the work of foreign researchers, digital competence can also be seen as a set of theoretical and practical knowledge, skills and values that can be easily identified and used in a particular situation. And the ability to use digital technologies productively implies the development of four levels of digital competence as a prerequisite for the effective use of digital technologies, or their use for certain purposes (Ally, 2019).

To use effectively the opportunities of the educational digital space, the digital competence of masters of industrial training should include the development of the following levels:

1. The technical level contains a set of practical knowledge, usually obtained on the basis of experience with digital devices. These skills constitute the knowledge from which the user will choose, using specific criteria derived from the analysis of the situation needed to select and use digital technologies.

2. The social level includes a set of practical knowledge, usually formed on the basis of communication experience and based on caring for the needs of others, for the development and use of strategies for reflection and interaction with others on the Internet.

3. The information level is a set of theoretical and practical knowledge developed by analyzing the results of various data collection experiments in order to select usable methods for the identification, selection, organization and interpretation of information.

4. The epistemological level is a set of theoretical and practical knowledge in a particular discipline or in a particular field, which is usually developed through formal research and experience. These data are used, with the help of certain methods, for the efficient and effective use of industry-specific digital tools. This knowledge, translated into operating systems or schemas, is needed to formulate information processing tasks with digital tools (such as spreadsheets, databases, photo or music editing systems, any other information processing software, including programming languages and authoring systems), to identify and solve problems or to perform professional tasks (Desjardins, 2017).

These levels are represented in the questionnaire by indicators consisting of 16 activities divided into categories (four for each level), each of which has two measures: frequency and confidence in use, which are conceptualized as "twins", synergistic indicators of digital competence.

Frequency of use is considered an important general indicator of digital competence, provided that procedural knowledge is transferred, which is supported by the purposeful use of digital devices (ie practice leads to the acquisition of abilities). Confidence in use, self-esteem, taking into account a person's ability to choose and perform certain actions directly related to self-efficacy, which is considered an important parameter of un necessarily acquired abilities, but rather a person's desire to engage in new activities, positively solve problems and to expand already acquired abilities.

The results of the study *(Fig. 1)* show differences in the levels of digital competence of future masters of industrial training. The analysis of the obtained data showed that almost half of the respondents (47%) have developed a social level of digital competence. 24% of respondents have a technical level, and 17% have an information level. The smallest number of respondents (12%) has an epistemological level of digital competence development.

If we analyze each block separately, we can identify the following patterns. At the technical level, the capabilities and willingness to work with digital devices differ significantly *(Fig. 2)*. Most often, in their activities, respondents (54%) said that they manage various their own accounts (e-mail, bank, telephone, video chat, television, etc.). This is due to the fact that today all social networking services, bank accounts and even utilities have accounts where is a large number of settings for ease of use or security. Other respondents – 35% most often manage digital devices (multimedia equipment, home entertainment systems, smart devices, etc.). Almost none of the respondents (1%) use remote monitoring of digital

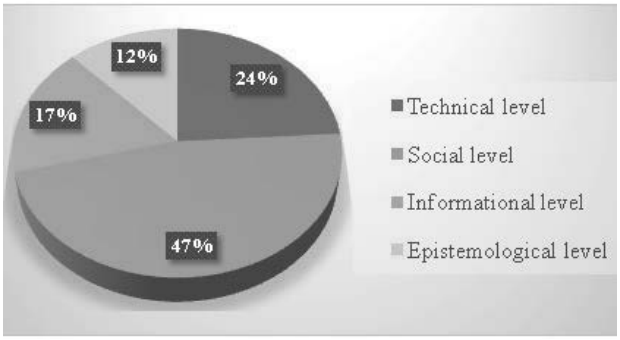

Fig. 1. The general distribution of respondents by levels of digital competence

devices yet, probably due to the fact that such devices have not yet become widespread among the majority of the population. To find a way and navigate in space (working with digital maps Map Quest, Google Maps and their devices Navitel, Garmin) 10% of respondents most often use digital technology.

At the social level *(Fig. 3)* they received the following distribution of the most common indicators: 45% of students often use social networking systems (Facebook, Istagram, Google+, LinkedIN, Twitter, etc.), 42% – use digital technologies to communicate with others via text messages, e-mail or applications (chats, SMS, Skype, Viber, Facetime, etc.), 5% – use digital tools for commonwork and share documents (Google Drive, Dropbox, etc.) and 3% often share their own work and ideas in public blogs, photo sharing, etc.).

The information level of digital competence development *(Fig. 4)* is represented by the following distribution: 22% – use digital technologies to search and download books or articles (text or audio). 29% of respondents in the first place search and download music or movies from the Internet. The largest percentage of all respondents (34%) belongs to watching short videos on the Internet (YouTube, etc.). And only 15% of students most often watch the news on the Internet.

At the epistemological level *(Fig. 5)*, a larger number of respondents (63%) use the ability to create or edit electronic documents (text processing, presentations, spreadsheets), data sorting. This is easily explained by the fact that respondents (graduate students) often use these technologies in education (preparation and defense of works, presentation of materials, etc.). The second place – 28% of respondents who use the ability to create or edit audio recordings (podcasts, voice memos), multimedia elements (photos, movies, slide shows). This is due to the fact that today everyone has pages on social networks, and the placement of photos or videos there is a quite spread fact. 9% of respondents often use the capabilities of digital technology to calculate and create graphs from numerical data. This group of respondents mainly includes students who have high academic results, i.e.

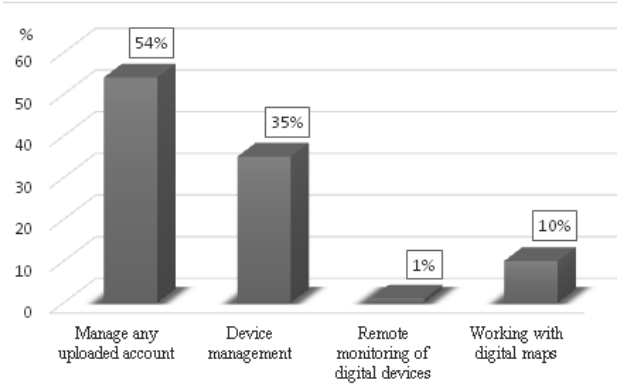

Fig. 2. Distribution of respondents at the technical level of development of digital competence by the most frequent use of indicators

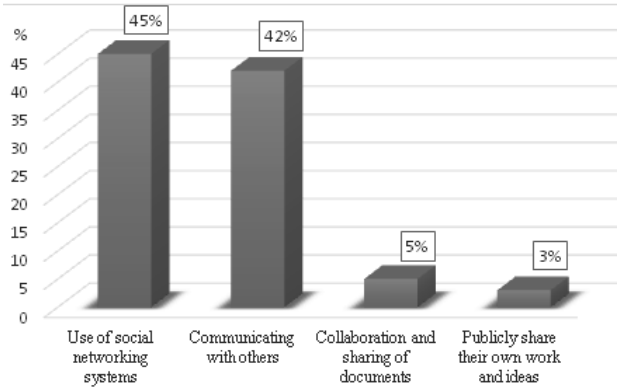

Fig. 3. Distribution of respondents at the social level of digital competence development according to the most frequent use of indicators

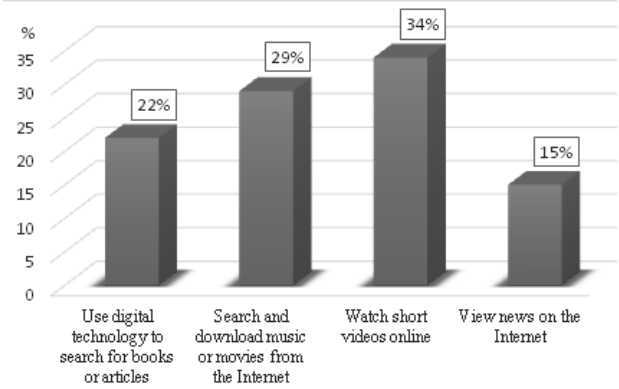

Fig. 4. Distribution of respondents at the information level of digital competence according to the most frequent use of indicators

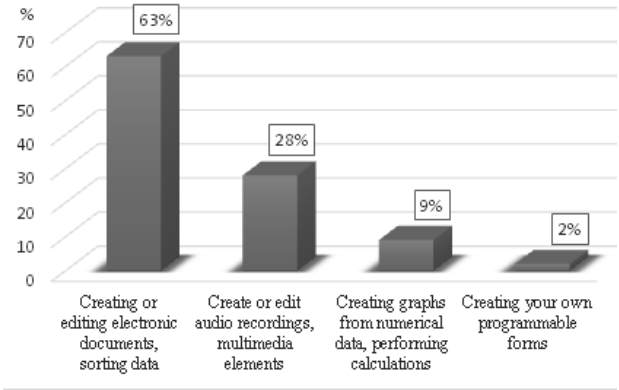

Fig. 5. Distribution of respondents at the epistemological level of digital competence by the most frequent use of indicators

those who conduct research with calculations and presentation of results in the form of graphs or charts. The smallest number of respondents (2%) use digital technologies to create their own programmable forms to automate certain processes (macros, scripts, robotics, use of any programming languages, etc.). Such a small percentage is explained not due to the great need for this category, because today most of the necessary technologies that can automate processes can be found ready-made. But some respondents do it because they are interested in it or it is a hobby for them.

Digital competence at each level can develop differently and in different aspects of everyday life. Using the Internet to communicate, search, download and create new content, to solve technical problems, to make purchases and payments – all these are different opportunities and, accordingly, different resources are needed to implement them. Each of the described levels can be both general (in many areas of activity) and partial (in some areas). Therefore, in such research, it is important to study carefully each level and areas in which it can receive specific development and implementation.

Educators need to give recommendations to students to improve their overall level of digital competence. This will allow them to master the necessary knowledge, improve their skills and be successful professionals in modern society.

Conclusions. Digital competence means the confident and critical use of the full range of digital technologies for information, communication and basic problem solving in all aspects of life. Frequent use of a variety of digital technologies is an important overall indicator of digital competence under the circumstances to give procedural knowledge which is supported by the purposeful using of digital devices.

According to the results of experimental research, respondents had some differences in the levels of development of digital competence. Thus, 47% of respondents showed a developed social level, 24% of respondents showed the technical level, and 17% of them showed the information level. The smallest number of respondents (12%) has an epistemological level of digital competence.

For more productive future professional activity of the master of industrial training it is necessary to try to equalize all described levels in a certain range. This will allow professionals to use equally a variety of digital technologies. To achieve a more uniform use of digital technologies in the educational process, each future specialist must personally strive for the development, exchange of experience, the maximum implementation of modern technological advances in educational activities. Raising awareness of innovations, gaining experience in using new digital technologies and tools, involving students in the practical application of digital technologies in the educational process, sharing experiences with colleagues will increase the personal level of digital competence of each future teacher.

The increasing interest of professionals in current trends and innovations in technology can help create a comfortable digital environment in educational institutions, as well as acquaintance of teachers with the possibilities of digital technologies that will improve their professional activities (Yachyna and Fernandez, 2018).

In the field of education, it is necessary to adopt standards and programs for the development of digital literacy of teachers, one of the most important directions of which it should be the development of critical thinking, as well as expanding knowledge and skills of modern digital technologies in education.

In the future it is planned to develop a model for the formation of digital competence of future masters of industrial training of motor transport profile. The results of the study will be taken into account in the further training of masters of industrial training.

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Розвиток цифрової компетентності майбутніх майстрів виробничого навчання

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Реферат.

Актуальність: використання сучасних цифрових технологій є необхідною умовою розвитку ефективніших підходів до навчання та вдосконалення методики викладання, що дає змогу заощадити час і швидше досягти поставленої мети. Високий навчальний потенціал сучасних цифрових технологій та темпи їх розвитку, розробка і модернізація програмних засобів зумовлюють вимогу щодо вдосконалення підготовки майстрів виробничого навчання. За таких умов випускникам закладів передфахової вищої освіти важливо володіти знаннями, уміннями та досвідом для розв'язання освітніх завдань, перш за все, засобами цифрових технологій.

Мета: обґрунтувати та експериментально перевірити рівні розвитку цифрової компетентності майбутніх майстрів виробничого навчання.

Методи: теоретичні (аналіз, синтез, узагальнення); емпіричні (тестування); статистичні (опрацювання результатів, побудова діаграм).

Результати. Проаналізовано роль цифрової компетентності у професійній діяльності майстрів виробничого навчання, виділено основні аспекти її формування, виокремлено рівні розвитку цифрової компетентності (технічний, соціальний, інформаційний та епістемологічний). Для визначення рівнів цифрової компетентності майбутніх майстрів виробничого навчання було проведено дослідження серед студентів випускних груп професійно-педагогічного фахового коледжу Глухівського НПУ ім. О. Довженка з подальшим аналізом і презентацією отриманих результатів. В експериментальному дослідженні використовувалась методика, що дає змогу встановити рівні цифрової компетентності на основі визначення частоти використання різноманітних цифрових технологій респондентами. Отримані результати дають змогу виявити деякі проблеми у формуванні та розвитку рівнів цифрової компетентності при підготовці майбутніх майстрів виробничого навчання. Зокрема, було продемонстровано, що досліджувані чотири рівні цифрової компетентності мають неоднаковий розвиток і потребують подальшого коригування. У значної кількості учасників дослідження переважав соціальний рівень. Аналіз кожного рівня окремо дав змогу виявити деякі закономірності в їх формуванні під час освітнього процесу та у звичайних, повсякденних операціях респондентів.

Висновки: активність використання різноманітних цифрових технологій є важливим загальним показником розвитку цифрової компетентності за умови, що передаються процедурні знання, котрі підкріплюються цілеспрямованим використанням цифрових пристроїв. За результатами експериментального дослідження у респондентів було встановлено певні відмінності в рівнях розвитку цифрової компетентності: в 47% респондентів виявився розвинутий соціальний рівень, у 24% опитуваних – технічний, а в 17 % – інформаційний. Найменша кількість респондентів (12%) має епістемологічний рівень цифрової компетентності.

Ключові слова: *майстри виробничого навчання, рівні розвитку, цифрова компетентність, цифровізація, цифрові технології.*

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